

## CMOS LDO Regulator Series for Portable Equipments

# High-speed Load Response FULL CMOS LDO Regulators


**BU□□TA2WNVX Series, BU□□TA2WHFV Series**

No.09020EAT01

**●Description**

BU□□TA2WNVX /HFV series is high-performance FULL CMOS regulator with 200-mA output, which is mounted on microminiature package SSON004X1216 (1.2 mm × 1.6 mm × 0.6 mm) & HVSO5 (1.6mm X 1.6mm X 0.6mm). It has excellent noise characteristics and load responsiveness characteristics despite its low circuit current consumption of 40 μA. It is most appropriate for various applications such as power supplies for logic IC, RF, and camera modules. Microminiature package SSON004X1216 & HVSO5 with built-in heatsink is adopted for the package, which contributes to the space-saving design of the set.

**●Features**

- 1) High-accuracy output voltage of ±1% (±25 mV on 1.5-V & 1.8-V products)
- 2) High ripple rejection: 70 dB (Typ., 1 kHz, VOUT≤1.8 V)
- 3) Compatible with small ceramic capacitor (CIN=Co=1.0 μF)
- 4) Low current consumption: 40 μA
- 5) ON/OFF control of output voltage
- 6) With built-in overcurrent protection circuit and overheat protection circuit
- 7) With built-in output discharge circuit
- 8) Adopting microminiature power package SSON004X1216

**●Applications**

Battery-powered portable equipment, etc.

**● Absolute maximum rating**

| Parameter                     | Symbol | Limits                              | Unit |
|-------------------------------|--------|-------------------------------------|------|
| Maximum applied power voltage | VMAX   | -0.3 ~ +6.5                         | V    |
| Power dissipation             | Pd1    | 220* <sup>1</sup><br>(SSON004X1216) | mW   |
|                               | Pd2    | 410* <sup>2</sup> (HVSO5)           | mW   |
| Maximum junction temperature  | TjMAX  | +125                                | °C   |
| Operational temperature range | Topr   | -40 ~ +85                           | °C   |
| Storage temperature range     | Tstg   | -55 ~ +125                          | °C   |

\*1 When 1 PCB (70 mm × 70 mm, thickness 1.6-mm glass epoxy) a standard ROHM board is implemented.  
Reduced to 2.2 mW/°C when used at Ta=25°C or higher.

\*2 When 1 PCB (70 mm × 70 mm, thickness 1.6-mm glass epoxy) a standard ROHM board is implemented.  
Reduced to 4.1 mW/°C when used at Ta=25°C or higher.

**● Recommended operating range (Do not exceed Pd.)**

| Parameter                  | Symbol | Limits    | Unit |
|----------------------------|--------|-----------|------|
| Input power supply voltage | VIN    | 2.5 ~ 5.5 | V    |
| Maximum output current     | IMAX   | 200       | mA   |

**● Recommended operating conditions**

| Parameter        | Symbol | Min.              | Typ. | Max. | Unit | Conditions                          |
|------------------|--------|-------------------|------|------|------|-------------------------------------|
| Input capacitor  | CIN    | 0.5* <sup>3</sup> | 1.0  | —    | μF   | A ceramic capacitor is recommended. |
| Output capacitor | Co     | 0.5* <sup>3</sup> | 1.0  | —    | μF   | A ceramic capacitor is recommended. |

\*3 Set the capacity value of the capacitor so that it does not fall below the minimum value, taking temperature characteristics, DC device characteristics, and change with time into consideration.

- Block diagram, recommended circuit diagram, and pin configuration diagram

**BH□□TA2WNVX**

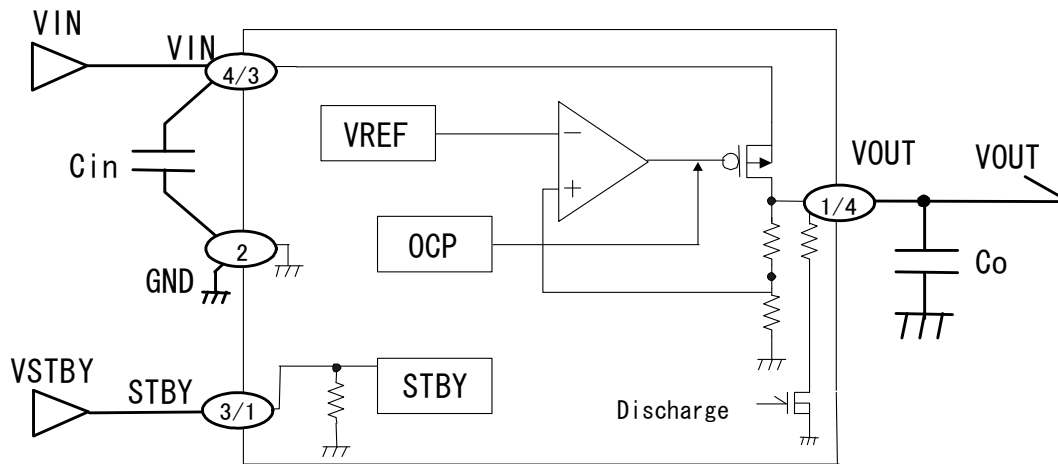
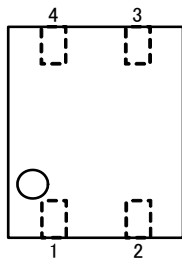


Fig.1 Recommended circuit diagram

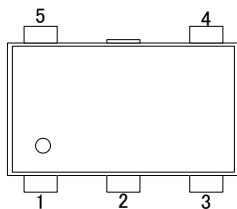
Recommended ceramic capacitor for Cin & Co  
Murata Manufacturing Co., Ltd.  
GRM188B11A105KA61D

**BU□□TA2WNVX(SSON004X1216)**



| PIN No. | Symbol | Function  |
|---------|--------|---|
| 1       | VOUT   | Voltage output  |
| 2       | GND    | Grounding   |
| 3       | STBY   | ON/OFF control of output voltage (High: ON, Low: OFF) |
| 4       | VIN    | Power input   |

**BU□□TA2WHFV(HVSOF5)**



| PIN No. | Symbol | Function  |
|---------|--------|---|
| 1       | STBY   | ON/OFF control of output voltage (High:ON, Low:OFF) |
| 2       | GND    | Grounding   |
| 3       | VIN    | Power input   |
| 4       | VOUT   | Voltage output                                      |
| 5       | N.C.   | No Connect  |

● **Electrical characteristics** ( $T_a=25^\circ\text{C}$ ,  $V_{IN}=V_{OUT}+1.0\text{ V}$  ( $V_{IN}=3.5\text{ V}$  on  $V_{OUT}=1.8\text{-V}$  and  $1.5\text{-V}$  products),  $STBY=1.5\text{ V}$ ,  $C_{IN}=1.0\ \mu\text{F}$ ,  $C_O=1.0\ \mu\text{F}$ , unless otherwise specified)

| Parameter                                | Symbol | Min.                   | Typ. | Max.                   | Unit          | Conditions   |  |
|--|--------|------------------------|------|------------------------|---------------|--|--|
| Output voltage                           | VOUT   | $V_{OUT}\times 0.99$   | VOUT | $V_{OUT}\times 1.01$   | V             | $I_{OUT}=10\ \mu\text{A}$ , $V_{OUT}\geq 2.5\text{ V}$   |  |
|  |        | $V_{OUT}-25\text{ mV}$ |      | $V_{OUT}+25\text{ mV}$ |               | $I_{OUT}=10\ \mu\text{A}$ , $V_{OUT}< 2.5\text{ V}$  |  |
| Circuit current                          | IIN    | -                      | 40   | 95                     | $\mu\text{A}$ | $I_{OUT}=0\text{ mA}$  |  |
| Circuit current (at STBY)                | ISTBY  | -                      | -    | 1                      | $\mu\text{A}$ | $STBY=0\text{ V}$  |  |
| Ripple rejection                         | RR     | 55                     | 70   | -                      | dB            | $V_{RR}=-20\text{ dBv}$ , $f_{RR}=1\text{ kHz}$ ,<br>$I_{OUT}=10\text{ mA}$<br>$1.5\text{ V}\leq V_{OUT}\leq 1.8\text{ V}$ |  |
|  |        |                        | 65   |                        |               | $V_{RR}=-20\text{ dBv}$ , $f_{RR}=1\text{ kHz}$ ,<br>$I_{OUT}=10\text{ mA}$<br>$2.5\text{ V}\leq V_{OUT}$                  |  |
| Input/Output voltage difference          | VSAT   | -                      | 400  | 800                    | mV            | $2.5\text{ V}\leq V_{OUT}\leq 2.6\text{ V}$<br>( $V_{IN}=0.98\times V_{OUT}$ , $I_{OUT}=200\text{ mA}$ )                   |  |
|  |        | -                      | 360  | 720                    | mV            | $2.7\text{ V}\leq V_{OUT}\leq 2.85\text{ V}$<br>( $V_{IN}=0.98\times V_{OUT}$ , $I_{OUT}=200\text{ mA}$ )                  |  |
|  |        | -                      | 330  | 660                    | mV            | $2.9\text{ V}\leq V_{OUT}\leq 3.1\text{ V}$<br>( $V_{IN}=0.98\times V_{OUT}$ , $I_{OUT}=200\text{ mA}$ )                   |  |
|  |        | -                      | 300  | 600                    | mV            | $3.2\text{ V}\leq V_{OUT}\leq 3.4\text{ V}$<br>( $V_{IN}=0.98\times V_{OUT}$ , $I_{OUT}=200\text{ mA}$ )                   |  |
| Line regulation                          | VDL    | -                      | 2    | 20                     | mV            | $V_{IN}=V_{OUT}+1.0\text{ V}$ to $5.5\text{ V}$ ,<br>$I_{OUT}=10\ \mu\text{A}$   |  |
| Load regulation                          | VDLO   | -                      | 10   | 80                     | mV            | $I_{OUT}=0.01\text{ mA}$ to $100\text{ mA}$  |  |
| Overcurrent protection detection current | ILMAX  | 250                    | 400  | 700                    | mA            | $V_o=V_{OUT}\times 0.8$  |  |
| Output short-circuit current             | ISHORT | 20                     | 70   | 150                    | mA            | $V_o=0\text{ V}$   |  |
| Output discharge resistance              | RDSC   | 20                     | 40   | 80                     | $\Omega$      | $V_{IN}=4.0\text{ V}$ , $STBY=0\text{ V}$  |  |
| Standby pull-down resistance             | RSTB   | 500                    | 1000 | 2000                   | k $\Omega$    |  |  |
| Standby control                          | ON     | VSTBH                  | 1.5  | -                      | 5.5           | V  |  |
|  | OFF    | VSTBL                  | -0.3 | -                      | 0.3           | V  |  |

\* This product does not have radiation-proof design.

● Lineup

■ 200 mA BU□□TA2WNVX / HFV series

| Product Name | 1.5 | 1.8 | 2.5 | 2.6 | 2.7 | 2.8 | 2.85 | Package                |
|--------------|-----|-----|-----|-----|-----|-----|------|------------------------|
| BU□□TA2WNVX  | ○   | ○   | ○   | ○   | ○   | ○   | ○    | SSON004X1216<br>HVSOF5 |
| BU□□TA2WHFV  | 2.9 | 3.0 | 3.1 | 3.2 | 3.3 | 3.4 | -    |                        |
|              | ○   | ○   | ○   | ○   | ○   | ○   | -    |                        |

Model name: BU□□TA2WNVX / HFV

| Symbol | Contents                        |                    |             |                    |    |                    |
|--------|---------------------------------|--------------------|-------------|--------------------|----|--------------------|
| a      | Specification of output voltage |                    |             |                    |    |                    |
|        | □□                              | Output voltage (V) | □□          | Output voltage (V) | □□ | Output voltage (V) |
|        | 15                              | 1.5 V(Typ.)        | 28          | 2.8 V(Typ.)        | 32 | 3.2 V(Typ.)        |
|        | 18                              | 1.8 V(Typ.)        | 2J          | 2.85 V(Typ.)       | 33 | 3.3 V(Typ.)        |
|        | 25                              | 2.5 V(Typ.)        | 29          | 2.9 V(Typ.)        | 34 | 3.4 V(Typ.)        |
|        | 26                              | 2.5 V(Typ.)        | 30          | 3.0 V(Typ.)        | -  | -                  |
| 27     | 2.7 V(Typ.)                     | 31                 | 3.1 V(Typ.) | -                  | -  |                    |

● Input/Output terminal equivalent circuit schematic

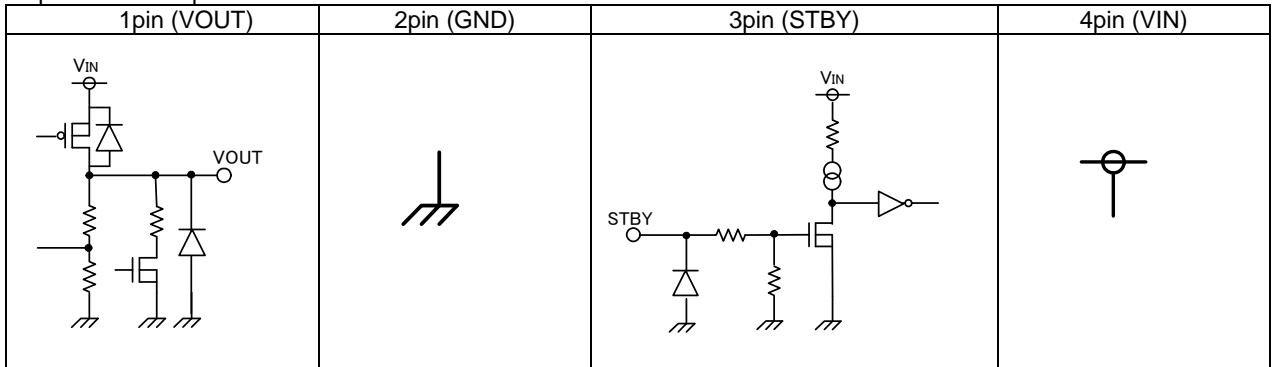


Fig. 2 Input/Output equivalent circuit

● About input/output capacitor

It is recommended to place a capacitor as close as possible to the pins between the input terminal and GND or between the output terminal and GND.

The capacitor between the input terminal and GND becomes valid when source impedance increases or when wiring is long. The larger the capacity of the output capacitor between the output terminal and GND is, the better the stability and characteristics in output load fluctuation become. However, please check the status of actual implementation. Ceramic capacitors generally have variation, temperature characteristics, and direct current bias characteristics and the capacity value also decreases with time depending on the usage conditions. It is recommended to select a ceramic capacitor upon inquiring about detailed data of the related manufacturer.

● About the equivalent series resistance (ESR) of a ceramic capacitor

Capacitors generally have ESR (equivalent series resistance) and it operates stably in the ESR-IOUT area shown on the right. Since ceramic capacitors, tantalum capacitors, electrolytic capacitors, etc. generally have different ESR, please check the ESR of the capacitor to be used and use it within the stability area range shown in the right graph for evaluation of the actual application.

Capacity value of ceramic capacitor - DC bias characteristics (Example)

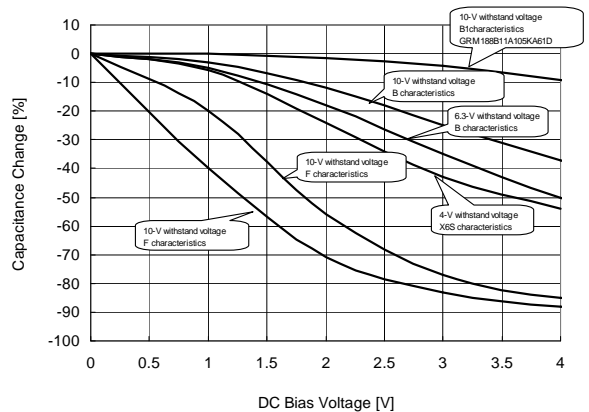


Fig.3 Capacity – bias characteristics

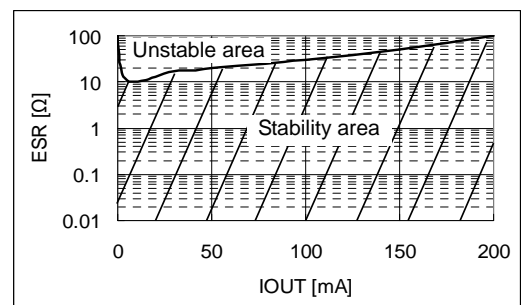


Fig.4 Stability area characteristics (Example)

● Reference data BU15TA2WNVX / HFV (Ta=25°C unless otherwise specified.)

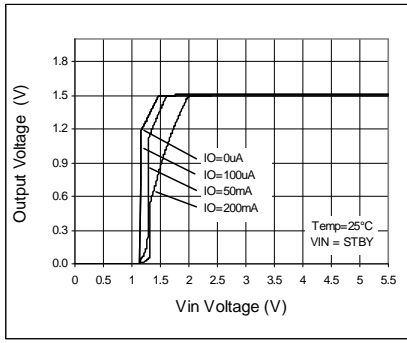


Fig. 5 Output Voltage

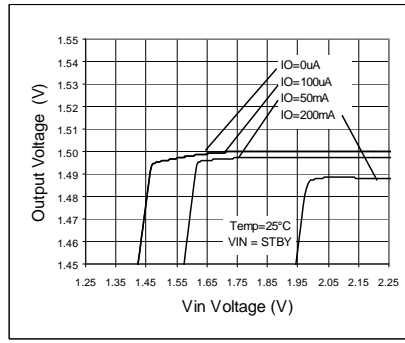


Fig. 6 Line Regulation

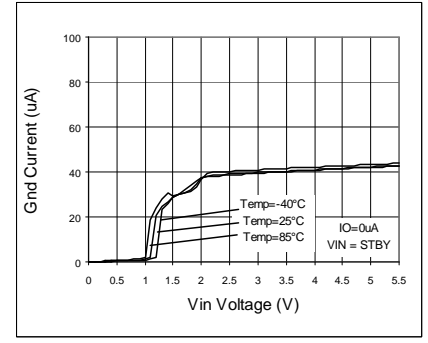


Fig. 7 Circuit Current IGND

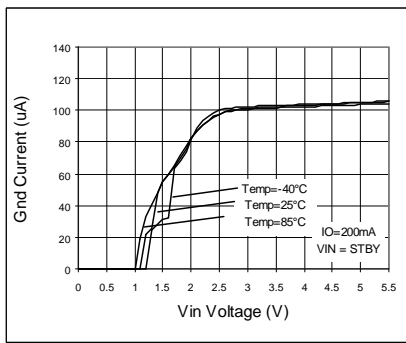


Fig. 8 Circuit Current IGND

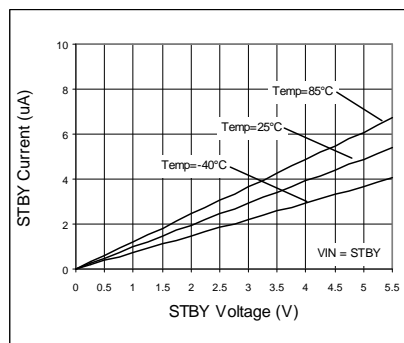


Fig. 9 STBY Input Current

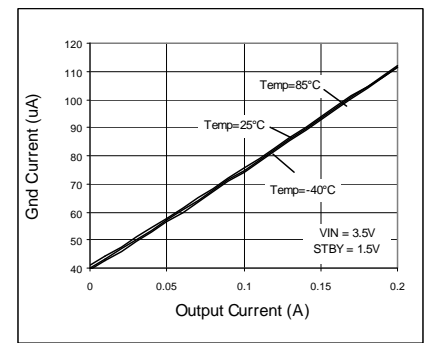


Fig. 10 IOOUT - IGDND

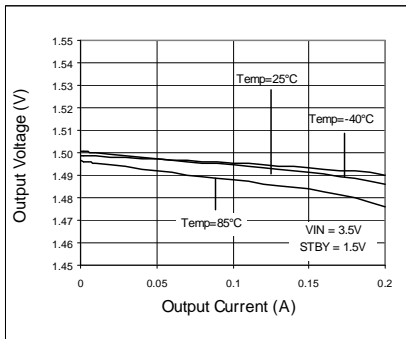


Fig. 11 Load Regulation

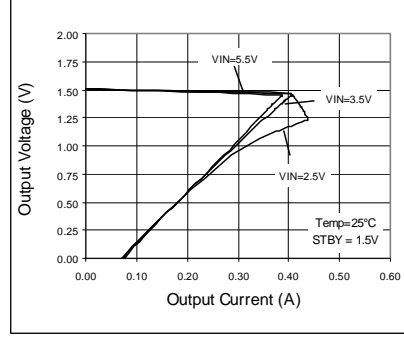


Fig. 12 OCP Threshold

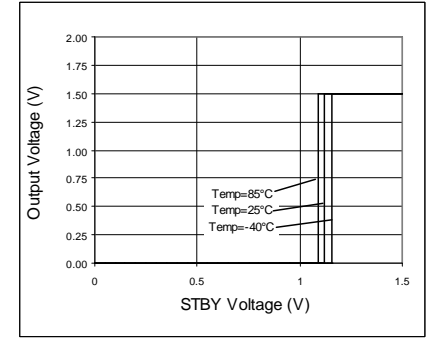


Fig. 13 STBY Threshold

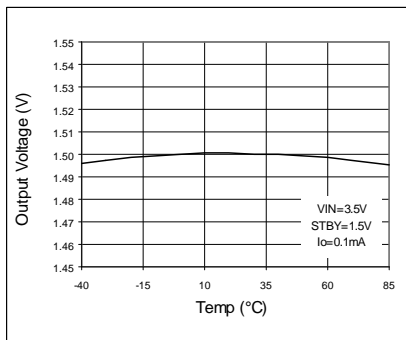


Fig. 14 VOUT vs. Temp

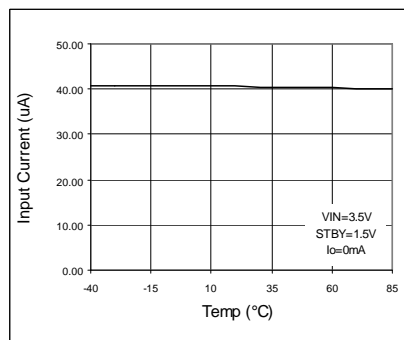


Fig. 15 IGDND vs. Temp

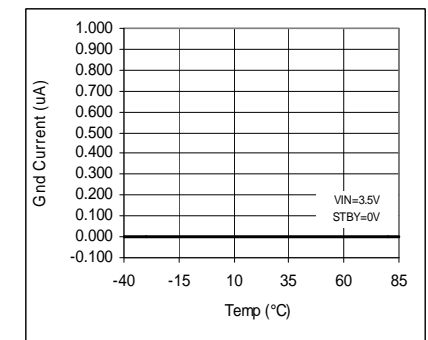


Fig. 16 IGDND vs. Temp (STBY)

● Reference data BU15TA2WNVX /HFV (Ta=25°C unless otherwise specified.)

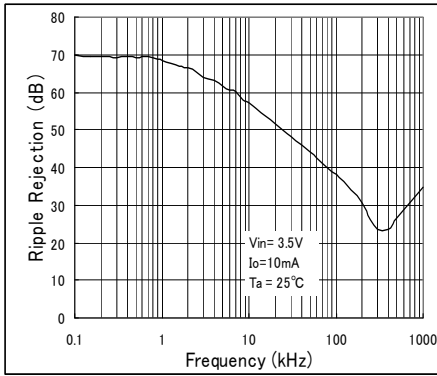


Fig. 17 Ripple Rejection vs. Freq.

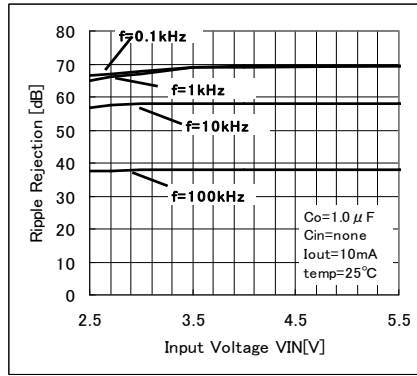


Fig. 18 Ripple Rejection vs. VIN (Iout=10 mA)

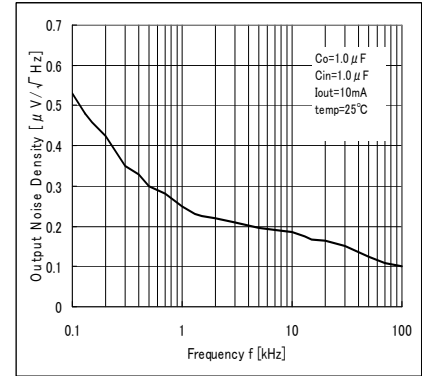


Fig. 19 Output Noise Spectral Density vs. Freq.

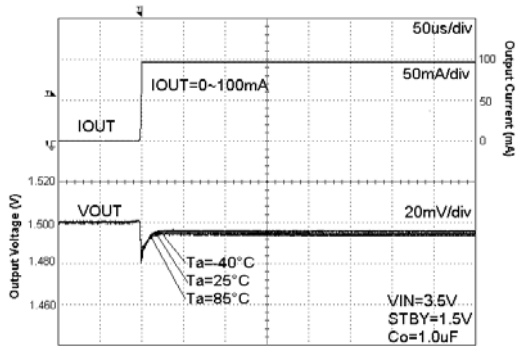


Fig. 20 Load Response

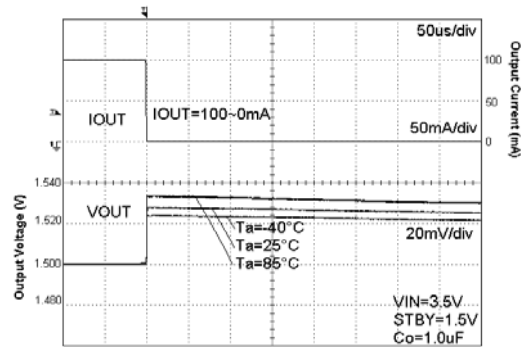


Fig. 21 Load Response

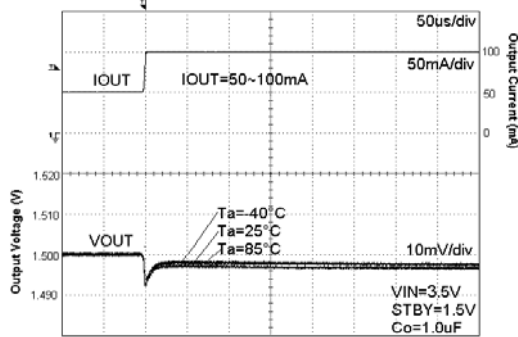


Fig. 22 Load Response

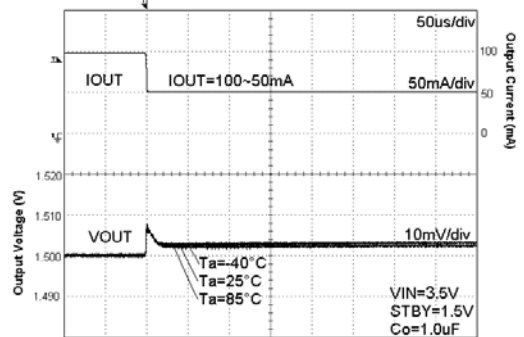


Fig. 23 Load Response

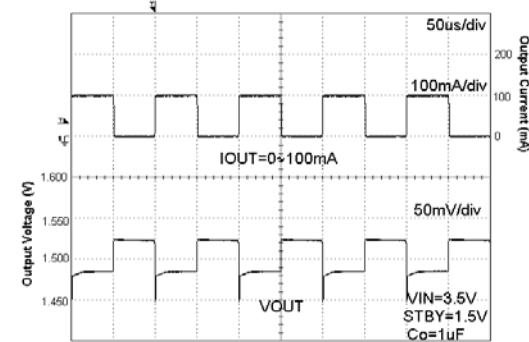


Fig. 24 Load Response Current Pulse=10 kHz

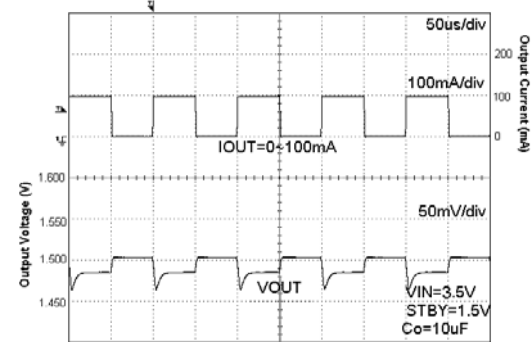


Fig. 25 Load Response Current Pulse=10 kHz

● Reference data BU15TA2WNVX / HFV (Ta=25°C unless otherwise specified.)

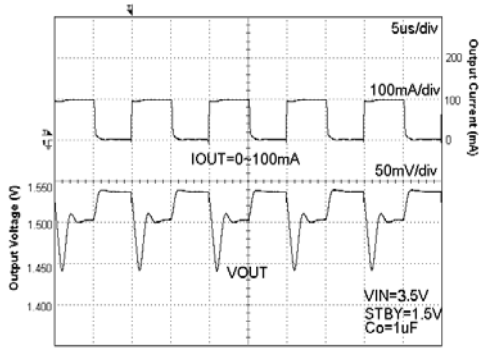


Fig. 26 Load Response  
Current Pulse=100 kHz

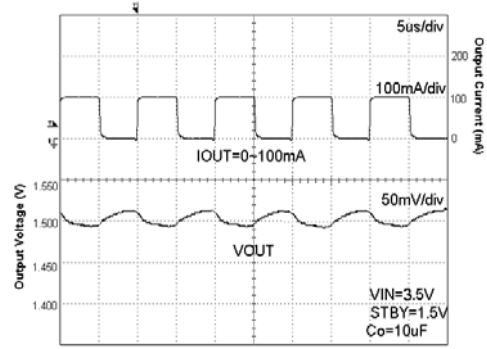


Fig. 27 Load Response  
Current Pulse=100 kHz

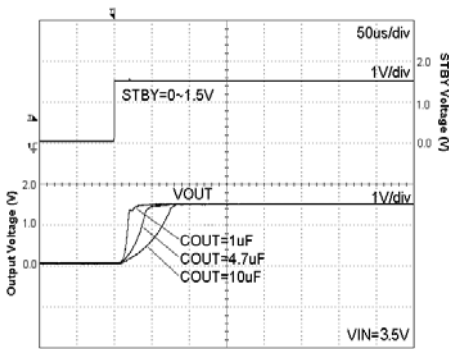


Fig. 28 Startup Time  
Iout = 0 mA

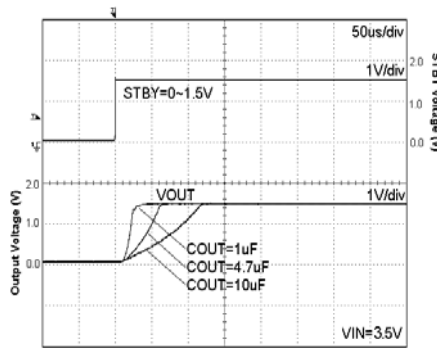


Fig. 29 Startup Time  
Iout = 200 mA

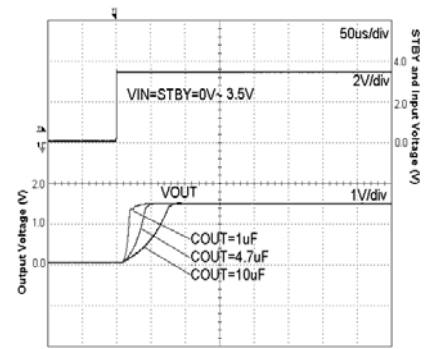


Fig. 30 Startup Time (STBY=VIN)  
Iout = 0 mA

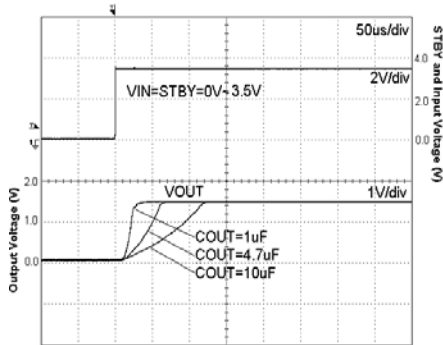


Fig. 31 Startup Time (STBY=VIN)  
Iout = 200mA

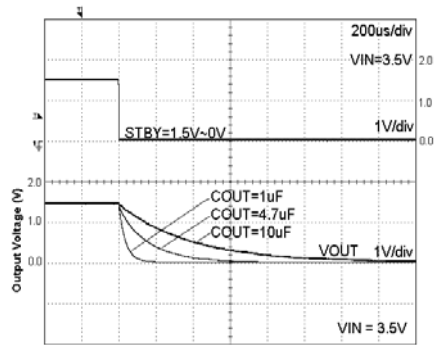


Fig. 32 Discharge Time  
Iout = 0 mA

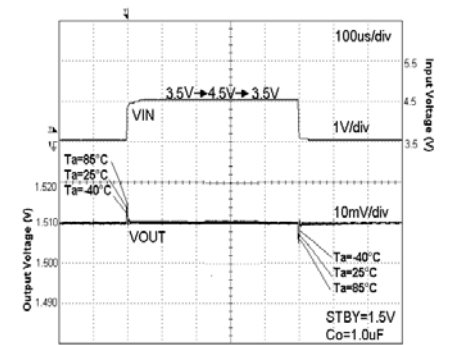


Fig. 33 VIN Response  
Iout = 10 mA

●Reference data BU18TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

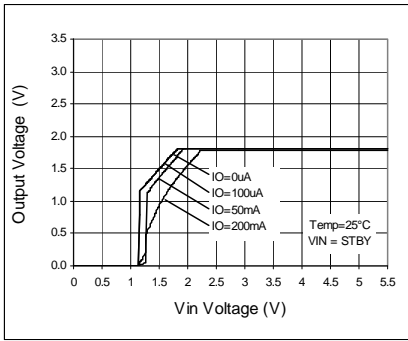


Fig. 34 Output Voltage

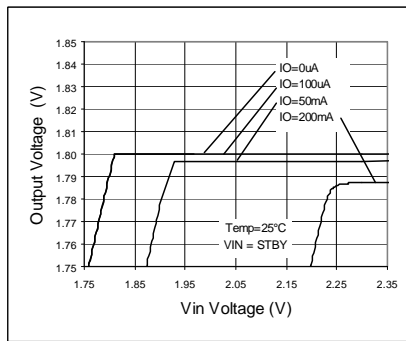


Fig. 35 Line Regulation

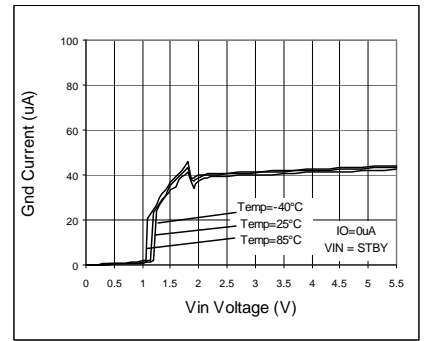


Fig. 36 Circuit Current IGND

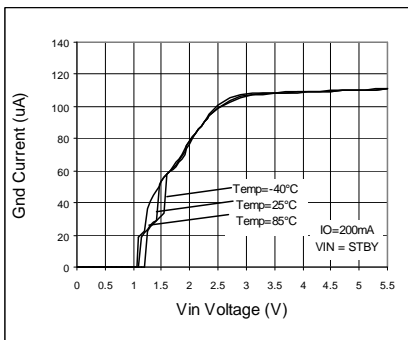


Fig. 37 Circuit Current IGND

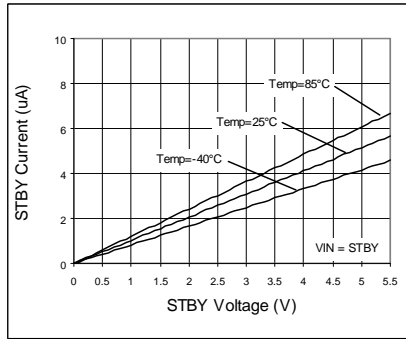


Fig. 38 STBY Input Current

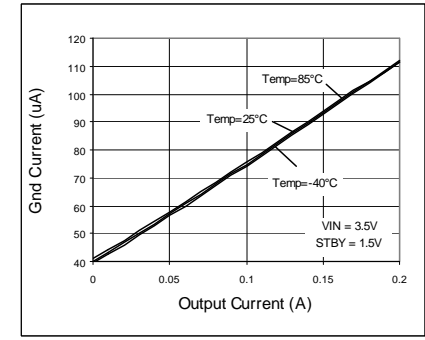


Fig. 39 IO/UT - IGND

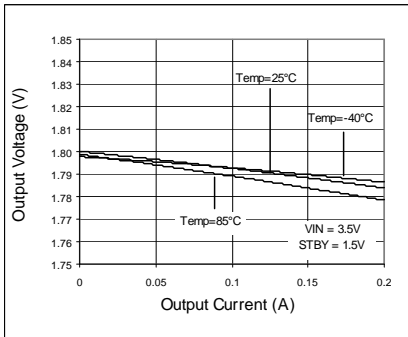


Fig. 40 Load Regulation

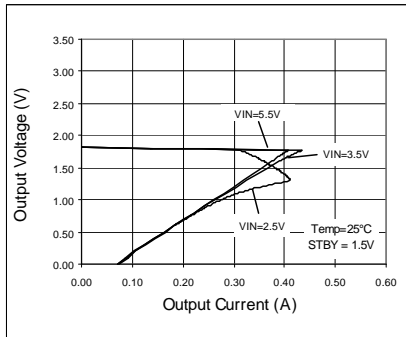


Fig. 41 OCP Threshold

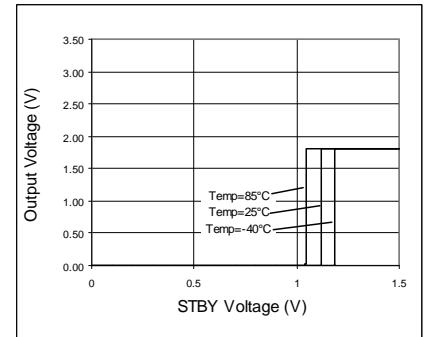


Fig. 42 STBY Threshold

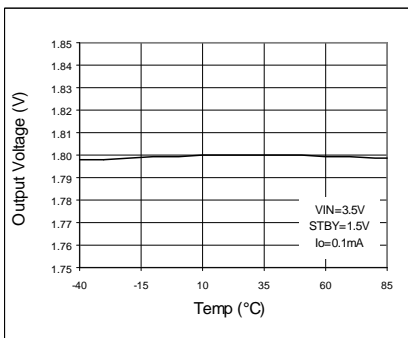


Fig. 43 VOUT vs Temp

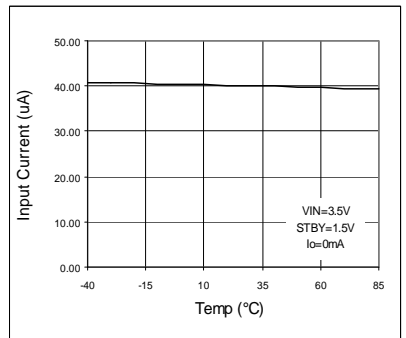


Fig. 44 IGND vs Temp

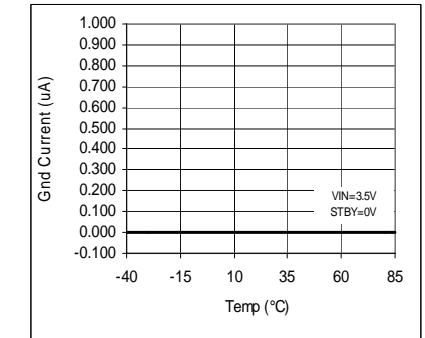


Fig. 45 IGND vs Temp (STBY)



●Reference data BU18TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

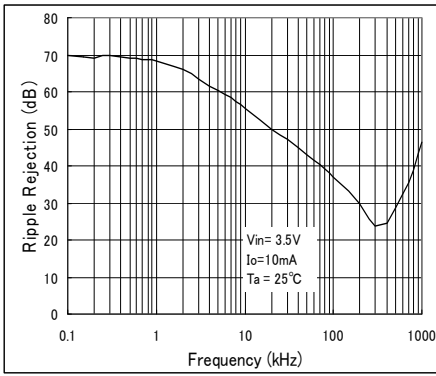


Fig. 46 Ripple Rejection VS Freq.

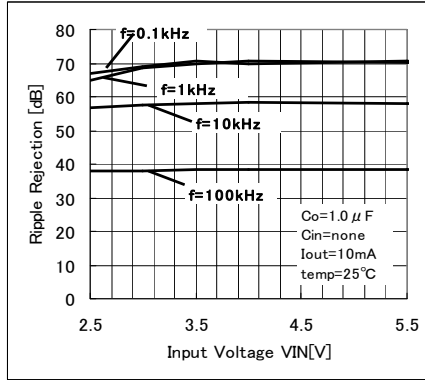


Fig. 47 Ripple Rejection VS VIN

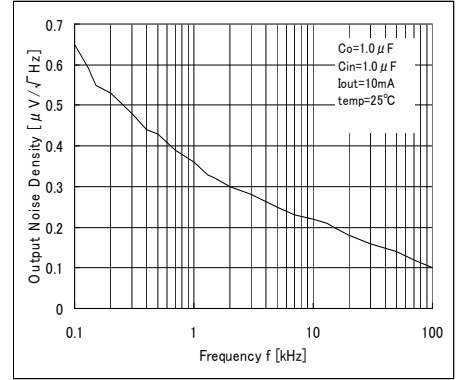


Fig. 48 Output Noise Spectrl Density VS Freq.

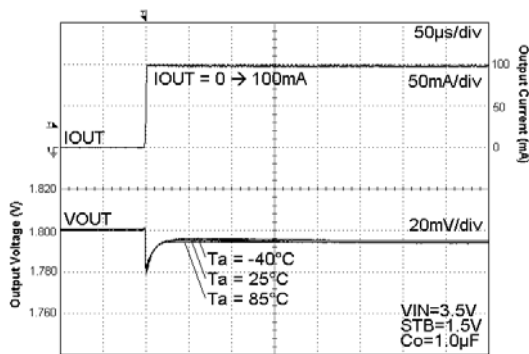


Fig. 49 Load Response

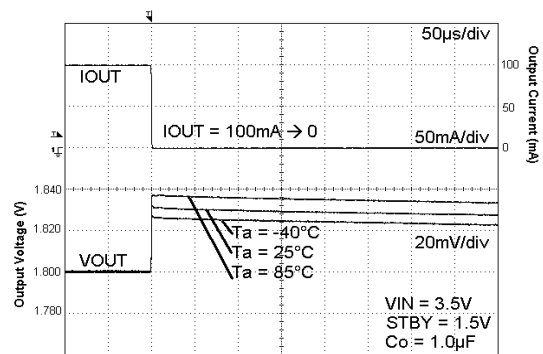


Fig. 50 Load Response

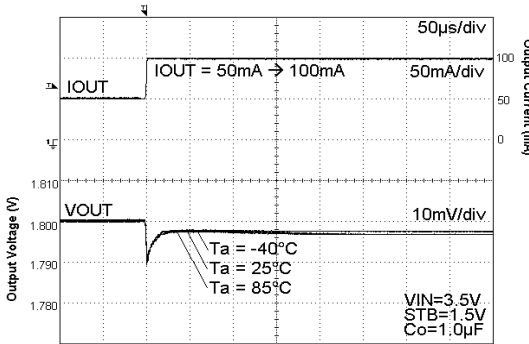


Fig. 51 Load Response

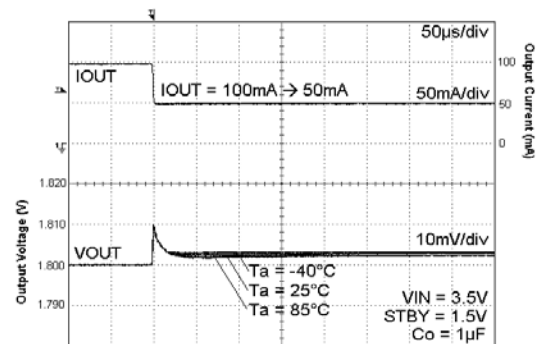


Fig. 52 Load Response

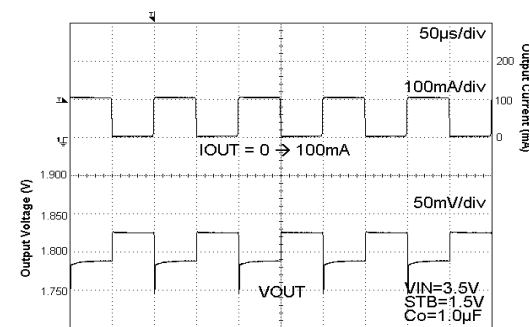


Fig. 53 Load Response  
Current Pulse=10kHz

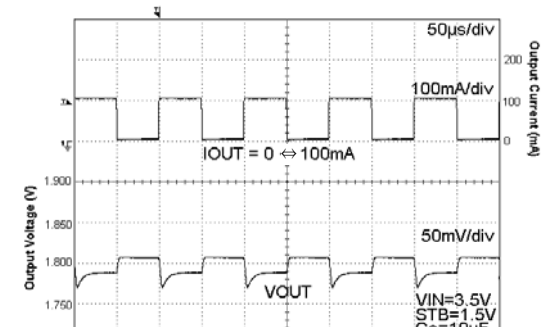


Fig. 54 Load Response  
Current Pulse=10kHz

●Reference data BU18TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

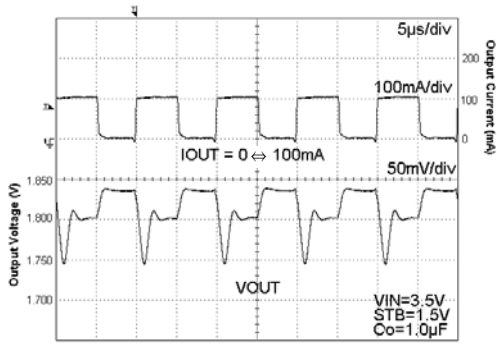


Fig. 55 Load Response  
Current Pulse=100kHz

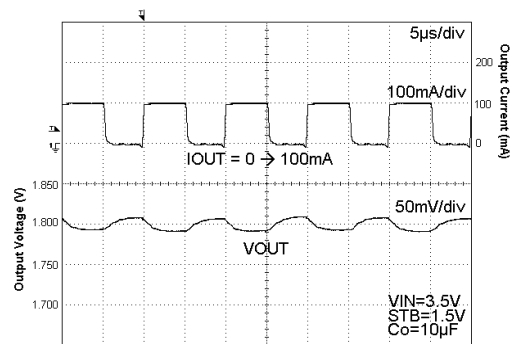


Fig. 56 Load Response  
Current Pulse=100kHz

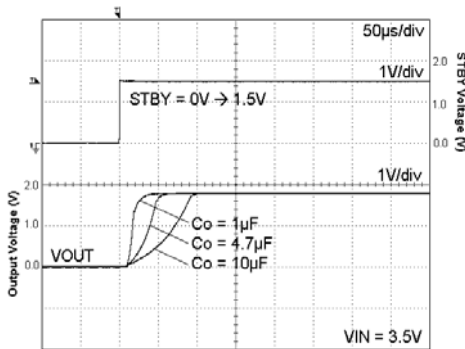


Fig. 57 Start Up Time  
Iout = 0mA

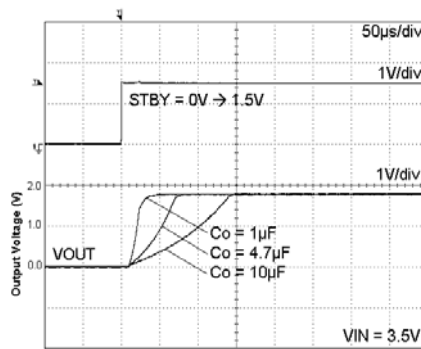


Fig. 58 Start Up Time  
Iout = 200mA

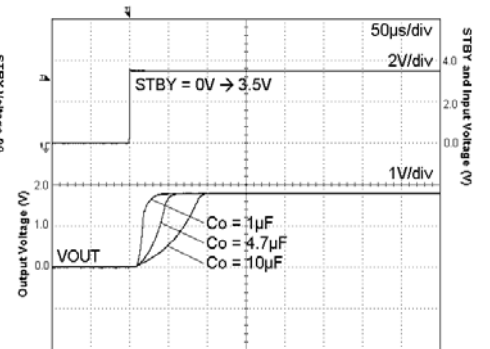


Fig. 59 Start Up Time (STBY=VIN)  
Iout = 0mA

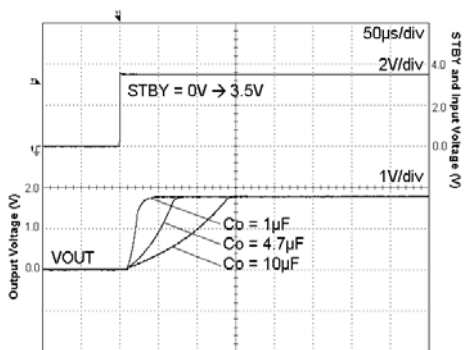


Fig. 60 Start Up Time(STBY=VIN)  
Iout = 200mA

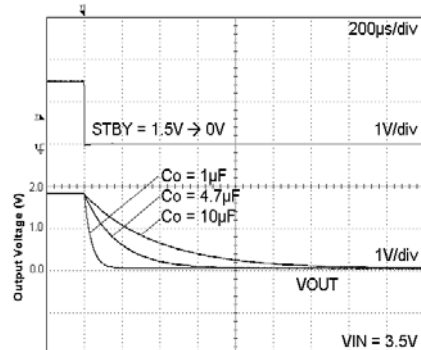


Fig. 61 Discharge Time  
Iout = 0mA

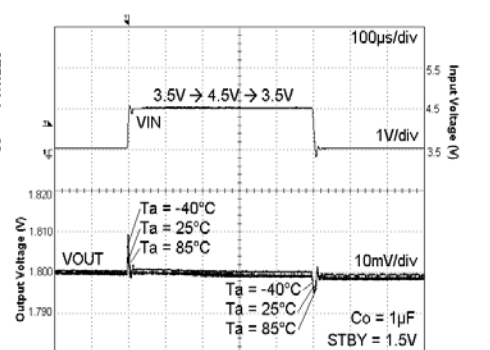


Fig. 62 VIN Response  
Iout = 10mA

●Reference data BU25TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

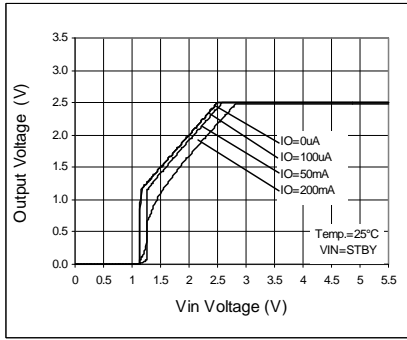


Fig. 63 Output Voltage

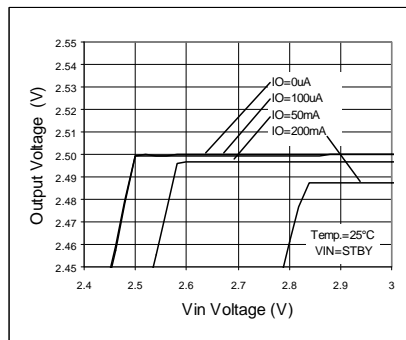


Fig. 64 Line Regulation

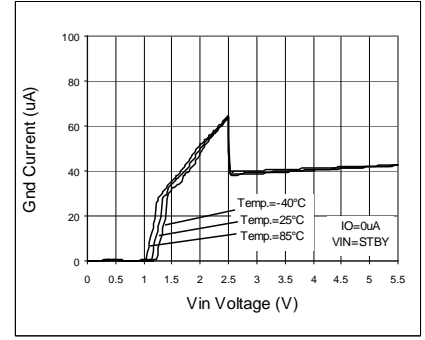


Fig. 65 Circuit Current IGND

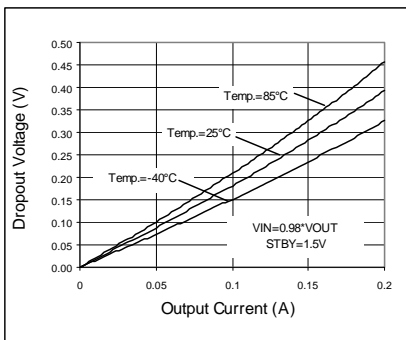


Fig. 66 Dropout Voltage

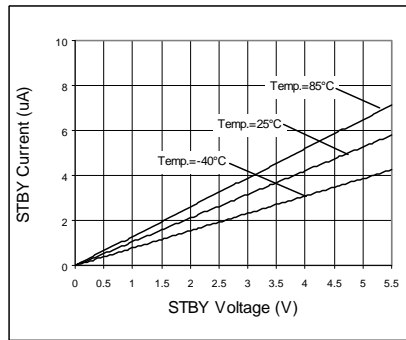


Fig. 67 STBY Input Current

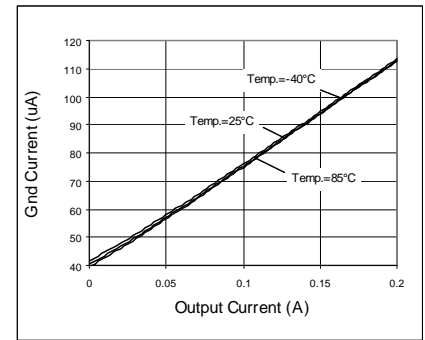


Fig. 68 IOU - IGND

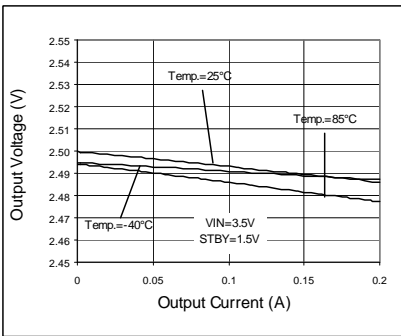


Fig. 69 Load Regulation

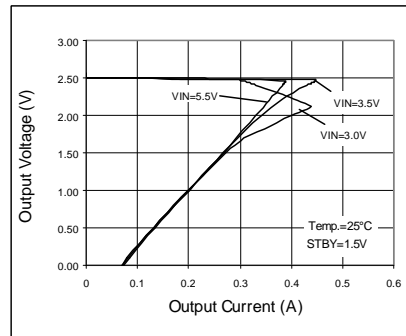


Fig. 70 OCP Threshold

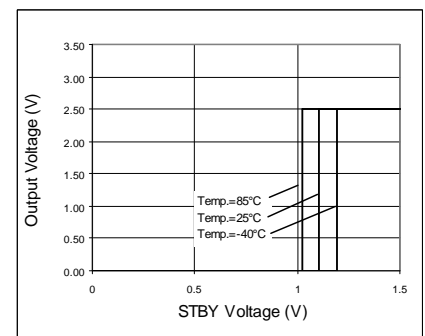


Fig. 71 STBY Threshold

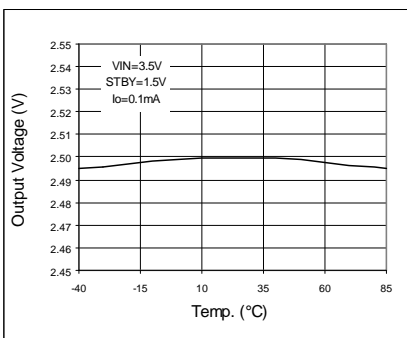


Fig. 72 VOUT vs Temp

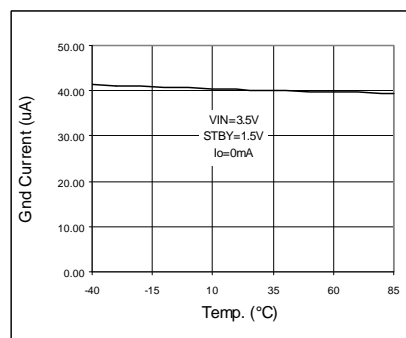


Fig. 73 IGND vs Temp

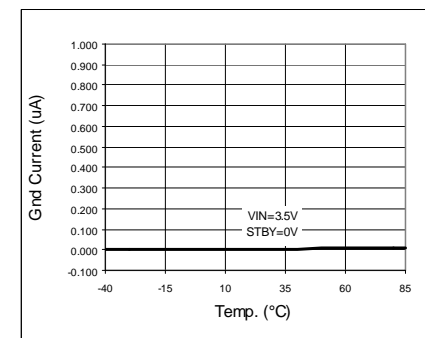


Fig. 74 IGND vs Temp (STBY)

●Reference data BU25TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

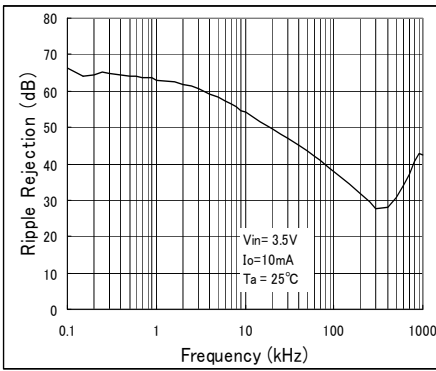


Fig. 75 Ripple Rejection VS Freq.

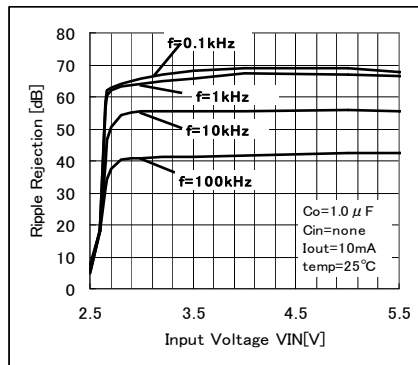


Fig. 76 Ripple Rejection VS VIN

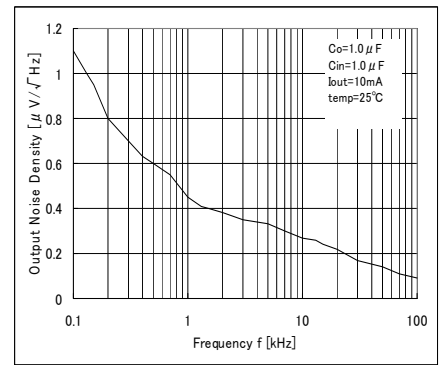


Fig. 77 Output Noise Spectral Density VS Freq.

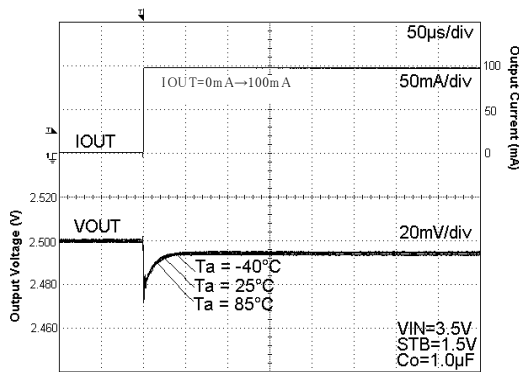


Fig. 78 Load Response

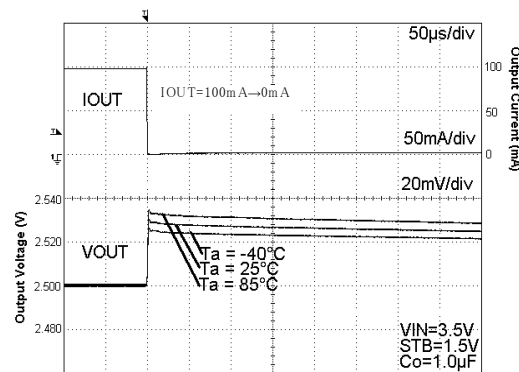


Fig. 79 Load Response

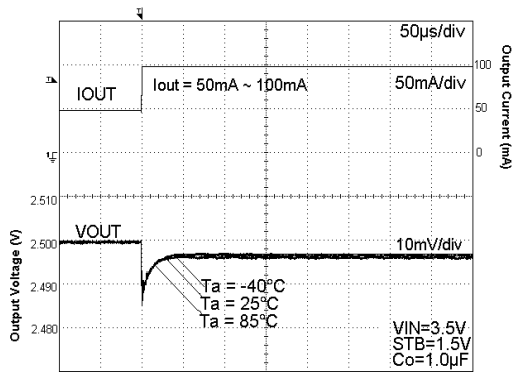


Fig. 80 Load Response

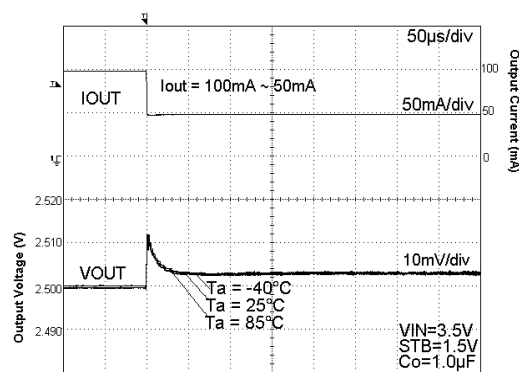


Fig. 81 Load Response

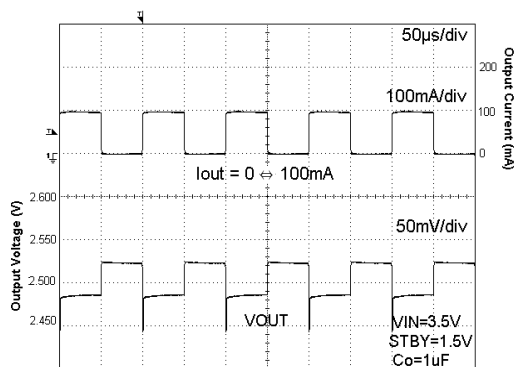


Fig. 82 Load Response  
Current Pulse=10kHz

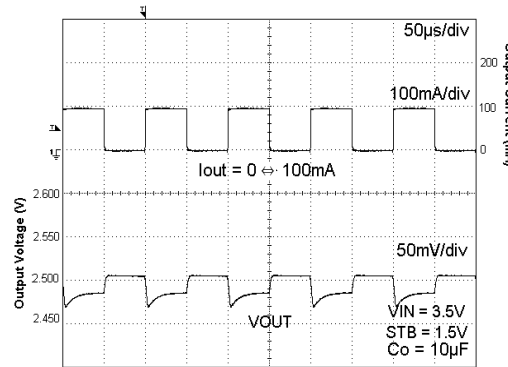


Fig. 83 Load Response  
Current Pulse=10kHz

●Reference data BU25TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

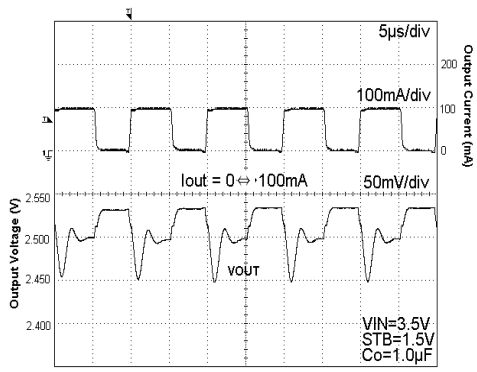


Fig. 84 Load Response  
Current Pulse=100kHz

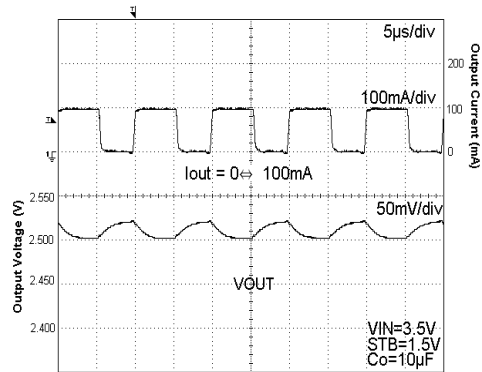


Fig. 85 Load Response  
Current Pulse=100kHz

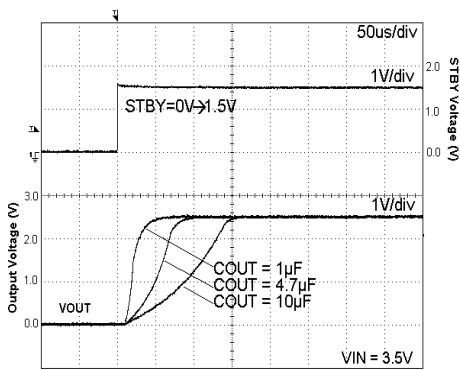


Fig. 86 Start Up Time  
Iout = 0mA

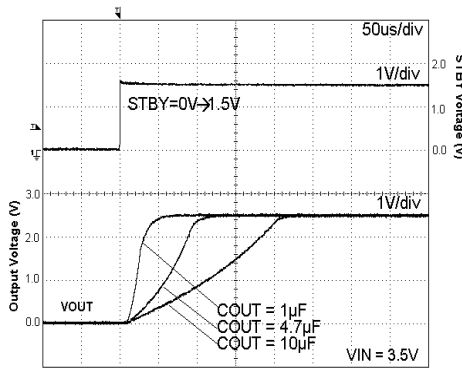


Fig. 87 Start Up Time  
Iout = 200mA

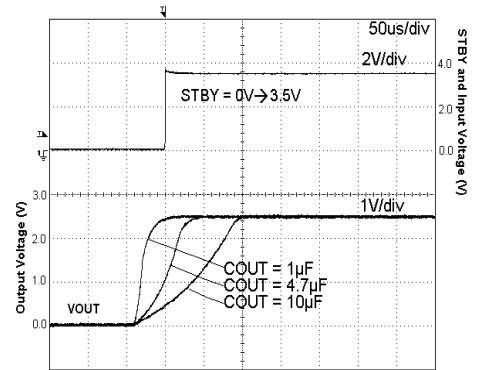


Fig. 88 Start Up Time (STBY=VIN)  
Iout = 0mA

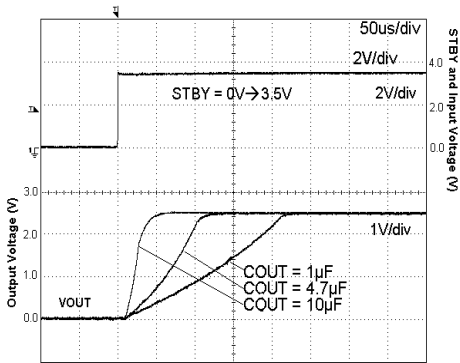


Fig. 89 Start Up Time (STBY=VIN)  
Iout = 200mA

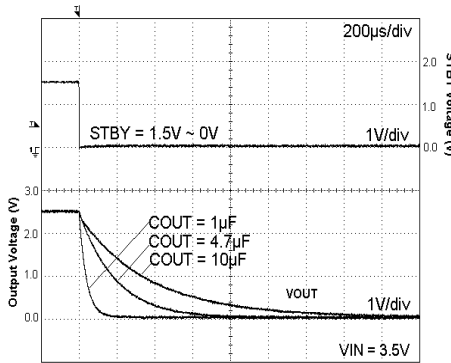


Fig. 90 Discharge Time  
Iout = 0mA

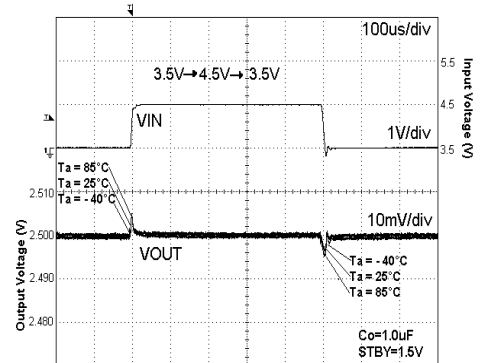


Fig. 91 VIN Response  
Iout = 10mA

●Reference data BU28TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

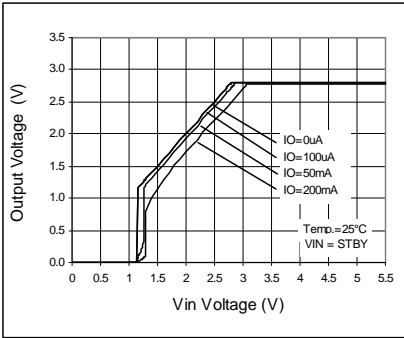


Fig. 92 Output Voltage

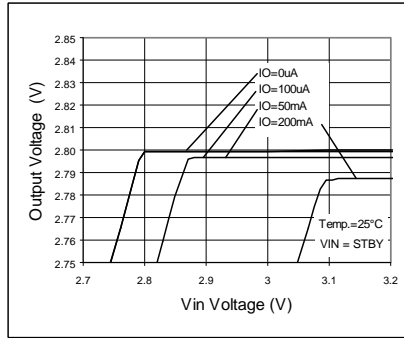


Fig. 93 Line Regulation

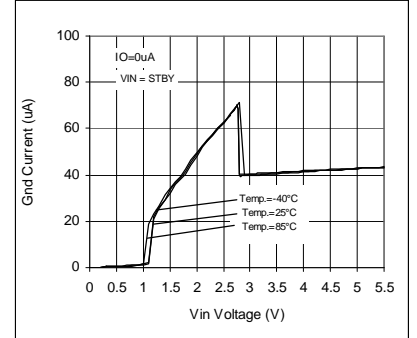


Fig. 94 Circuit Current IGND

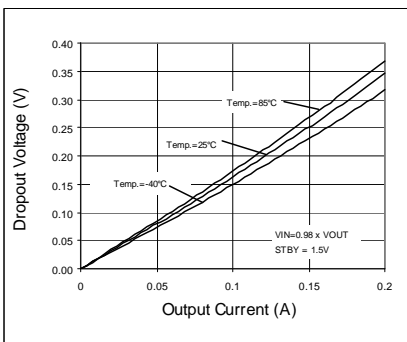


Fig. 95 Dropout Voltage

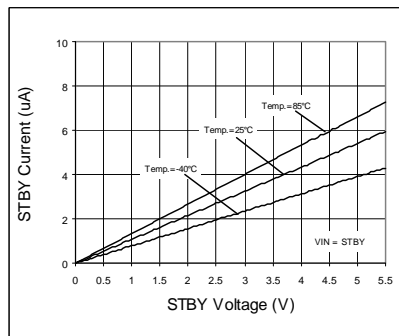


Fig. 96 STBY Input Current

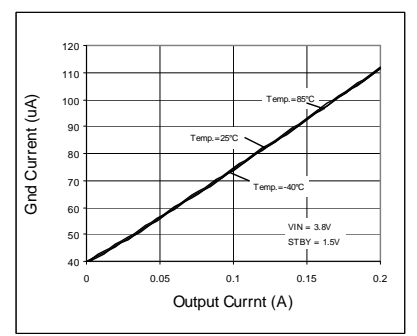


Fig. 97 IOOUT - IGND

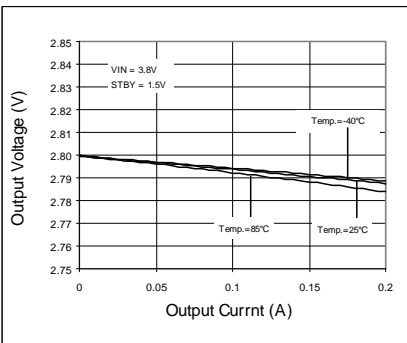


Fig. 98 Load Regulation

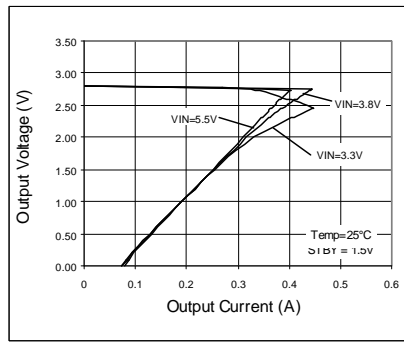


Fig. 99 OCP Threshold

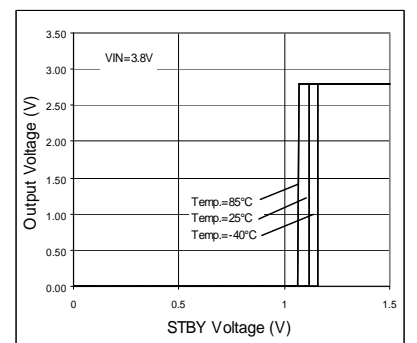


Fig. 100 STBY Threshold

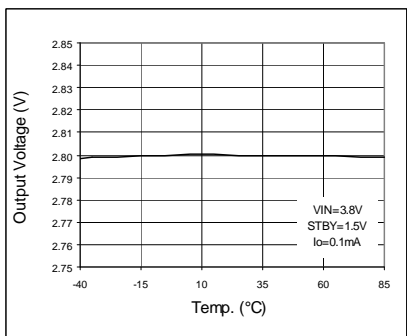


Fig. 101 VOUT vs Temp

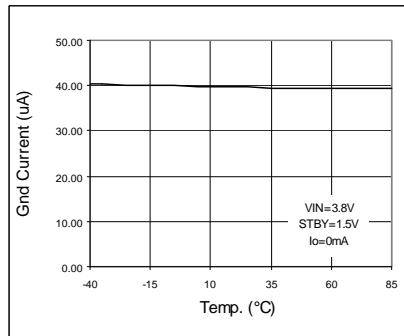


Fig. 102 IGND vs Temp

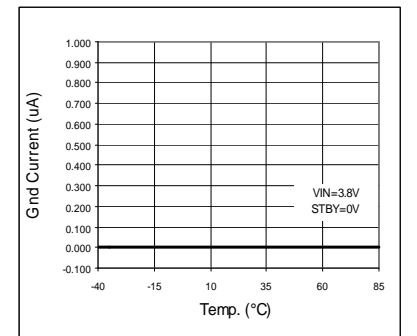


Fig. 103 IGND vs Temp (STBY)

●Reference data BU28TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

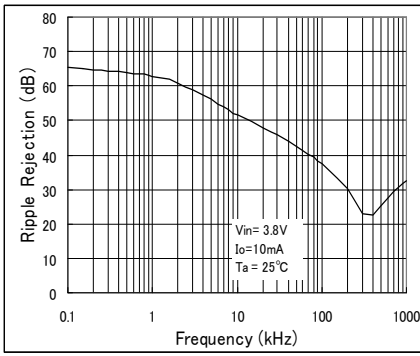


Fig. 104 Ripple Rejection VS Freq.

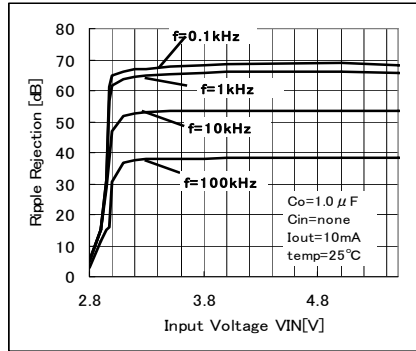


Fig. 105 Ripple Rejection VS VIN

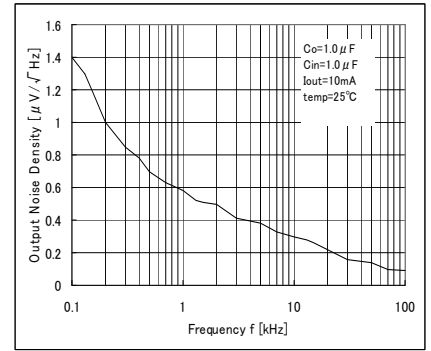


Fig. 106 Output Noise Spectral Density VS Freq.

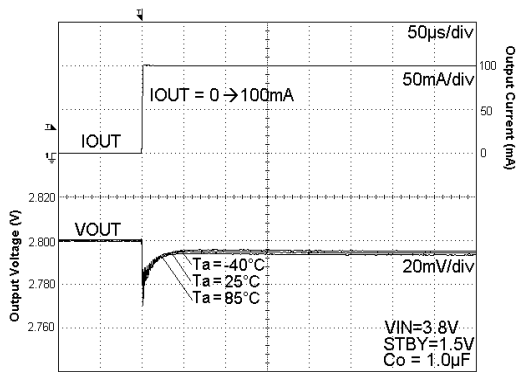


Fig. 107 Load Response

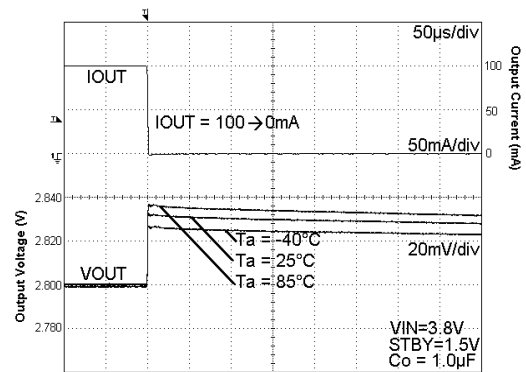


Fig. 108 Load Response

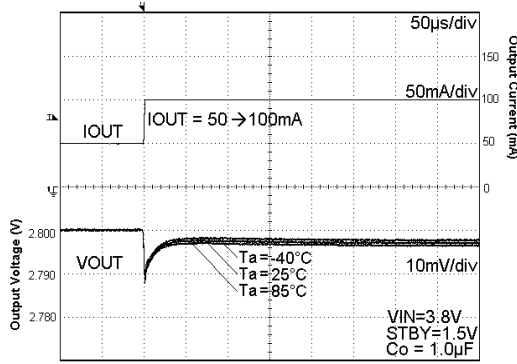


Fig. 109 Load Response

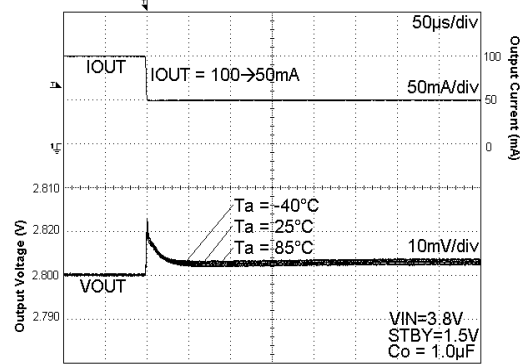


Fig. 110 Load Response

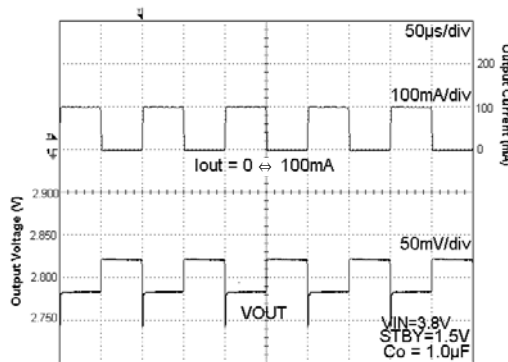


Fig. 111 Load Response  
Current Pulse=10kHz

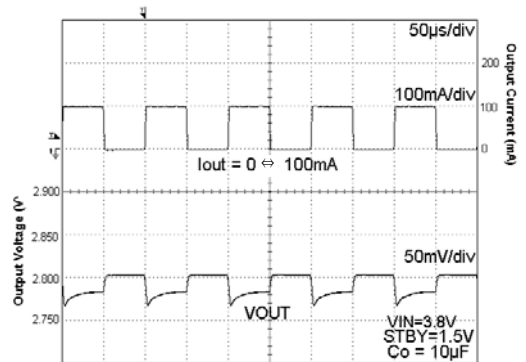
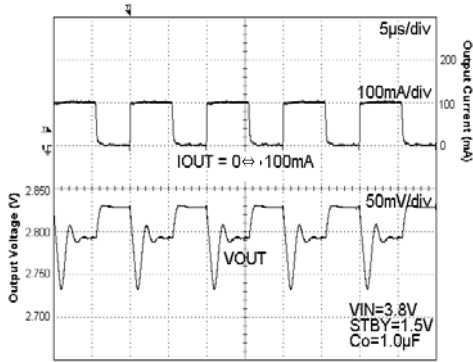


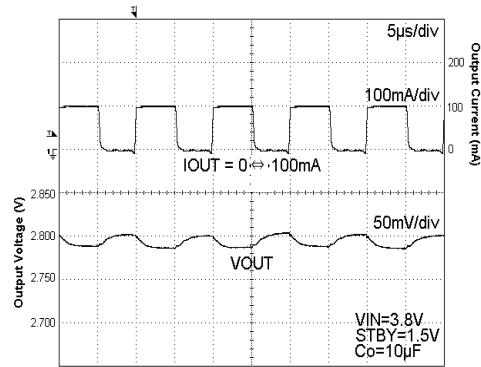
Fig. 112 Load Response  
Current Pulse=10kHz



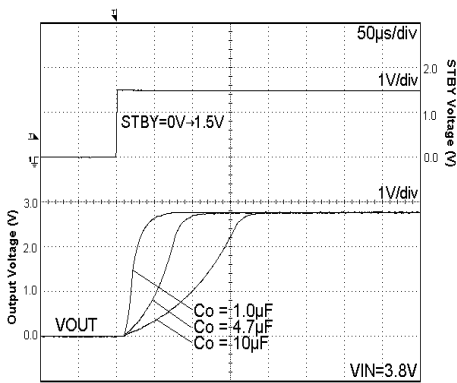
●Reference data BU28TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)



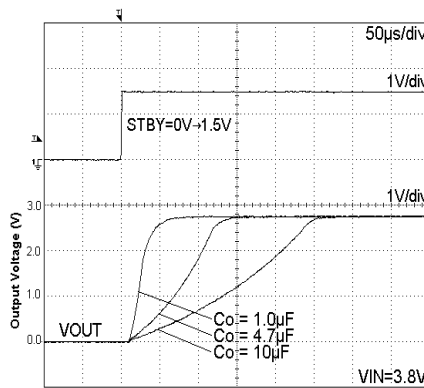
**Fig. 113 Load Response**  
Current Pulse=100kHz



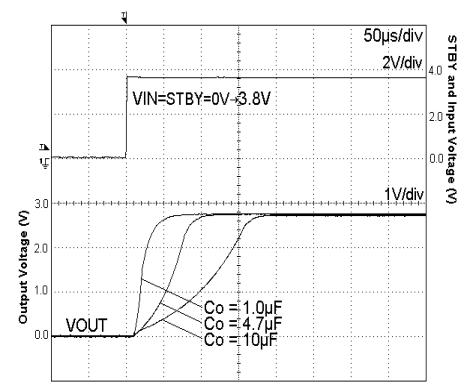
**Fig. 114 Load Response**  
Current Pulse=100kHz



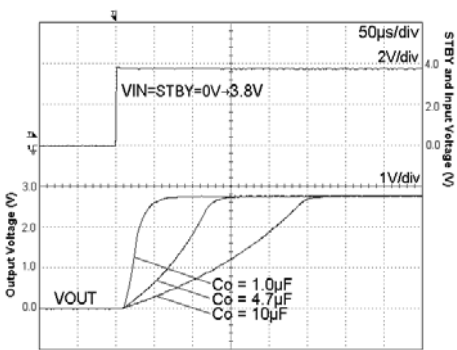
**Fig. 115 Start Up Time**  
Iout = 0mA



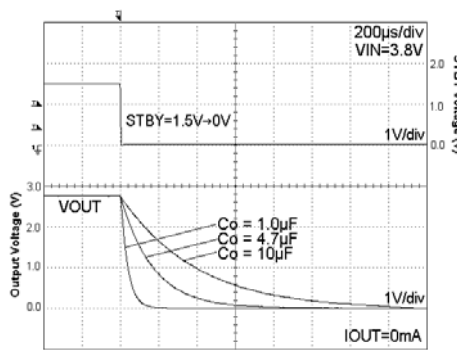
**Fig. 116 Start Up Time**  
Iout = 200mA



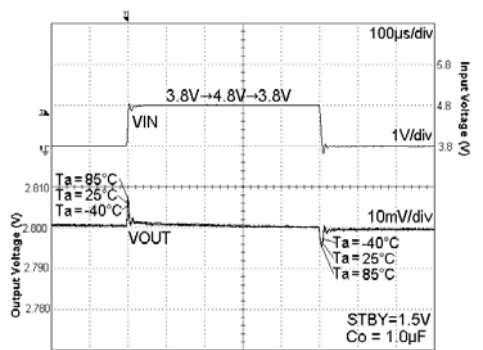
**Fig. 117 Start Up Time (STBY=VIN)**  
Iout = 0mA



**Fig. 118 Start Up Time(STBY=VIN)**  
Iout = 200mA



**Fig. 119 Discharge Time**  
Iout = 0mA



**Fig.120 VIN Response**  
Iout = 10mA



●Reference data BU30TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

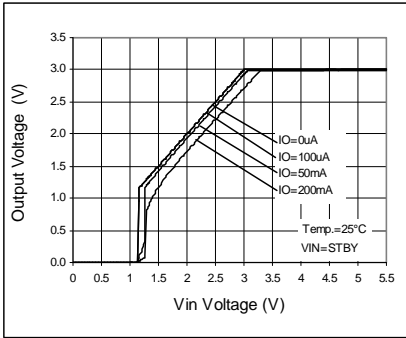


Fig. 121 Output Voltage

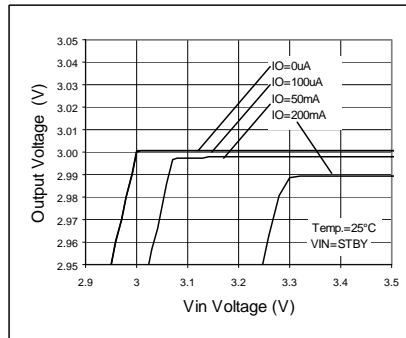


Fig. 122 Line Regulation

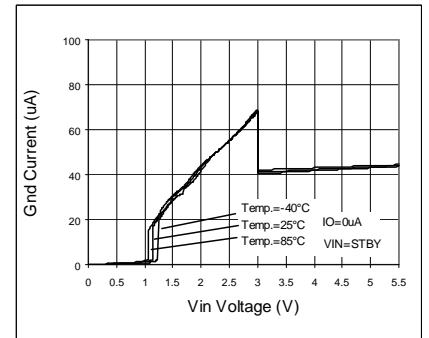


Fig. 123 Circuit Current IGND

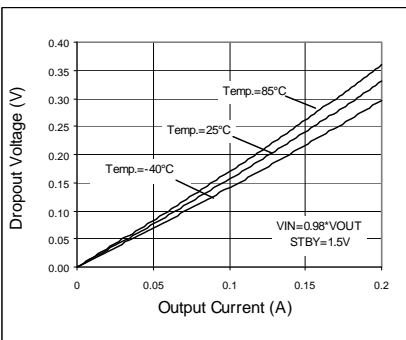


Fig. 124 Dropout Voltage

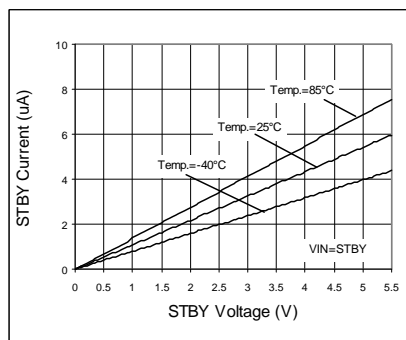


Fig. 125 STBY Input Current

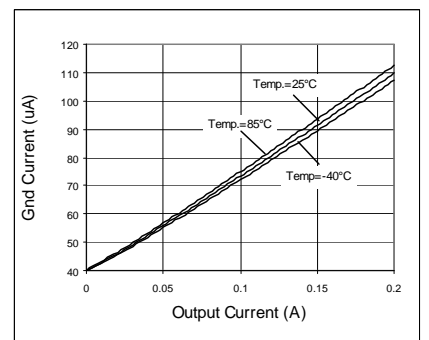


Fig. 126 IOOUT - IGND

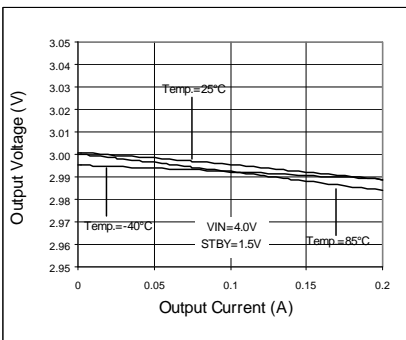


Fig. 127 Load Regulation

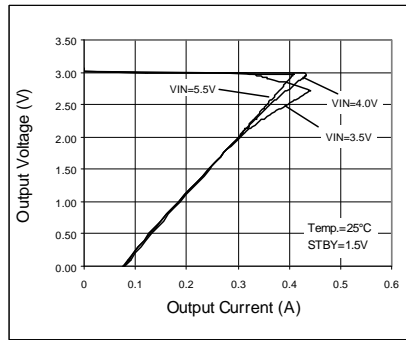


Fig. 128 OCP Threshold

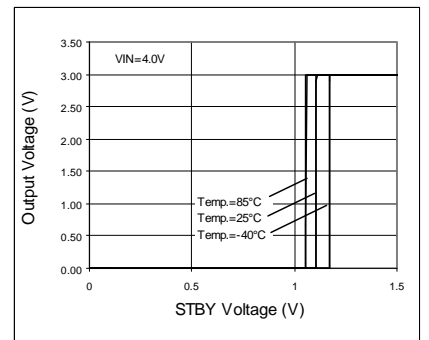


Fig. 129 STBY Threshold

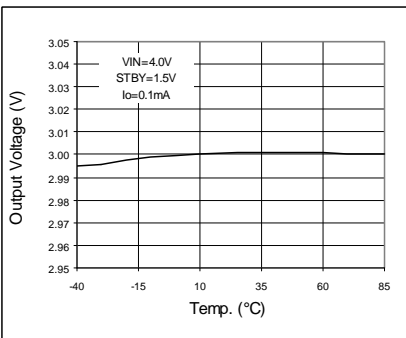


Fig. 130 VOUT vs Temp

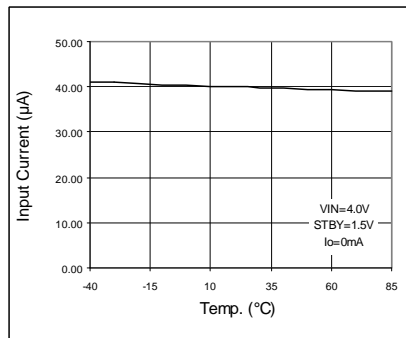


Fig. 131 IGND vs Temp

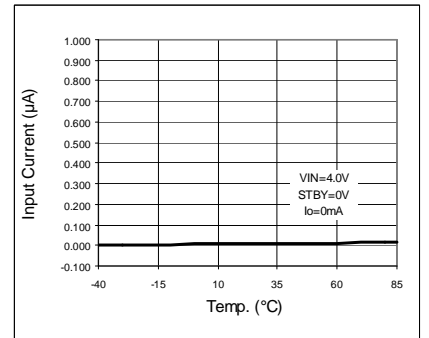


Fig. 132 IGND vs Temp (STBY)

●Reference data BU30TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

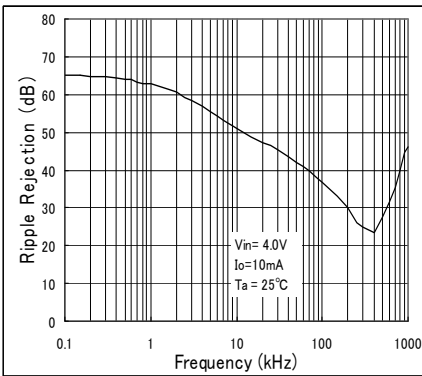


Fig. 133 Ripple Rejection VS Freq.

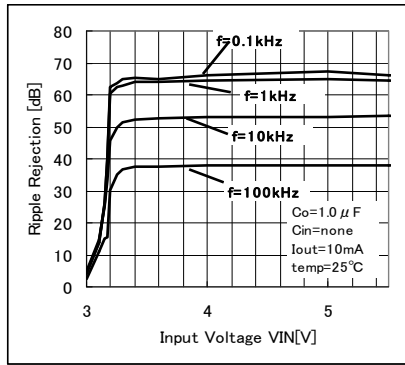


Fig. 134 Ripple Rejection VS VIN

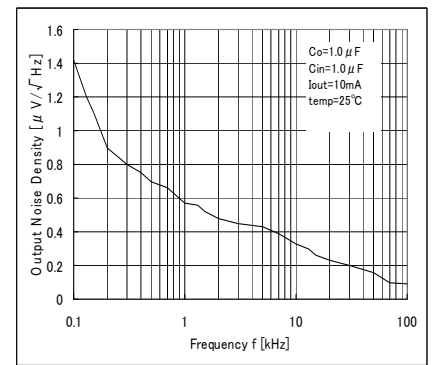


Fig. 135 Output Noise Spectral Density VS Freq.

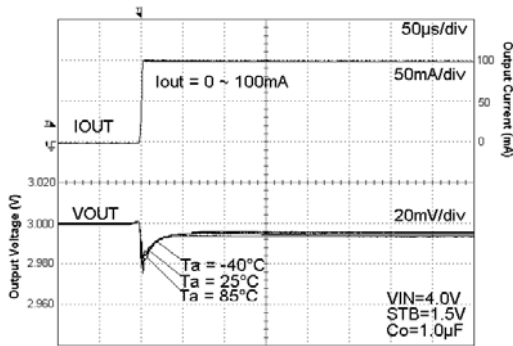


Fig. 136 Load Response

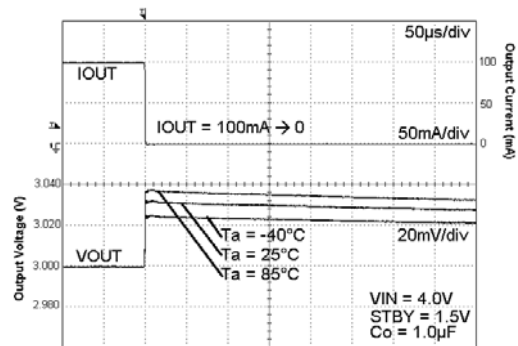


Fig. 137 Load Response

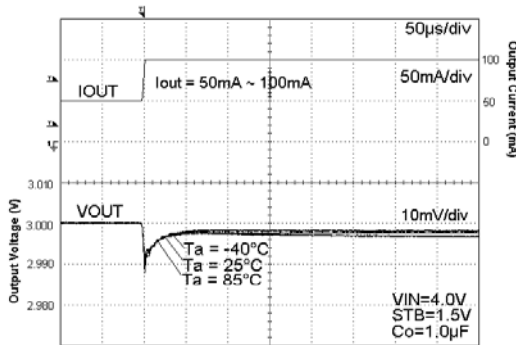


Fig. 138 Load Response

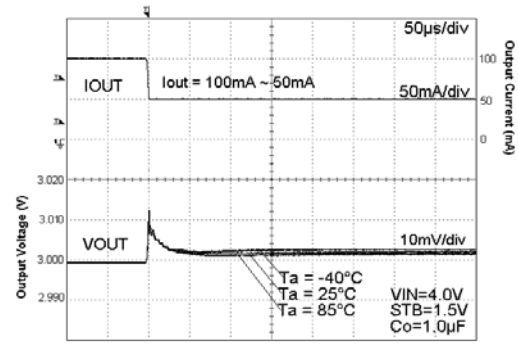


Fig. 139 Load Response

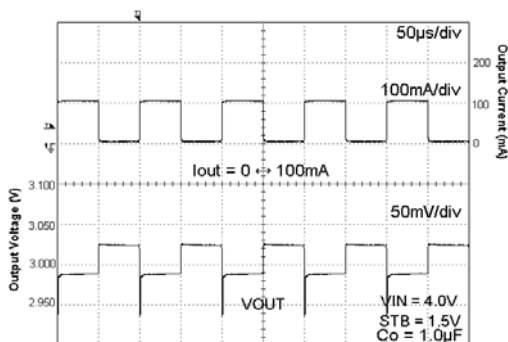


Fig. 140 Load Response  
Current Pulse=10kHz

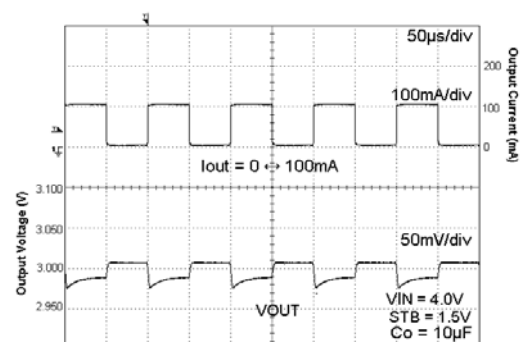


Fig. 141 Load Response  
Current Pulse=10kHz

●Reference data BU30TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

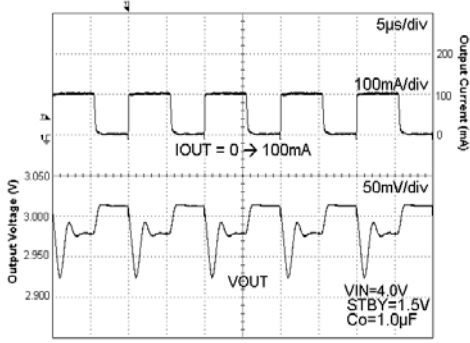


Fig. 142 Load Response  
Current Pulse=100kHz

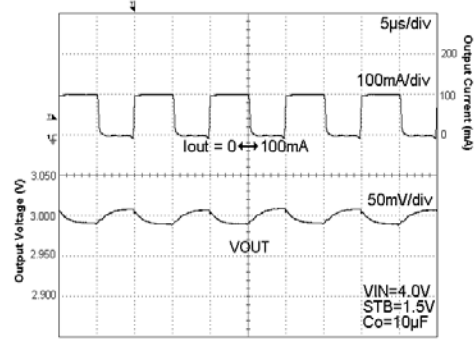


Fig. 143 Load Response  
Current Pulse=100kHz

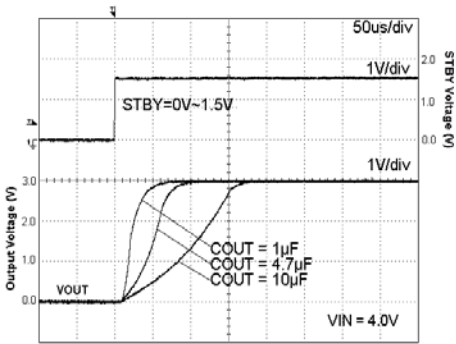


Fig. 144 Start Up Time  
Iout = 0mA

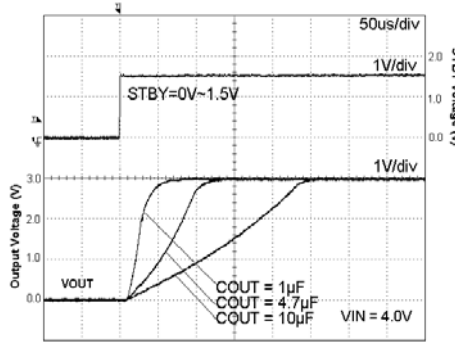


Fig. 145 Start Up Time  
Iout = 200mA

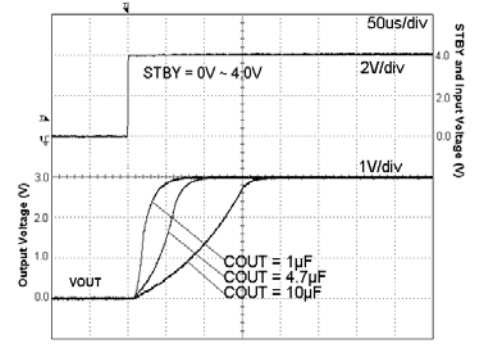


Fig. 146 Start Up Time (STBY=VIN)  
Iout = 0mA

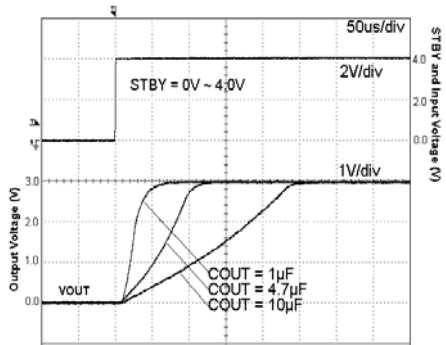


Fig. 147 Start Up Time(STBY=VIN)  
Iout = 200mA

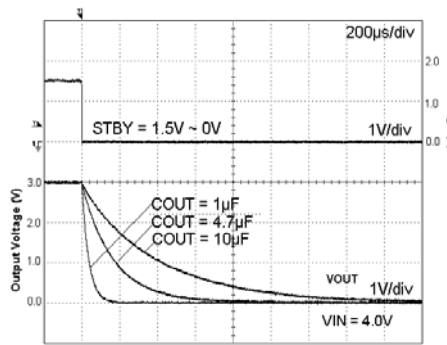


Fig. 148 Discharge Time  
Iout = 0mA

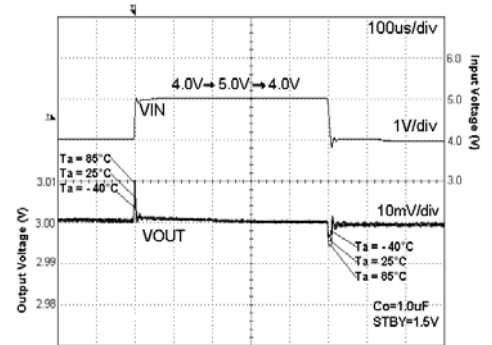


Fig. 149 VIN Response  
Iout = 10mA

●Reference data BU33TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

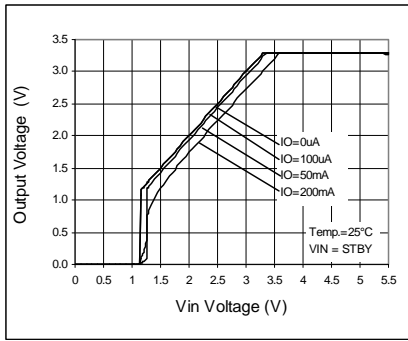


Fig. 150 Output Voltage

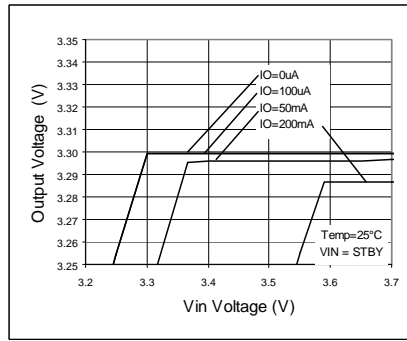


Fig. 151 Line Regulation

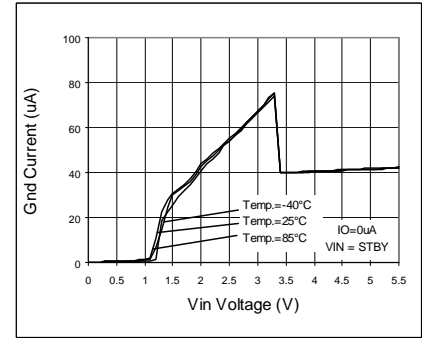


Fig. 152 Circuit Current IGND

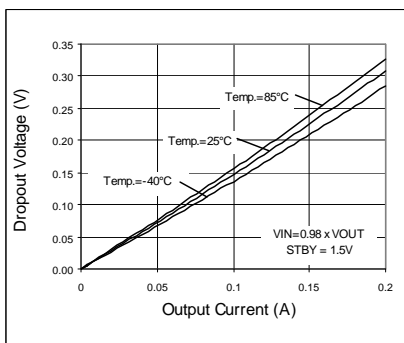


Fig. 153 Dropout Voltage

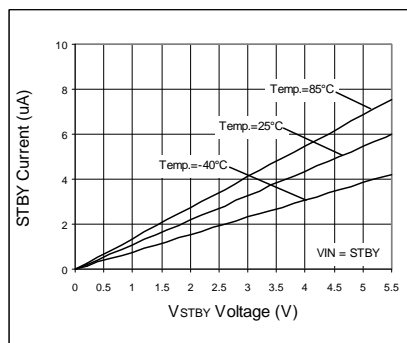


Fig. 154 STBY Input Current

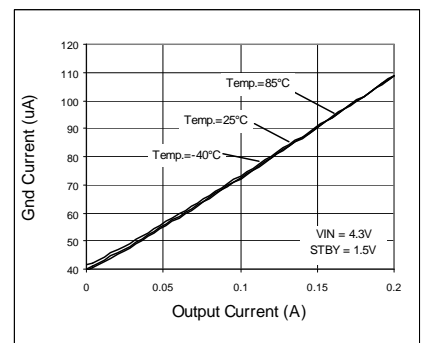


Fig. 155 IOUT - IGND

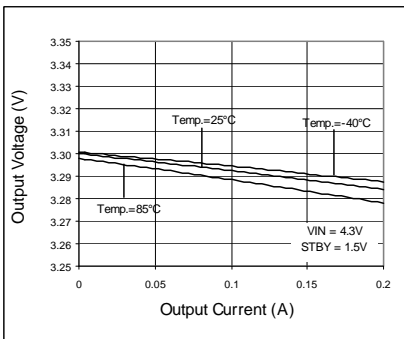


Fig. 156 Load Regulation

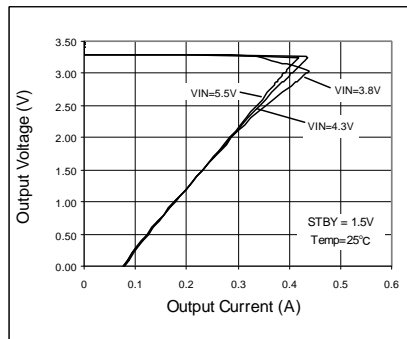


Fig. 157 OCP Threshold

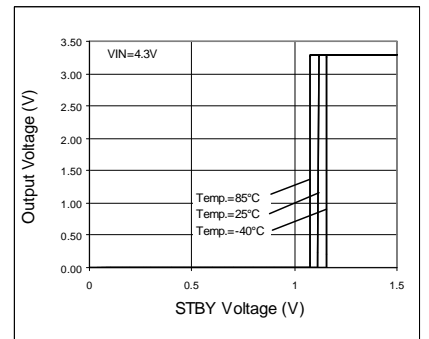


Fig. 158 STBY Threshold

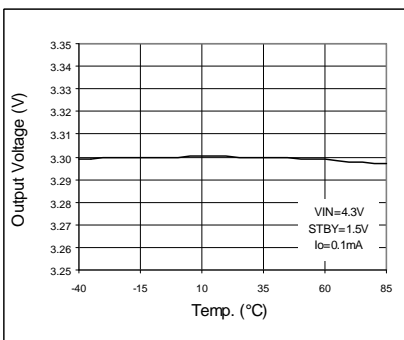


Fig. 159 VOUT vs Temp

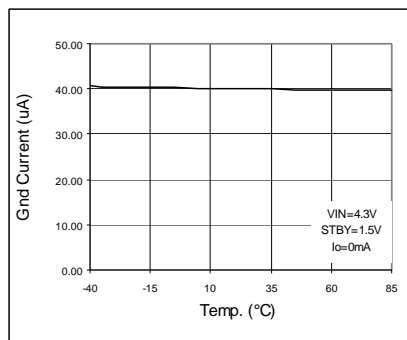


Fig. 160 IGND vs Temp

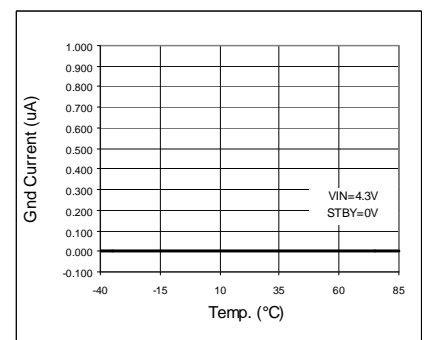


Fig. 161 IGND vs Temp (STBY)

●Reference data BU33TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

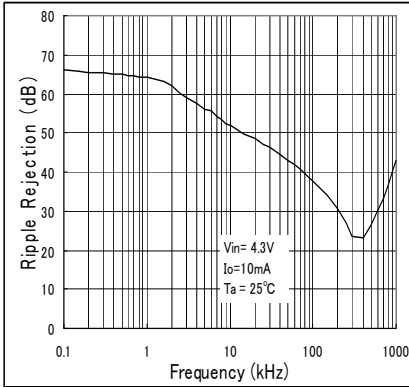


Fig. 162 Ripple Rejection VS Freq.

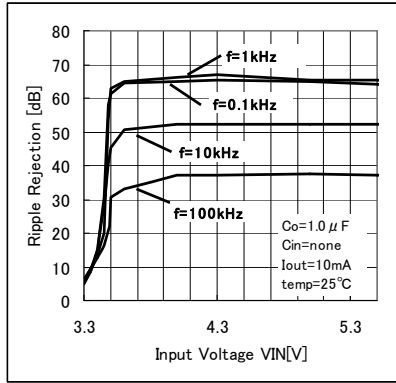


Fig. 163 Ripple Rejection VS VIN

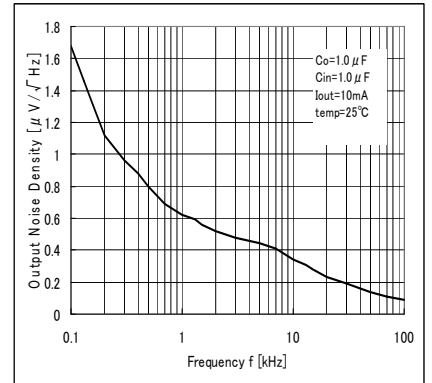


Fig. 164 Output Noise Spectrl Density VS Freq.

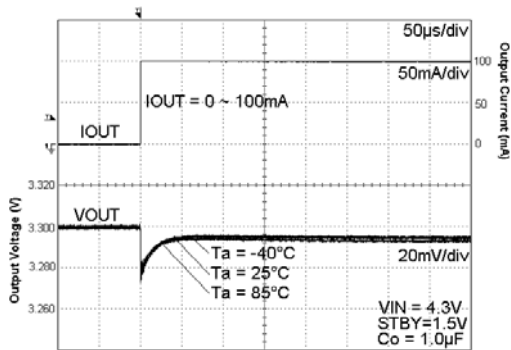


Fig. 165 Load Response

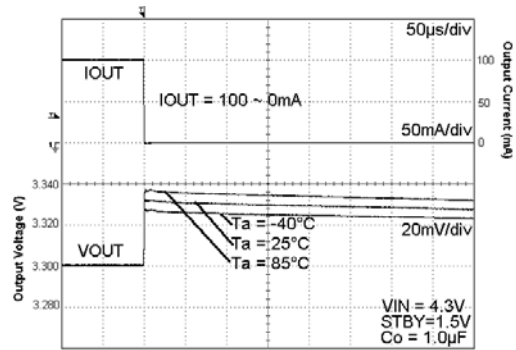


Fig. 166 Load Response

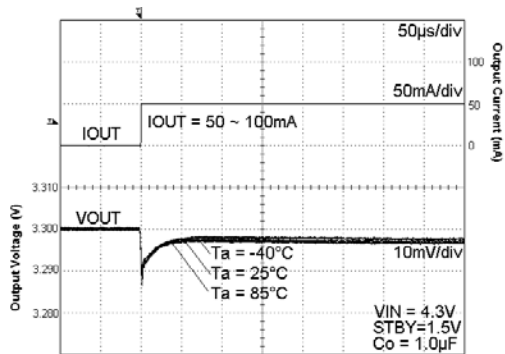


Fig. 167 Load Response

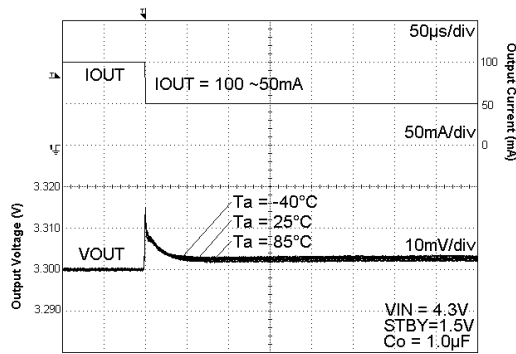


Fig. 168 Load Response

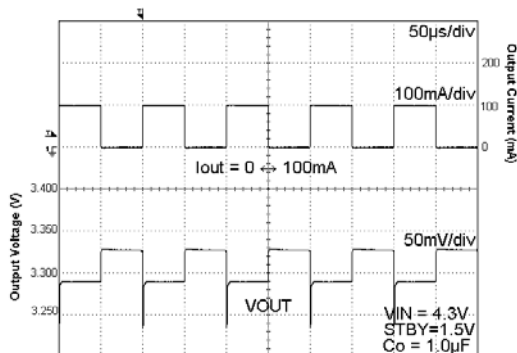


Fig. 169 Load Response  
Current Pulse=10kHz

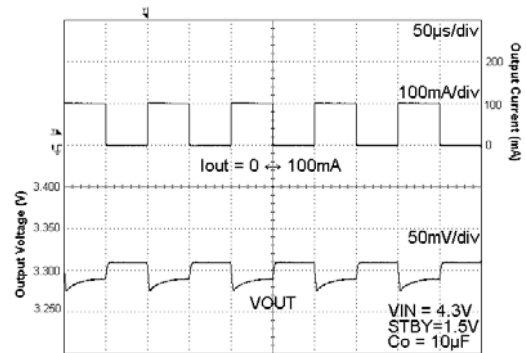


Fig. 170 Load Response  
Current Pulse=10kHz

●Reference data BU33TA2WNVX / HFV (Unless otherwise specified, Ta=25°C)

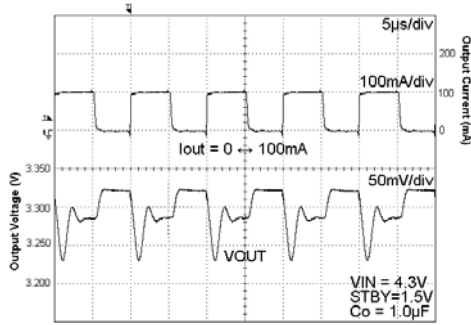


Fig. 171 Load Response  
Current Pulse=100kHz

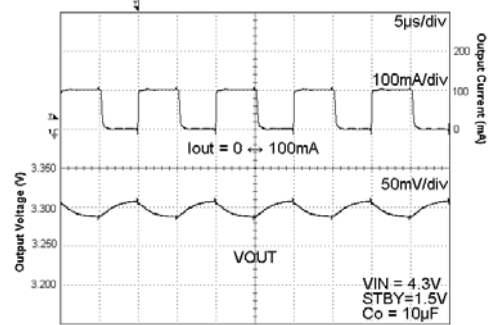


Fig. 172 Load Response  
Current Pulse=100kHz

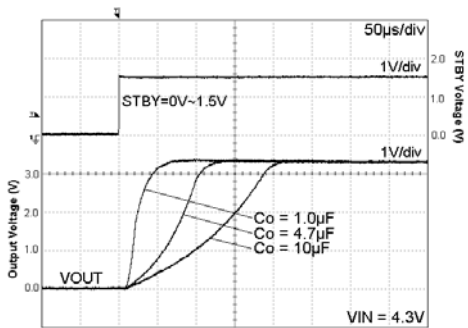


Fig. 173 Start Up Time  
Iout = 0mA

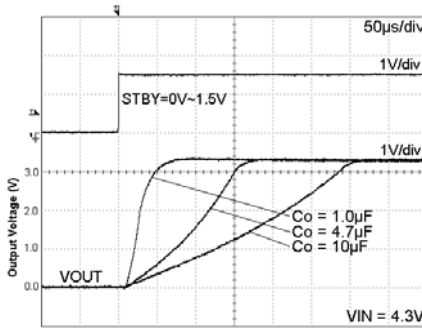


Fig. 174 Start Up Time  
Iout = 200mA

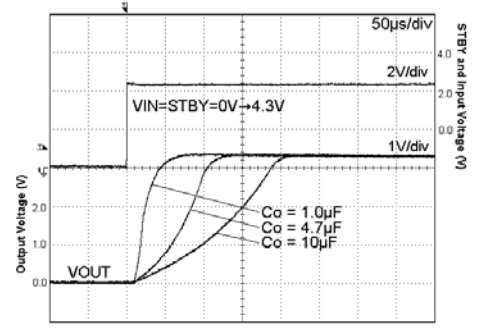


Fig. 175 Start Up Time (STBY=VIN)  
Iout = 0mA

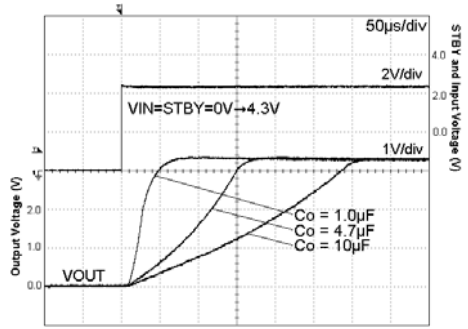


Fig. 176 Start Up Time(STBY=VIN)  
Iout = 200mA

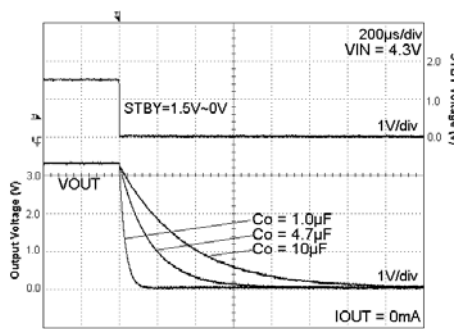


Fig. 177 Discharge Time  
Iout = 0mA

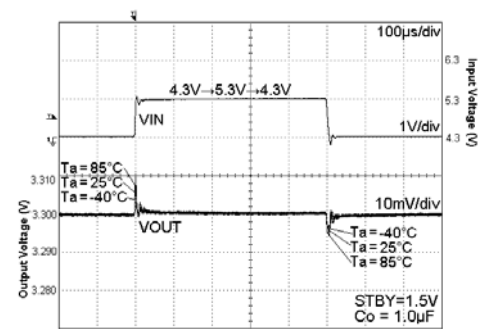


Fig. 178 VIN Response  
Iout = 10mA



● About power dissipation (Pd)

As for power dissipation, an approximate estimate of the heat reduction characteristics and internal power consumption of IC are shown, so please use these for reference. Since power dissipation changes substantially depending on the implementation conditions (board size, board thickness, metal wiring rate, number of layers and through holes, etc.), it is recommended to measure Pd on a set board. Exceeding the power dissipation of IC may lead to deterioration of the original IC performance, such as causing operation of the thermal shutdown circuit or reduction in current capability. Therefore, be sure to prepare sufficient margin within power dissipation for usage.

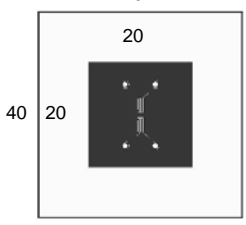
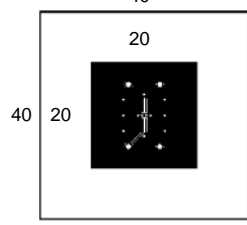
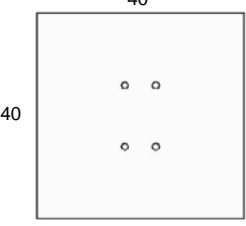
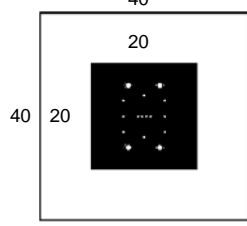

Calculation of the maximum internal power consumption of IC (P<sub>MAX</sub>)

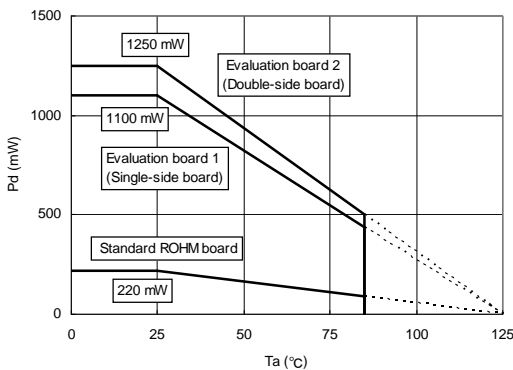
$$P_{MAX} = (V_{IN} - V_{OUT}) \times I_{OUT(MAX)}$$

(V<sub>IN</sub>: Input voltage V<sub>OUT</sub>: Output voltage I<sub>OUT(MAX)</sub>: Maximum output current)

○ SSON004X1216

Measurement conditions

|   | Evaluation Board 1<br>(Single-side Board)  | Evaluation Board 2<br>(Double-side Board)  |
|---|--|--|
| Layout of Board for Measurement<br>(Unit: mm) |   |   |
|   |  |  |
| IC Implementation Position                    |   |  |
| Measurement State                             | With board implemented (Wind speed 0 m/s)  | With board implemented (Wind speed 0 m/s)  |
| Board Material                                | Glass epoxy resin (Single-side board)  | Glass epoxy resin (Double-side board)  |
| Board Size                                    | 40 mm x 40 mm x 0.8 mm   | 40 mm x 40 mm x 0.8 mm   |
| Wiring Rate                                   | Top layer  | Metal (GND) wiring rate: Approx. 25%   |
|   | Bottom layer   | Metal (GND) wiring rate: Approx 0%   |
| Through Hole                                  | 0 holes  | Diameter 0.5 mm x 12 holes   |
| Power Dissipation                             | 1100 mW  | 1250 mW  |
| Thermal Resistance                            | θ <sub>ja</sub> =91°C/W  | θ <sub>ja</sub> =80°C/W  |

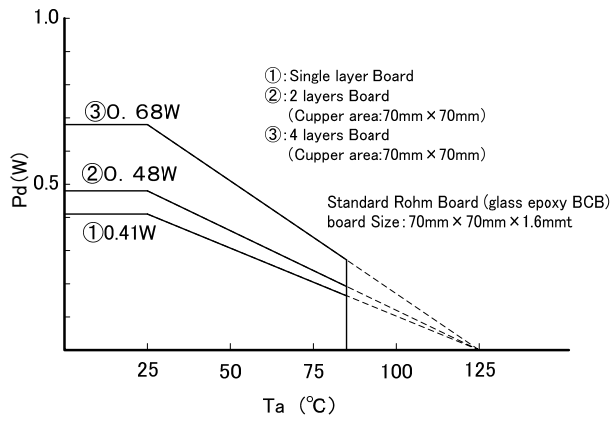


\* Please design the margin so that P<sub>MAX</sub> becomes is than Pd (P<sub>MAX</sub><Pd) within the usage temperature range.

- Standard ROHM board -  
Size: 70 mm x 70 mm x 1.6 mm  
Material: Glass epoxy board

Fig.179 SSON004X1216 Power dissipation heat reduction characteristics (Reference)

○ HVSO5



\* Please design the margin so that P<sub>MAX</sub> becomes is than Pd (P<sub>MAX</sub><Pd) within the usage temperature range.

Fig.180 HVSO5 Power dissipation heat reduction characteristics (Reference)

● DEVICE TYPE & Mark

OSSON004X1216

OHVSO5

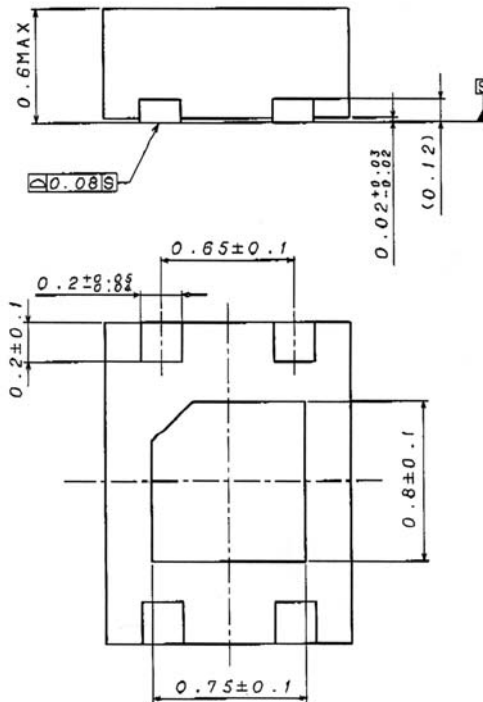
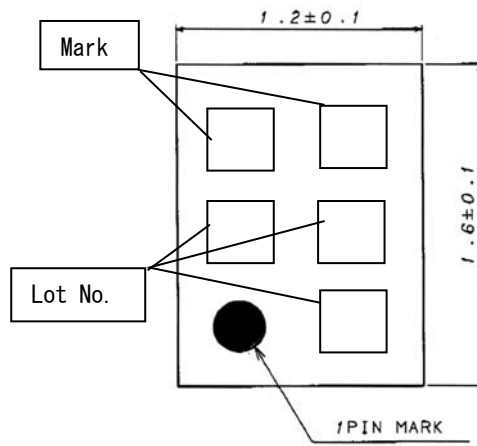
Device type: **BUXXTA2WNVX**  
 ↑  
 a

Device type: **BUXXTA2WHFV**  
 ↑  
 a

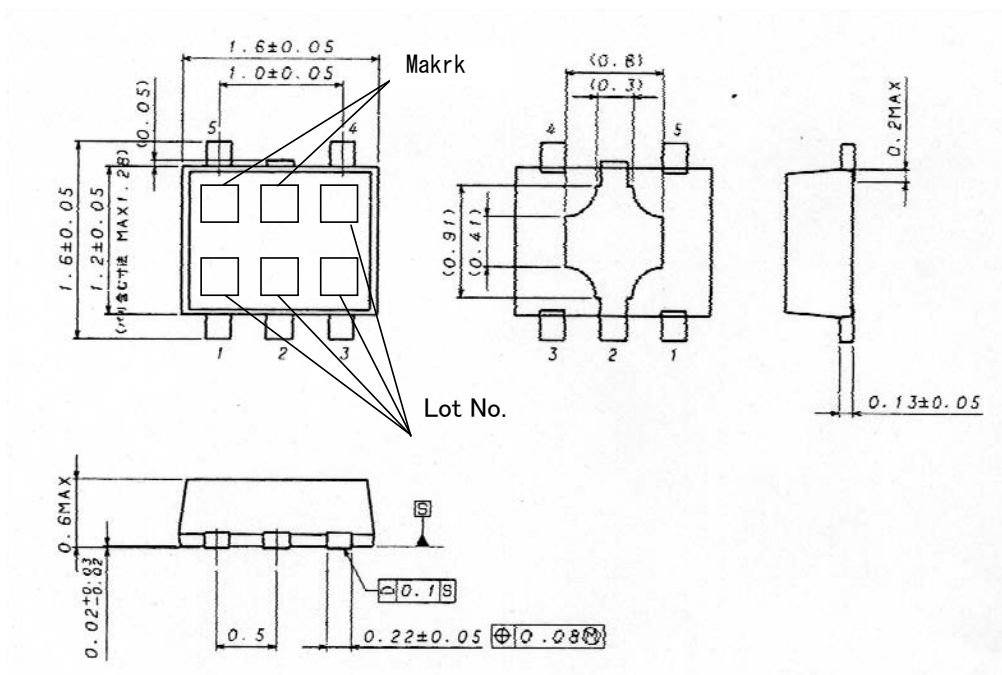
|   | XX | output voltage | package       |       |
|---|----|----------------|---------------|-------|
|   |    |                | SSON004 X1216 | HVSO5 |
| a | 15 | 1.5V typ.      | AA            | BA    |
|   | 18 | 1.8V typ.      | AB            | BB    |
|   | 23 | 2.3V typ.      | AG            | BC    |
|   | 25 | 2.5V typ.      | AC            | BD    |
|   | 26 | 2.6V typ.      | AD            | BE    |
|   | 27 | 2.7V typ.      | AE            | BF    |
|   | 28 | 2.8V typ.      | AF            | BG    |
|   | 2J | 2.85V typ.     | AG            | BH    |
|   | 29 | 2.9V typ.      | AH            | BJ    |
|   | 30 | 3.0V typ.      | AJ            | BK    |
|   | 31 | 3.1V typ.      | AK            | BL    |
|   | 32 | 3.2V typ.      | AL            | BM    |
|   | 33 | 3.3V typ.      | AM            | BN    |
|   | 34 | 3.4V typ.      | AN            | BP    |



○ SSON004X1216



○ HVSOF5



- Other notes

- About absolute maximum rating

Breakage may occur when absolute maximum ratings such as applied voltage and operating temperature range are exceeded. Short mode or open mode cannot be specified at occurrence of a break, so please prepare physical safety measures (e.g., fuse) if such special mode in which the absolute maximum rating is exceeded can be assumed.

- About GND potential

Please be sure that the potential of the GND terminal is the lowest in any operating condition.

- About thermal design

Please provide thermal design with sufficient margin, taking power dissipation (Pd) in actual usage conditions into consideration.

- About short between pins and misattachment

Please be careful regarding the IC direction and misalignment at attachment onto a printed circuit board. Misattachment may cause a break of IC. Short caused by foreign matter between outputs, output and power supply, or GNDs may also lead to a break.

- About operation in a strong electromagnetic field

Please note that usage in a strong electromagnetic field may cause malfunction.

- About common impedance

**Please give due consideration to wiring of the power source and GND by reducing common-mode ripple or making ripple as small as possible (e.g., making the wiring as thick and short as possible, or reducing ripple by L-C), etc.**

- About STBY terminal voltage

Set STBY terminal voltage to 0.3 V or less to put each channel into a standby state and to 1.5 V or more to put each channel into an operating state. Do not fix STBY terminal voltage to 0.3 V or more and 1.5 V or less or do not lengthen the transition time. This may cause malfunction or failure.

When shorting the VIN terminal and STBY terminal for usage, the status will be "STBY=VIN=LOW" at turning the power OFF, and discharge of the VOUT terminal cannot operate, which means voltage may remain for a certain time in the VOUT terminal. Since turning the power ON again in this state may cause overshoot, turn the power ON for use after the VOUT terminal is completely discharged.

- About overcurrent protection circuit

Output has a built-in overcurrent protection circuit, which prevents IC break at load short. Note that this protection circuit is effective for prevention of breaks due to unexpected accidents. Please avoid usage by which the protection circuit operates continuously.

- About thermal shutdown

Output is OFF when the thermal circuit operates since a temperature protection circuit is built in to prevent thermal breakdown. However, it recovers when the temperature returns to a certain temperature. The thermal circuit operates at emergency such as overheating of IC. Since it is prepared to prevent IC breakdown, please do not use it in a state in which protection works.

- About reverse current

For applications on which reverse current is assumed to flow into IC, it is recommended to prepare a path to let the current out by putting a bypass diode between the VIN-VOUT terminals.

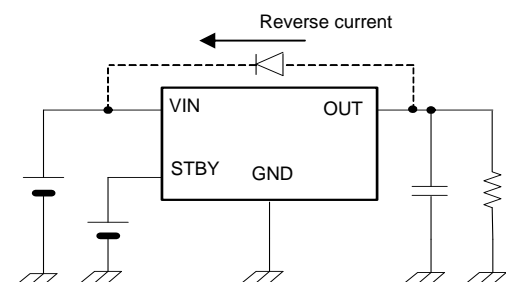
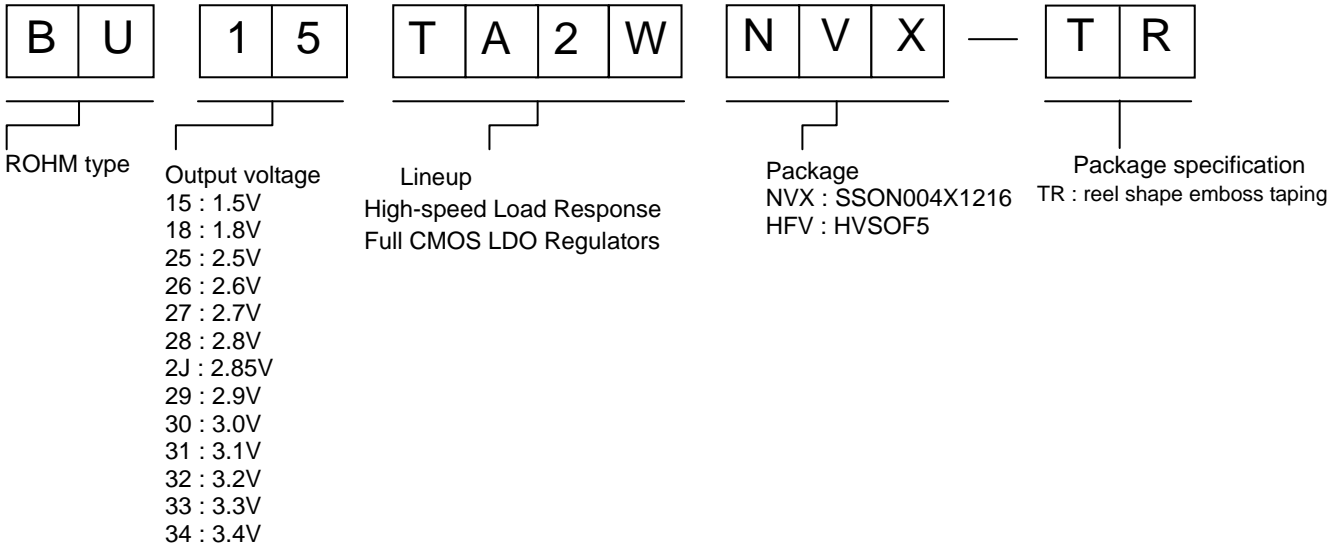


Fig.181 Example of bypass diode connection

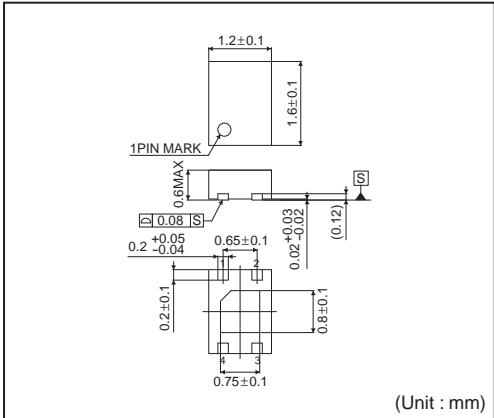
- About testing on a set board

When connecting a capacitor to a terminal with low impedance for testing on a set board, please be sure to discharge for each process since IC may be stressed. As a countermeasure against static electricity, prepare grounding in the assembly process and take sufficient care in transportation and storage. In addition, when connecting a capacitor to a jig in a testing process, please do so after turning the power OFF and remove it after turning the power OFF.

● Selection of order type

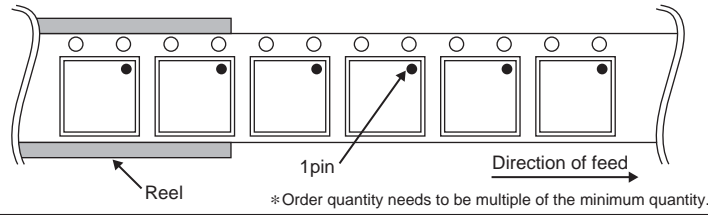


**SSON004X1216**

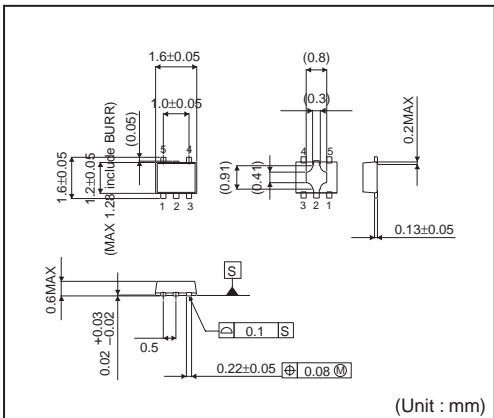


<Tape and Reel information>

|                   |  |
|-------------------|--|
| Tape              | Embossed carrier tape  |
| Quantity          | 5000pcs  |
| Direction of feed | TR<br>(The direction is the 1pin of product is at the upper right when you hold reel on the left hand and you pull out the tape on the right hand) |

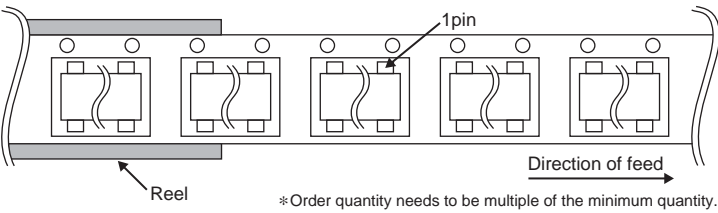


**HVSOF5**



<Tape and Reel information>

|                   |  |
|-------------------|--|
| Tape              | Embossed carrier tape  |
| Quantity          | 3000pcs  |
| Direction of feed | TR<br>(The direction is the 1pin of product is at the upper right when you hold reel on the left hand and you pull out the tape on the right hand) |



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<http://www.rohm.com/contact/>

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- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
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- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
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## JONHON

«JONHON» (основан в 1970 г.)

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