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June 2014

## FDA20N50\_F109

### N-Channel UniFET™ MOSFET

500 V, 20 A, 230 mΩ

#### Features

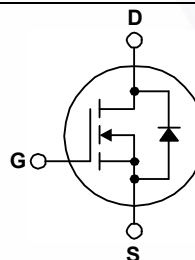
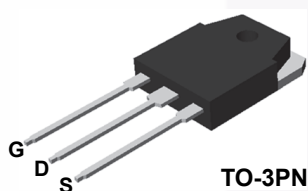
- $R_{DS(on)} = 230 \text{ m}\Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 10 \text{ A}$
- Low Gate Charge (Typ. 45.6 nC)
- Low  $C_{rss}$  (Typ. 27 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability

#### Applications

- PDP TV
- Uninterruptible Power Supply
- AC-DC Power Supply

#### Description

UniFET™ MOSFET is Fairchild Semiconductor's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.



#### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol         | Parameter                                                                    |                                            | FDA20N50_F109 | Unit                |
|----------------|------------------------------------------------------------------------------|--------------------------------------------|---------------|---------------------|
| $V_{DSS}$      | Drain-Source Voltage                                                         |                                            | 500           | V                   |
| $I_D$          | Drain Current                                                                | - Continuous ( $T_C = 25^\circ\text{C}$ )  | 22            | A                   |
|                |                                                                              | - Continuous ( $T_C = 100^\circ\text{C}$ ) | 13.2          | A                   |
| $I_{DM}$       | Drain Current                                                                | - Pulsed (Note 1)                          | 88            | A                   |
| $V_{GSS}$      | Gate-Source voltage                                                          |                                            | $\pm 30$      | V                   |
| $E_{AS}$       | Single Pulsed Avalanche Energy                                               | (Note 2)                                   | 1110          | mJ                  |
| $I_{AR}$       | Avalanche Current                                                            | (Note 1)                                   | 22            | A                   |
| $E_{AR}$       | Repetitive Avalanche Energy                                                  | (Note 1)                                   | 28.0          | mJ                  |
| dv/dt          | Peak Diode Recovery dv/dt                                                    | (Note 3)                                   | 20            | V/ns                |
| $P_D$          | Power Dissipation                                                            | ( $T_C = 25^\circ\text{C}$ )               | 280           | W                   |
|                |                                                                              | - Derate above $25^\circ\text{C}$          | 2.3           | W/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                                      |                                            | -55 to +150   | $^\circ\text{C}$    |
| $T_L$          | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds |                                            | 300           | $^\circ\text{C}$    |

#### Thermal Characteristics

| Symbol          | Parameter                                     | FDA20N50_F109 | Unit               |
|-----------------|-----------------------------------------------|---------------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max.    | 0.44          | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient, Max. | 40            | $^\circ\text{C/W}$ |

## Package Marking and Ordering Information

| Device Marking | Device        | Package | Reel Size | Tape Width | Quantity |
|----------------|---------------|---------|-----------|------------|----------|
| FDA20N50       | FDA20N50_F109 | TO-3PN  | Tube      | N/A        | 30 units |

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol                                                 | Parameter                                             | Conditions                                                                                     | Min      | Typ      | Max     | Unit     |
|--------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------|----------|----------|---------|----------|
| Off Characteristics                                    |                                                       |                                                                                                |          |          |         |          |
| BV <sub>DSS</sub>                                      | Drain-Source Breakdown Voltage                        | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA, T <sub>J</sub> = 25°C                            | 500      | --       | --      | V        |
| ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>                   | Breakdown Voltage Temperature Coefficient             | I <sub>D</sub> = 250μA, Referenced to 25°C                                                     | --       | 0.50     | --      | V/°C     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                       | V <sub>DS</sub> = 500V, V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = 400V, T <sub>C</sub> = 125°C | --<br>-- | --<br>-- | 1<br>10 | μA<br>μA |
| I <sub>GSSF</sub>                                      | Gate-Body Leakage Current, Forward                    | V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V                                                    | --       | --       | 100     | nA       |
| I <sub>GSSR</sub>                                      | Gate-Body Leakage Current, Reverse                    | V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V                                                   | --       | --       | -100    | nA       |
| On Characteristics                                     |                                                       |                                                                                                |          |          |         |          |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                     | 3.0      | --       | 5.0     | V        |
| R <sub>DS(on)</sub>                                    | Static Drain-Source On-Resistance                     | V <sub>GS</sub> = 10V, I <sub>D</sub> = 11A                                                    | --       | 0.20     | 0.23    | Ω        |
| g <sub>FS</sub>                                        | Forward Transconductance                              | V <sub>DS</sub> = 40V, I <sub>D</sub> = 11A                                                    | --       | 24.6     | --      | S        |
| Dynamic Characteristics                                |                                                       |                                                                                                |          |          |         |          |
| C <sub>iss</sub>                                       | Input Capacitance                                     | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                     | --       | 2400     | 3120    | pF       |
| C <sub>oss</sub>                                       | Output Capacitance                                    |                                                                                                | --       | 355      | 465     | pF       |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                          |                                                                                                | --       | 27       | --      | pF       |
| Switching Characteristics                              |                                                       |                                                                                                |          |          |         |          |
| t <sub>d(on)</sub>                                     | Turn-On Delay Time                                    | V <sub>DD</sub> = 250V, I <sub>D</sub> = 20A<br>R <sub>G</sub> = 25Ω<br><br>(Note 4)           | --       | 95       | 200     | ns       |
| t <sub>r</sub>                                         | Turn-On Rise Time                                     |                                                                                                | --       | 375      | 760     | ns       |
| t <sub>d(off)</sub>                                    | Turn-Off Delay Time                                   |                                                                                                | --       | 100      | 210     | ns       |
| t <sub>f</sub>                                         | Turn-Off Fall Time                                    |                                                                                                | --       | 105      | 220     | ns       |
| Q <sub>g</sub>                                         | Total Gate Charge                                     | V <sub>DS</sub> = 400V, I <sub>D</sub> = 20A<br>V <sub>GS</sub> = 10V<br><br>(Note 4)          | --       | 45.6     | 59.5    | nC       |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                    |                                                                                                | --       | 14.8     | --      | nC       |
| Q <sub>gd</sub>                                        | Gate-Drain Charge                                     |                                                                                                | --       | 21.6     | --      | nC       |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                       |                                                                                                |          |          |         |          |
| I <sub>S</sub>                                         | Maximum Continuous Drain-Source Diode Forward Current |                                                                                                | --       | --       | 20      | A        |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain-Source Diode Forward Current     |                                                                                                | --       | --       | 80      | A        |
| V <sub>SD</sub>                                        | Drain-Source Diode Forward Voltage                    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 22A                                                     | --       | --       | 1.4     | V        |
| t <sub>rr</sub>                                        | Reverse Recovery Time                                 | V <sub>GS</sub> = 0V, I <sub>S</sub> = 20A                                                     | --       | 507      | --      | ns       |
| Q <sub>rr</sub>                                        | Reverse Recovery Charge                               | dI <sub>F</sub> /dt =100A/μs                                                                   | --       | 7.20     | --      | μC       |

### NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 4.1\text{mH}, I_{AS} = 22A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 22A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Characteristics

Figure 1. On-Region Characteristics

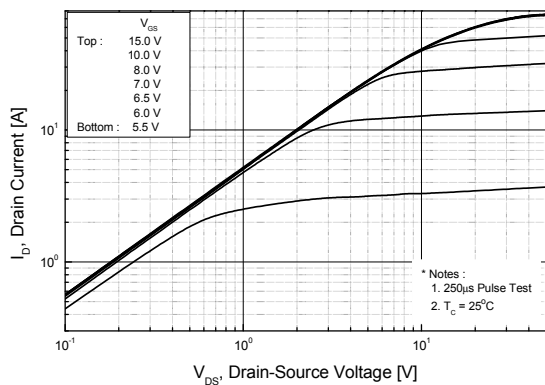


Figure 2. Transfer Characteristics

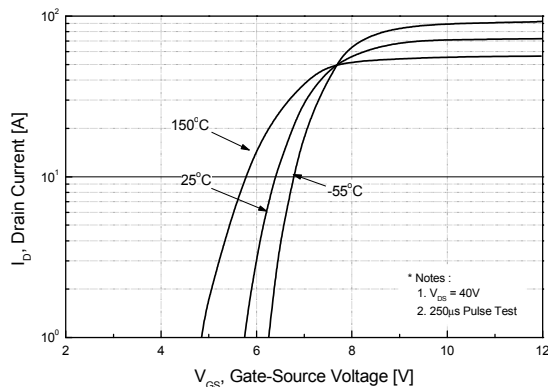


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

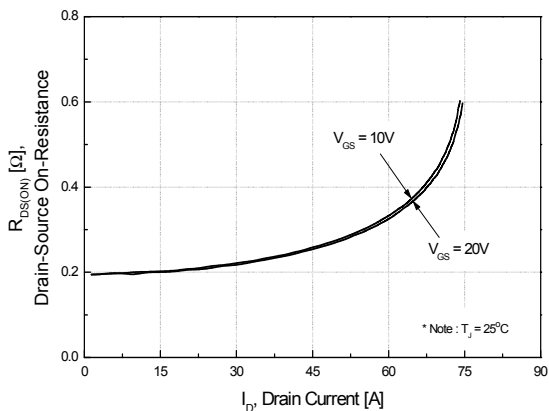


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

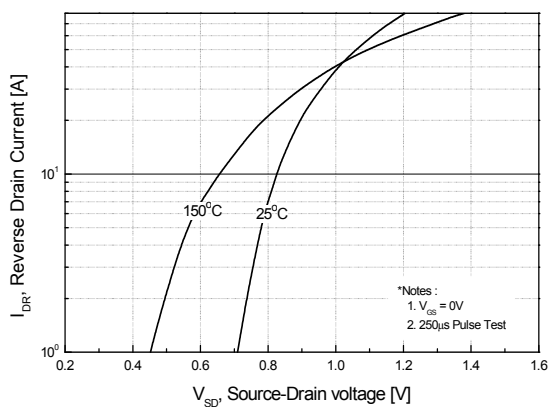


Figure 5. Capacitance Characteristics

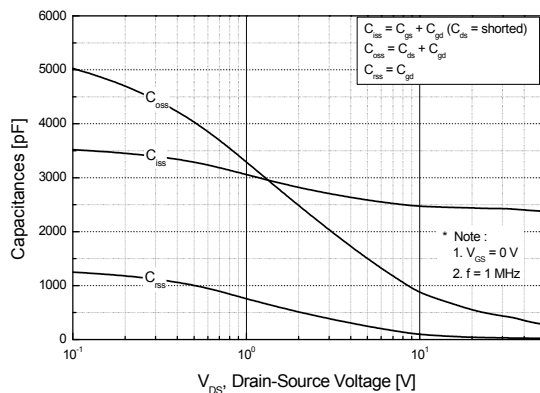
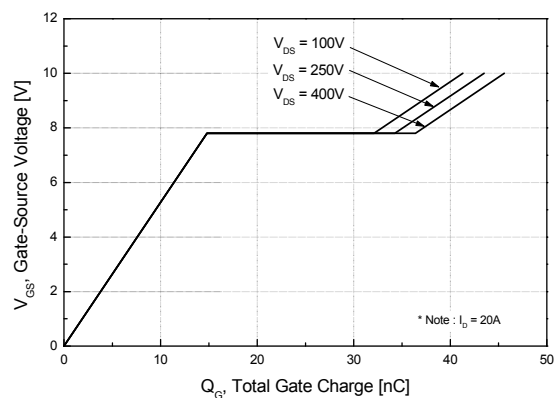
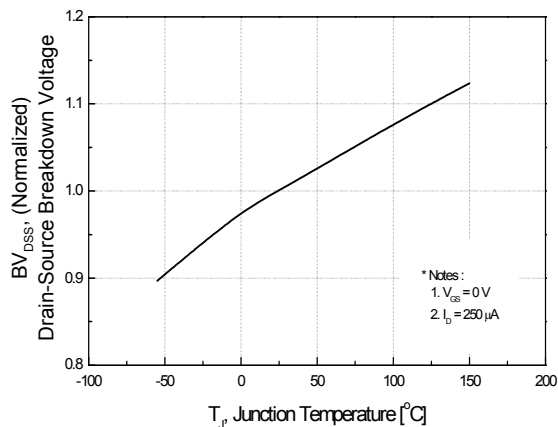


Figure 6. Gate Charge Characteristics

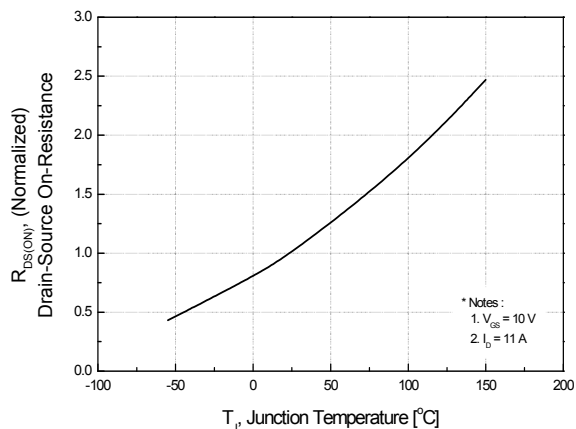


## Typical Characteristics (Continued)

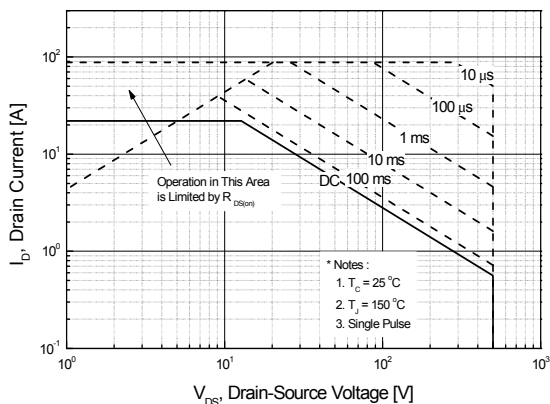
**Figure 7. Breakdown Voltage Variation vs. Temperature**



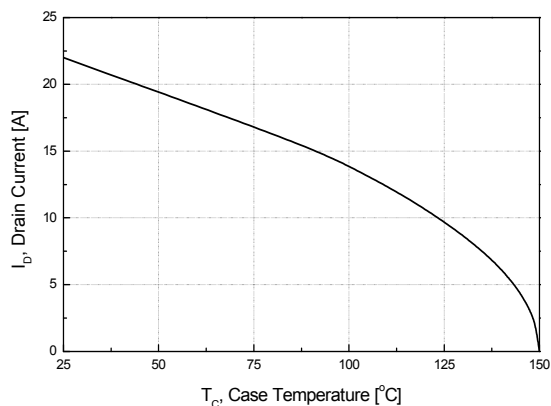
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. Transient Thermal Response Curve**

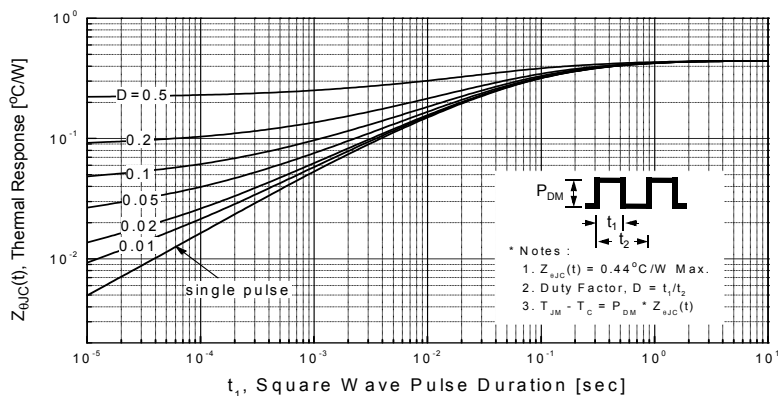


Figure 12. Gate Charge Test Circuit & Waveform

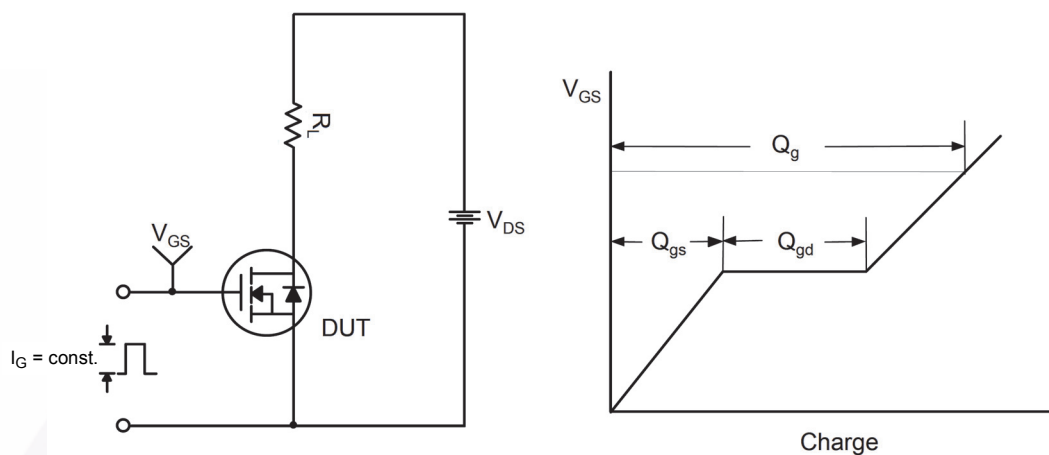


Figure 13. Resistive Switching Test Circuit & Waveforms

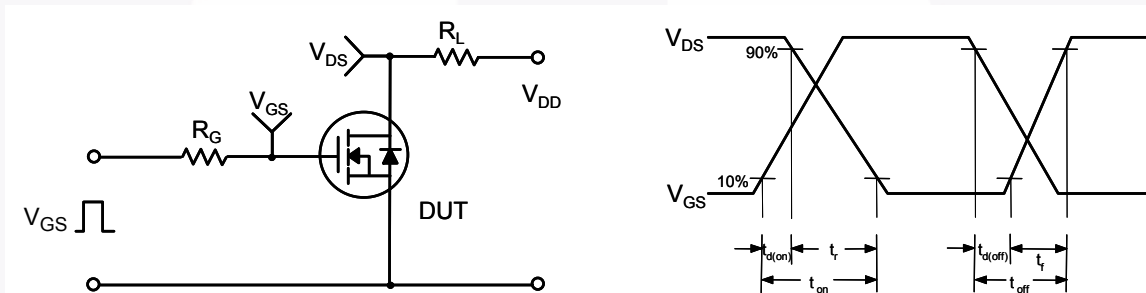
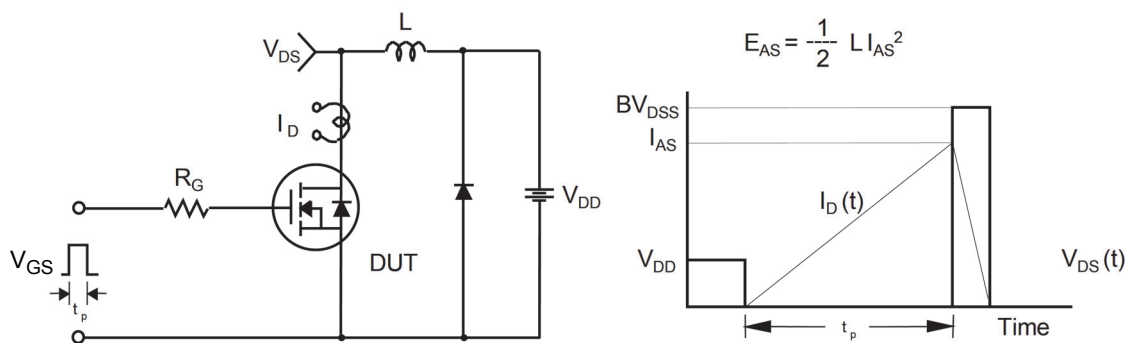
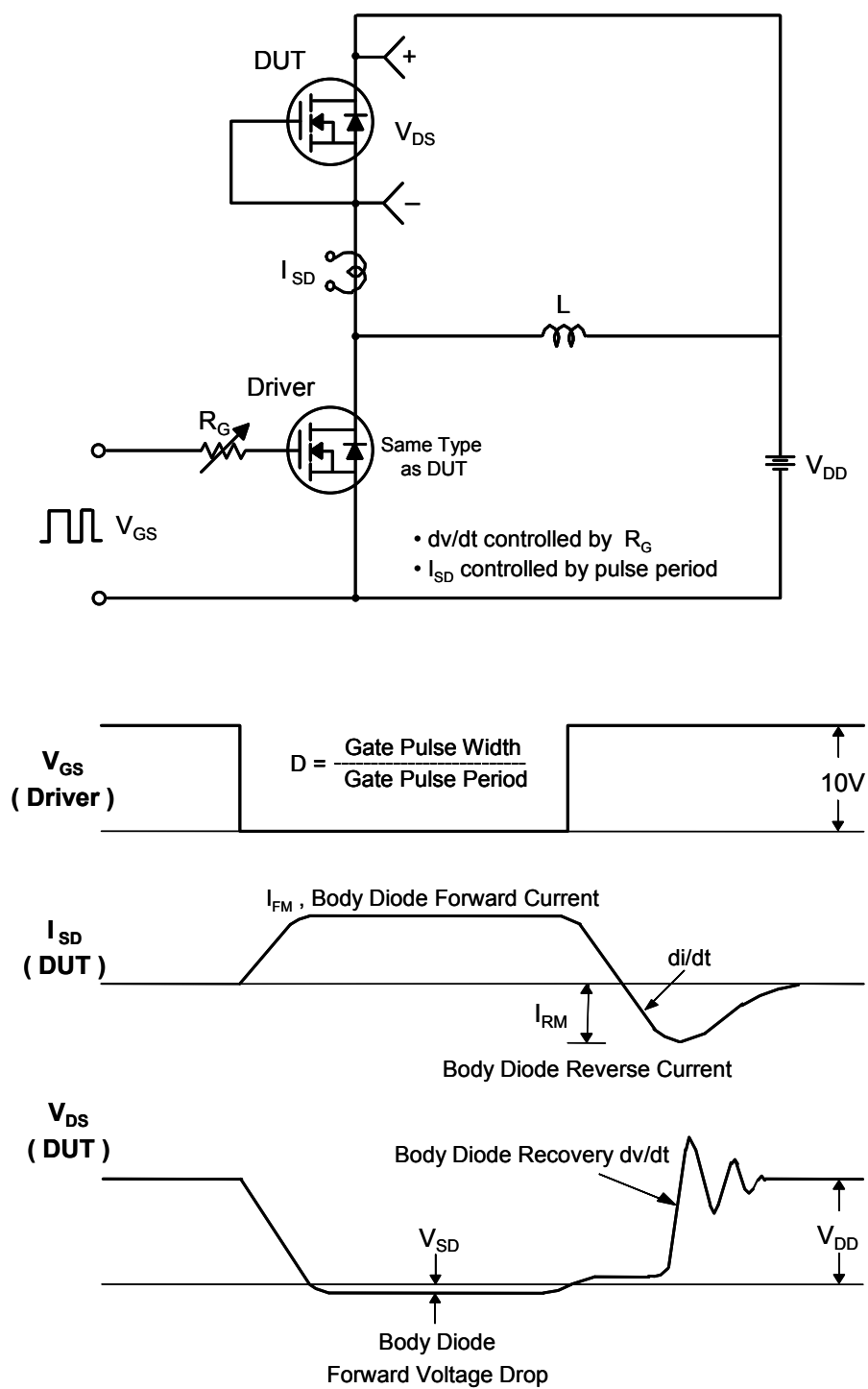


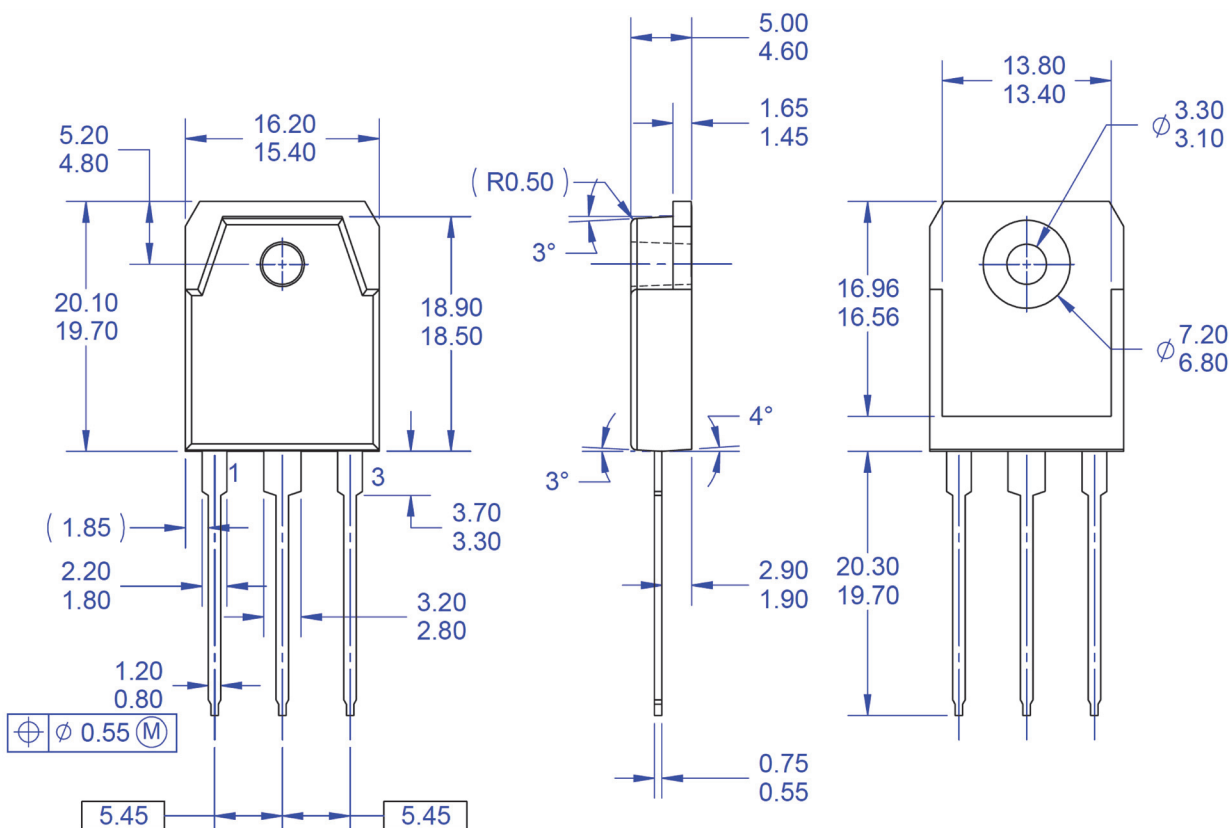
Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



### Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions



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**Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65**

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Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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