

# FCPF260N60E\_F152

## N-Channel SuperFET® II MOSFET

600 V, 15 A, 260 mΩ

### Features

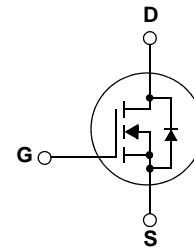
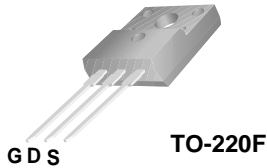
- 650 V @ T<sub>J</sub> = 150°C
- Max. R<sub>DS(on)</sub> = 260 mΩ
- Ultra Low Gate Charge (Typ. Q<sub>g</sub> = 48 nC)
- Low Effective Output Capacitance (Typ. C<sub>oss,eff</sub> = 129 pF)
- 100% Avalanche Tested

### Applications

- LCD / LED / PDP TV Lighting
- Solar Inverter
- AC-DC Power Supply

### Description

SuperFET® II MOSFET is Fairchild Semiconductor®'s first generation of high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This advanced technology is tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. Consequently, SuperFET® II MOSFET is suitable for various AC/DC power conversion for system miniaturization and higher efficiency.



### MOSFET Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted


| Symbol                            | Parameter  | FCPF260N60E_F152                     | Unit  |
|-----------------------------------|--|--------------------------------------|-------|
| V <sub>DSS</sub>                  | Drain to Source Voltage  | 600                                  | V     |
| V <sub>GSS</sub>                  | Gate to Source Voltage   | - DC                                 | ±20   |
|                                   |  | - AC (f > 1Hz)                       | ±30   |
| I <sub>D</sub>                    | Drain Current  | -Continuous (T <sub>C</sub> = 25°C)  | 15*   |
|                                   |  | -Continuous (T <sub>C</sub> = 100°C) | 9.5*  |
| I <sub>DM</sub>                   | Drain Current  | - Pulsed (Note 1)                    | 45*   |
| E <sub>AS</sub>                   | Single Pulsed Avalanche Energy   | (Note 2)                             | 292.5 |
| I <sub>AR</sub>                   | Avalanche Current  | (Note 1)                             | 3.0   |
| E <sub>AR</sub>                   | Repetitive Avalanche Energy  | (Note 1)                             | 1.56  |
| dv/dt                             | Peak Diode Recovery dv/dt  | (Note 3)                             | 20    |
|                                   | MOSFET dv/dt   |                                      | 100   |
| P <sub>D</sub>                    | Power Dissipation  | (T <sub>C</sub> = 25°C)              | 36    |
|                                   |  | - Derate above 25°C                  | 0.29  |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range                                      | -55 to +150                          | °C    |
| T <sub>L</sub>                    | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300                                  | °C    |

\*Drain current limited by maximum junction temperature

### Thermal Characteristics

| Symbol           | Parameter                                       | FCPF260N60E_F152 | Unit |
|------------------|---|------------------|------|
| R <sub>θJC</sub> | Thermal Resistance, Junction to Case            | 3.5              | °C/W |
| R <sub>θCS</sub> | Thermal Resistance, Case to Heat Sink (Typical) | 0.5              |      |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient         | 62.5             |      |

## Package Marking and Ordering Information

| Device Marking | Device           | Package | Eco Status  | Packaging Type | Quantity |
|----------------|------------------|---------|---|----------------|----------|
| FCPF260N60E    | FCPF260N60E_F152 | TO-220F | Green  | Tube           | 50       |

For Fairchild's definition of "green" Eco Status, please visit: [http://www.fairchildsemi.com/company/green/rohs\\_green.html](http://www.fairchildsemi.com/company/green/rohs_green.html).

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------------|------|------|------|------|
|--------|-----------|-----------------|------|------|------|------|

### Off Characteristics

|                                      |   |  |     |      |           |                    |
|--------------------------------------|---|--|-----|------|-----------|--------------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $V_{GS} = 0V, I_D = 10mA, T_J = 25^\circ\text{C}$  | 600 | -    | -         | V                  |
|                                      |   | $V_{GS} = 0V, I_D = 10mA, T_J = 150^\circ\text{C}$ | 650 | -    | -         | V                  |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 10mA$ , Referenced to $25^\circ\text{C}$    | -   | 0.67 | -         | $V/^\circ\text{C}$ |
| $BV_{DS}$                            | Drain-Source Avalanche Breakdown Voltage  | $V_{GS} = 0V, I_D = 15A$                           | -   | 700  | -         | V                  |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 480V, V_{GS} = 0V$                       | -   | -    | 10        | $\mu\text{A}$      |
|                                      |   | $V_{DS} = 480V, T_C = 125^\circ\text{C}$           | -   | -    | 10        |                    |
| $I_{GSS}$                            | Gate to Body Leakage Current              | $V_{GS} = \pm 20V, V_{DS} = 0V$                    | -   | -    | $\pm 100$ | nA                 |

### On Characteristics

|              |                                      |   |     |      |      |          |
|--------------|--------------------------------------|---|-----|------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage               | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ | 2.5 | -    | 3.5  | V        |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10V, I_D = 7.5A$              | -   | 0.22 | 0.26 | $\Omega$ |
| $g_{FS}$     | Forward Transconductance             | $V_{DS} = 20V, I_D = 7.5A$              | -   | 15.5 | -    | S        |

### Dynamic Characteristics

|                        |                               |  |          |      |      |          |
|------------------------|-------------------------------|--|----------|------|------|----------|
| $C_{iss}$              | Input Capacitance             | $V_{DS} = 25V, V_{GS} = 0V$<br>$f = 1\text{MHz}$ | -        | 1880 | 2500 | pF       |
| $C_{oss}$              | Output Capacitance            |  | -        | 1330 | 1770 | pF       |
| $C_{rfs}$              | Reverse Transfer Capacitance  |  | -        | 85   | 130  | pF       |
| $C_{oss}$              | Output Capacitance            | $V_{DS} = 380V, V_{GS} = 0V, f = 1\text{MHz}$    | -        | 32   | -    | pF       |
| $C_{oss \text{ eff.}}$ | Effective Output Capacitance  | $V_{DS} = 0V \text{ to } 480V, V_{GS} = 0V$      | -        | 129  | -    | pF       |
| $Q_{g(tot)}$           | Total Gate Charge at 10V      | $V_{DS} = 380V, I_D = 7.5A$<br>$V_{GS} = 10V$    | -        | 48   | 62   | nC       |
| $Q_{gs}$               | Gate to Source Gate Charge    |  | -        | 7.4  | -    | nC       |
| $Q_{gd}$               | Gate to Drain "Miller" Charge |  | (Note 4) | -    | 17   | -        |
| ESR                    | Equivalent Series Resistance  | $f = 1\text{MHz}$                                | -        | 5.8  | -    | $\Omega$ |

### Switching Characteristics

|              |                     |  |          |    |     |    |
|--------------|---------------------|--|----------|----|-----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 380V, I_D = 7.5A$<br>$V_{GS} = 10V, R_G = 4.7\Omega$ | -        | 20 | 50  | ns |
| $t_r$        | Turn-On Rise Time   |  | -        | 11 | 32  | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |  | -        | 89 | 188 | ns |
| $t_f$        | Turn-Off Fall Time  |  | (Note 4) | -  | 13  | 36 |

### Drain-Source Diode Characteristics

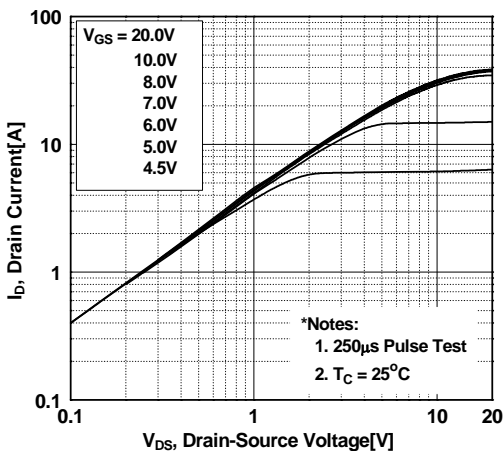
|          |  |  |   |     |     |               |
|----------|--|--|---|-----|-----|---------------|
| $I_S$    | Maximum Continuous Drain to Source Diode Forward Current | -  | - | 15  | A   |               |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current     | -  | - | 45  | A   |               |
| $V_{SD}$ | Drain to Source Diode Forward Voltage                    | $V_{GS} = 0V, I_{SD} = 7.5A$                                 | - | -   | 1.2 | V             |
| $t_{rr}$ | Reverse Recovery Time                                    | $V_{GS} = 0V, I_{SD} = 7.5A$<br>$di_F/dt = 100A/\mu\text{s}$ | - | 270 | -   | ns            |
| $Q_{rr}$ | Reverse Recovery Charge                                  |  | - | 3.6 | -   | $\mu\text{C}$ |

#### Notes:

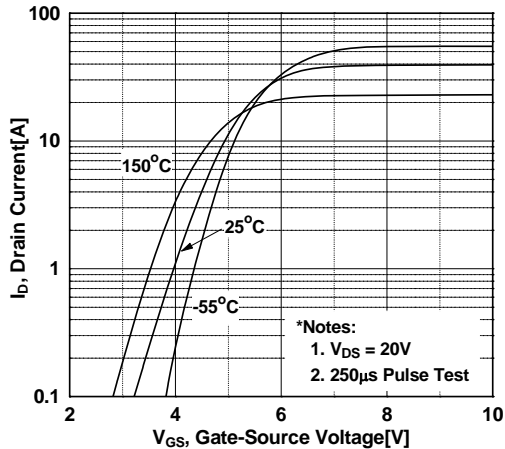
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 3A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 7.5A, di/dt \leq 200A/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

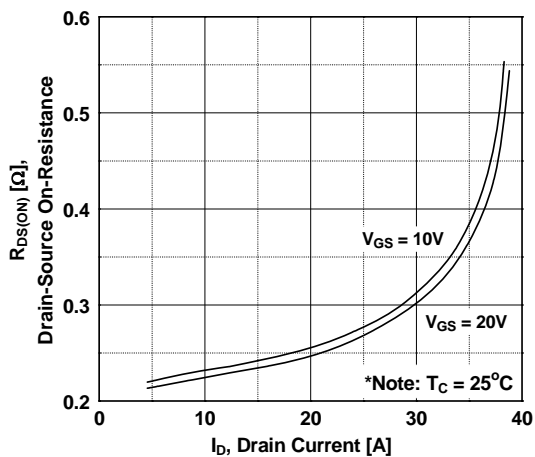
**Figure 1. On-Region Characteristics**



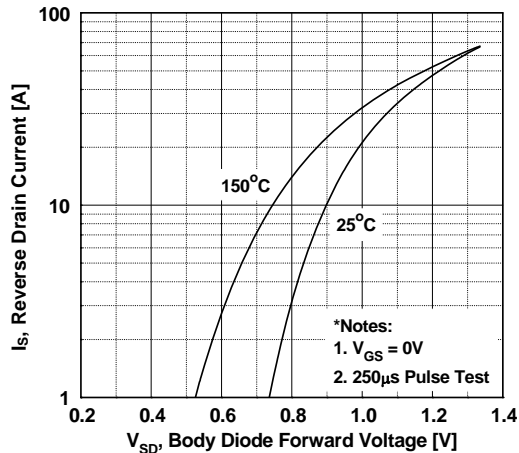
**Figure 2. Transfer Characteristics**



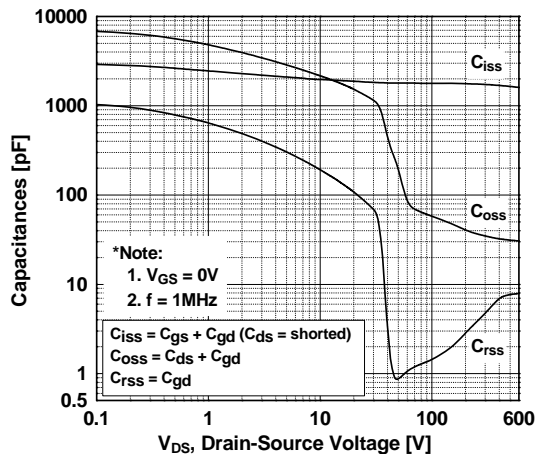
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



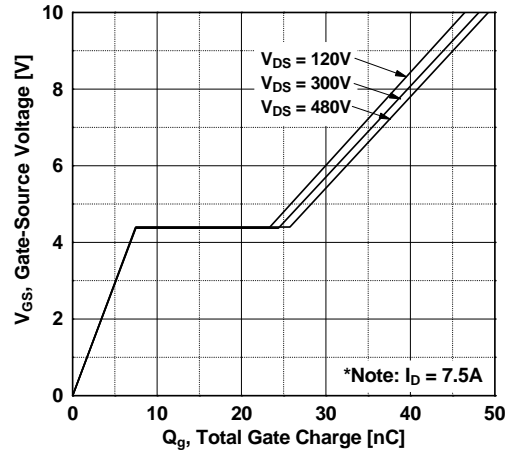
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

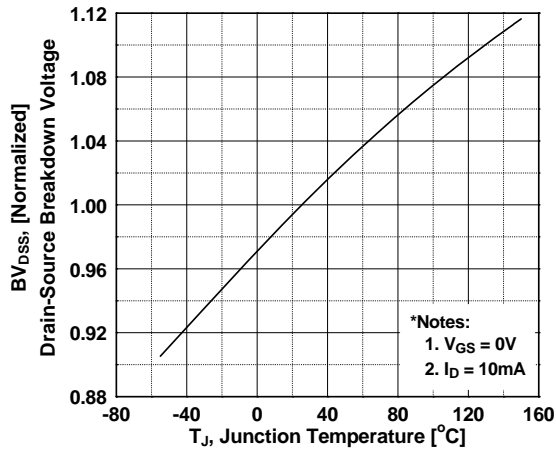


**Figure 6. Gate Charge Characteristics**

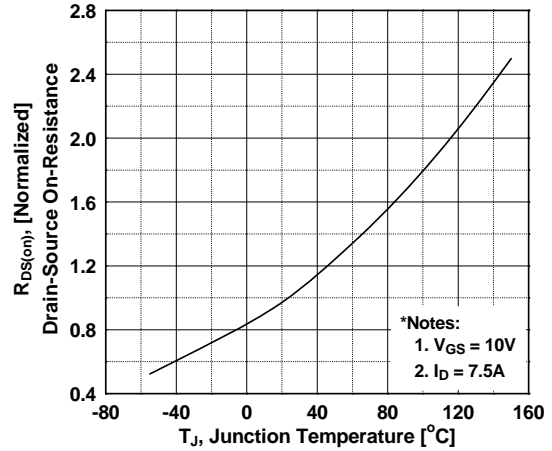


## Typical Performance Characteristics (Continued)

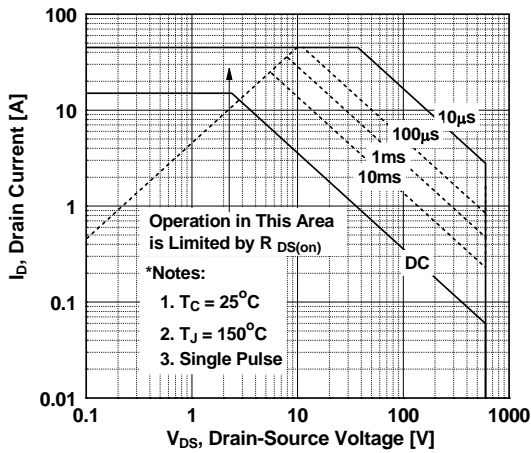
**Figure 7. Breakdown Voltage Variation vs. Temperature**



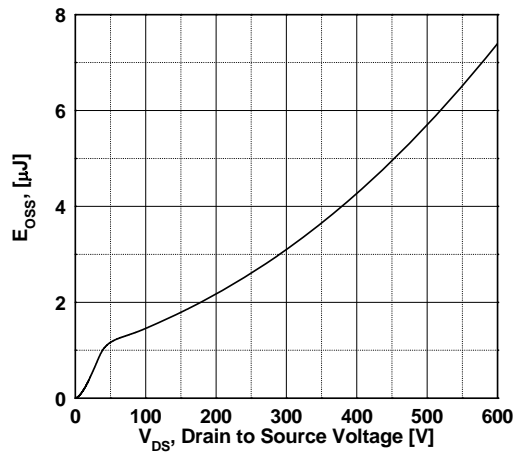
**Figure 8. On-Resistance Variation vs. Temperature**



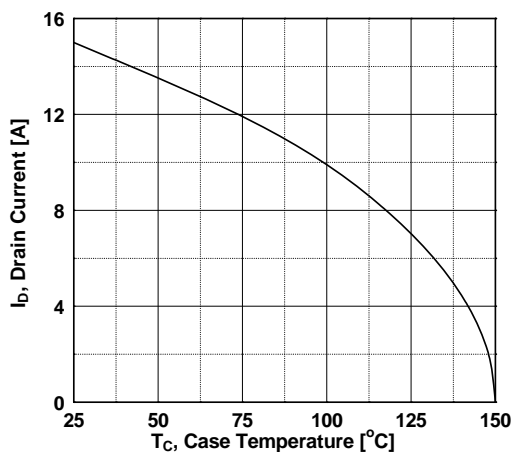
**Figure 9. Maximum Safe Operating Area vs. Case Temperature**



**Figure 10. E\_oss vs. Drain to Source Voltage Switching Capability**

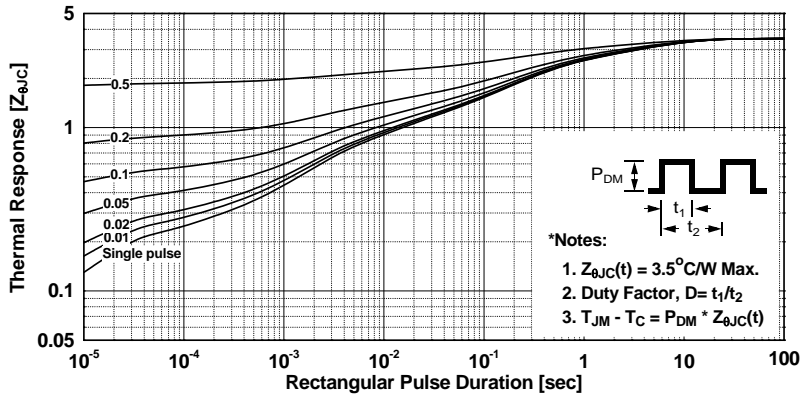


**Figure 11. Maximum Drain Current**

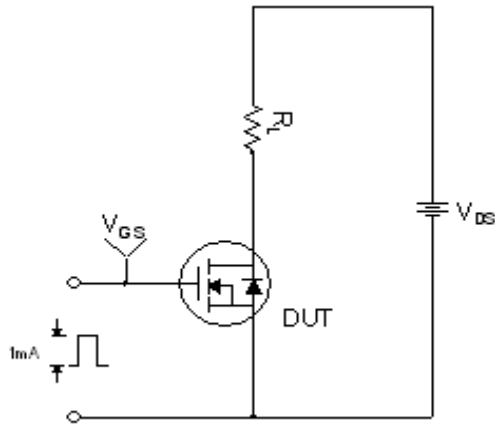


Typical Performance Characteristics (Continued)

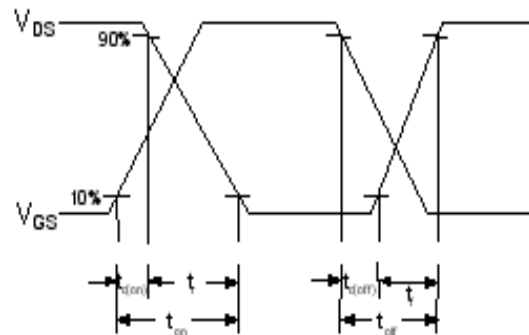
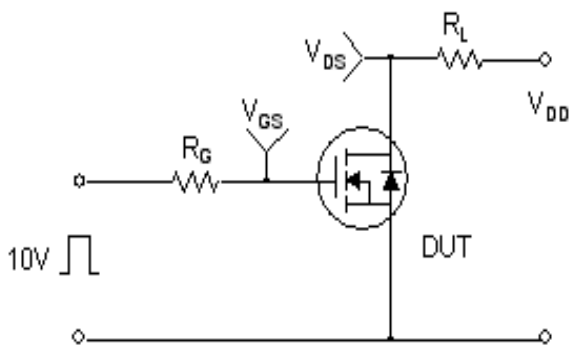
Figure 12. Transient Thermal Response Curve



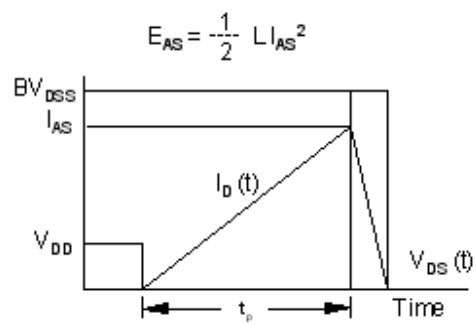
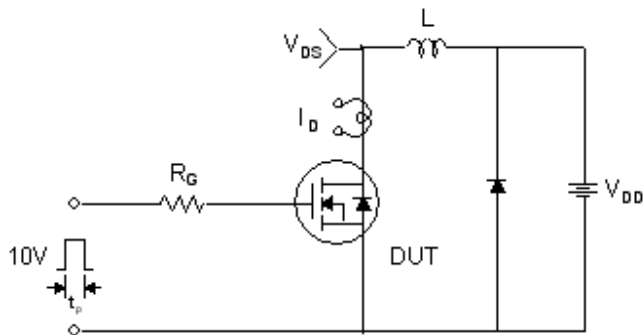
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

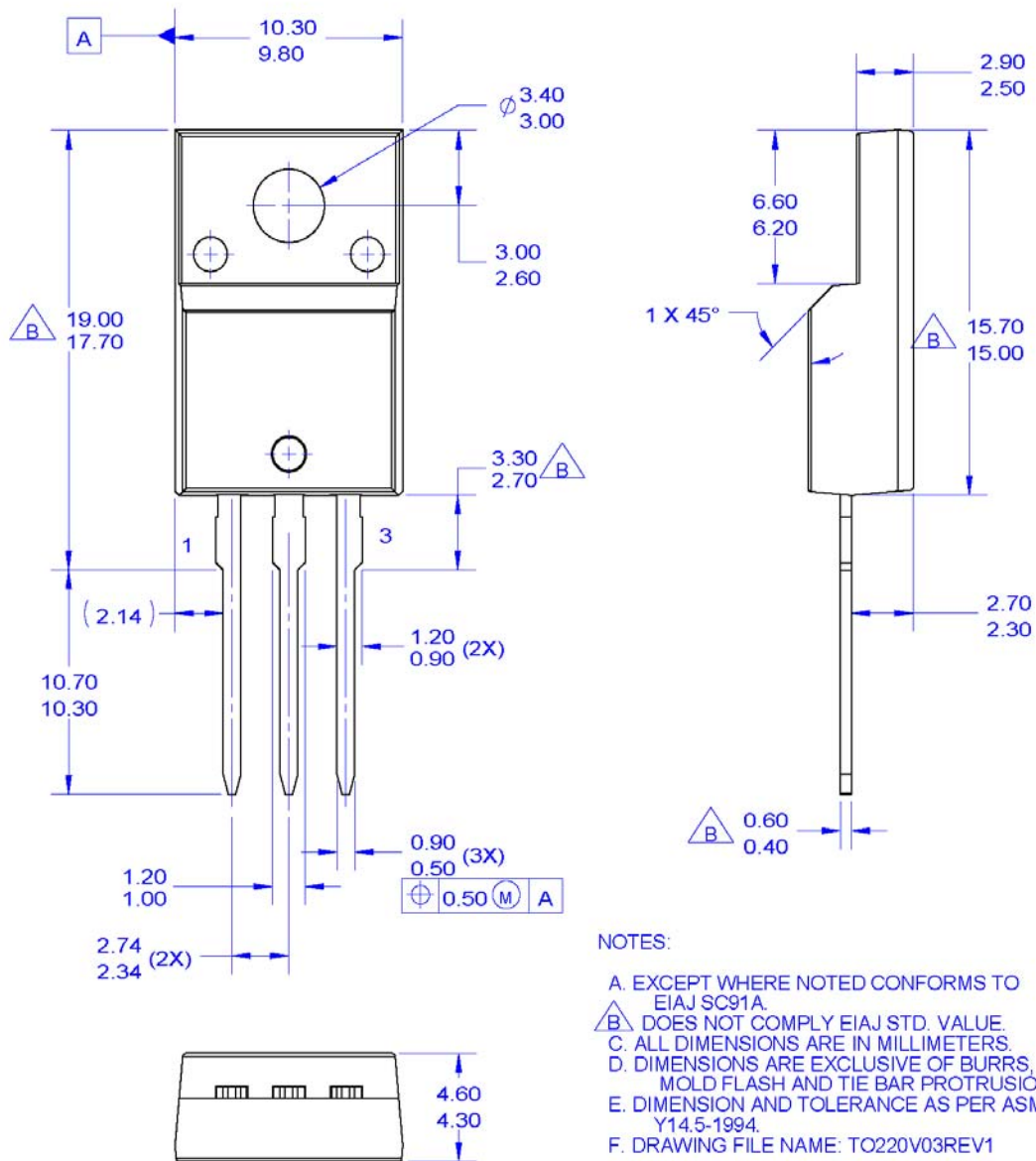


Peak Diode Recovery dv/dt Test Circuit & Waveforms



**Mechanical Dimensions**

**TO-220F**



**\* Front/Back Side Isolation Voltage : AC 2500V**

**TO-220, MOLDED, 3LD, FULL PACK, EIAJ SC91**

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| BitSiC™   | Global Power Resource <sup>SM</sup> | QFET®   | TinyBuck™        |
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Rev. I64

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