

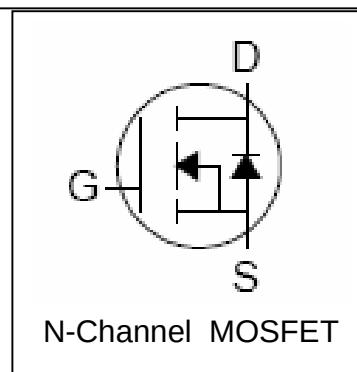
## **Features**

- 30V/160A,  
 $R_{DS(ON)} = 2.3m\Omega(tpy.) @ V_{GS} = 10V$
- Super High Dense Cell Design
- Ultra Low On-Resistance
- 100% avalanche tested
- Lead Free and Green Devices Available  
(RoHS Compliant)

## **Applications**

- DC-DC Converters

## **Pin Description**



## **Absolute Maximum Ratings**

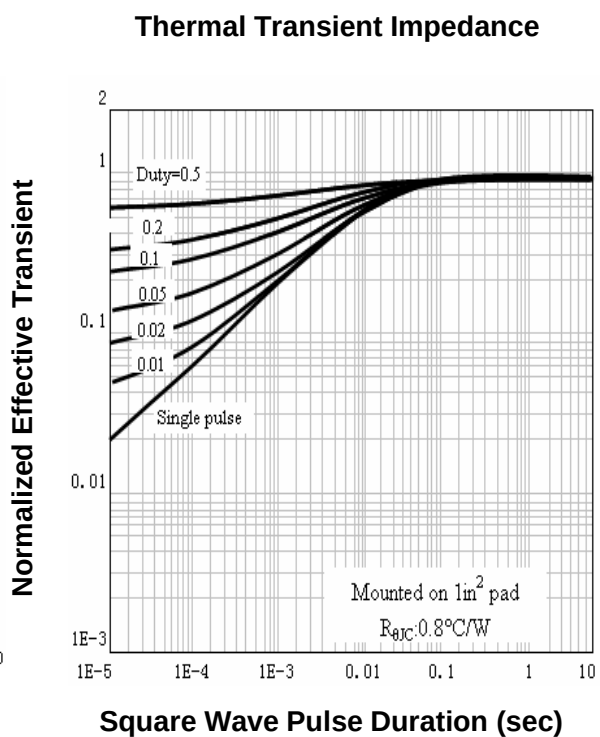
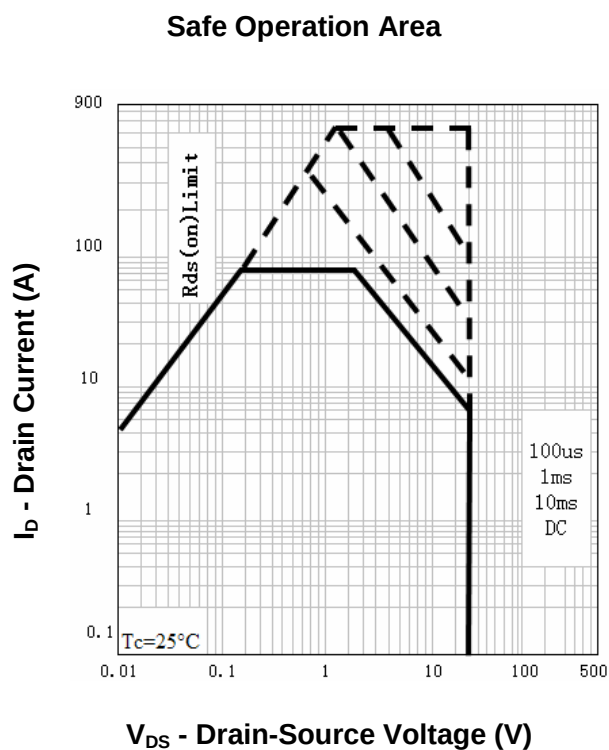
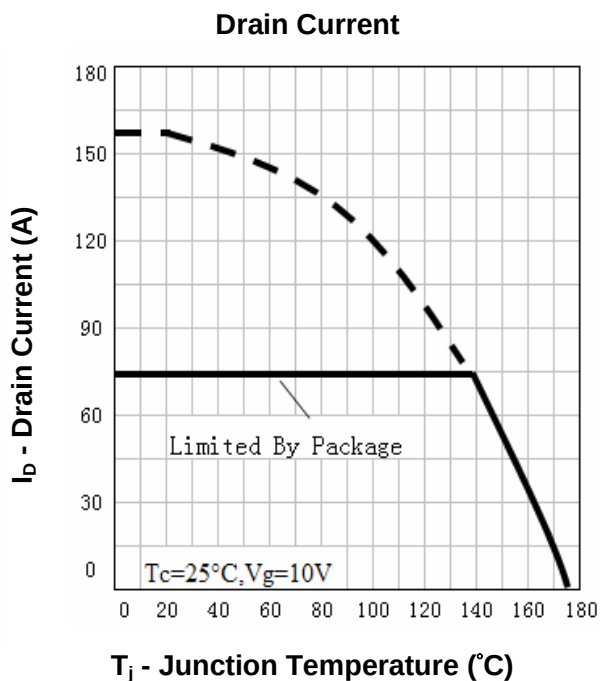
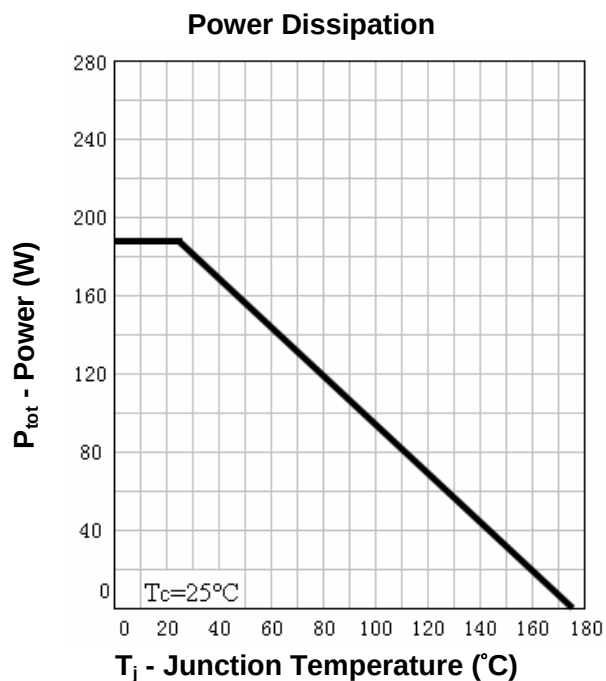
| Symbol                                                       | Parameter                           |                       | Rating           | Unit |
|--------------------------------------------------------------|-------------------------------------|-----------------------|------------------|------|
| Common Ratings (T <sub>C</sub> =25°C Unless Otherwise Noted) |                                     |                       |                  |      |
| V <sub>DSS</sub>                                             | Drain-Source Voltage                |                       | 30               | V    |
| V <sub>GSS</sub>                                             | Gate-Source Voltage                 |                       | ±20              |      |
| T <sub>J</sub>                                               | Maximum Junction Temperature        |                       | 175              | °C   |
| T <sub>STG</sub>                                             | Storage Temperature Range           |                       | -55 to 175       | °C   |
| I <sub>S</sub>                                               | Diode Continuous Forward Current    | T <sub>C</sub> =25°C  | 160 <sup>①</sup> | A    |
| Mounted on Large Heat Sink                                   |                                     |                       |                  |      |
| I <sub>DP</sub>                                              | 300μs Pulse Drain Current Tested    | T <sub>C</sub> =25°C  | 630 <sup>②</sup> | A    |
| I <sub>D</sub>                                               | Continuous Drain Current            | T <sub>C</sub> =25°C  | 160 <sup>①</sup> | A    |
|                                                              |                                     | T <sub>C</sub> =100°C | 120 <sup>①</sup> |      |
| P <sub>D</sub>                                               | Maximum Power Dissipation           | T <sub>C</sub> =25°C  | 188              | W    |
|                                                              |                                     | T <sub>C</sub> =100°C | 94               | W    |
| R <sub>θJC</sub>                                             | Thermal Resistance-Junction to Case |                       | 0.8              | °C/W |
| Drain-Source Avalanche Ratings                               |                                     |                       |                  |      |
| E <sub>AS</sub> <sup>③</sup>                                 | Avalanche Energy, Single Pulsed     |                       | 400              | mJ   |

**Electrical Characteristics** ( $T_C=25^{\circ}\text{C}$  Unless Otherwise Noted)

| Symbol                                   | Parameter                        | Test Condition                                                                                                       | RU30160R |      |      | Unit |
|------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------|----------|------|------|------|
|                                          |                                  |                                                                                                                      | Min.     | Typ. | Max. |      |
| Static Characteristics                   |                                  |                                                                                                                      |          |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                                                          | 30       |      |      | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> = 30V, V <sub>GS</sub> =0V                                                                           |          |      | 1    | μA   |
|                                          |                                  | T <sub>J</sub> =85°C                                                                                                 |          |      | 10   |      |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                                            | 2        | 3    | 4    | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                           |          |      | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>④</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> = 10V, I <sub>DS</sub> =75A                                                                          |          | 2.3  | 3.5  | mΩ   |
| Diode Characteristics                    |                                  |                                                                                                                      |          |      |      |      |
| V <sub>SD</sub> <sup>④</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =75A, V <sub>GS</sub> =0V                                                                            |          |      | 1.2  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =75A, dI <sub>SD</sub> /dt=100A/μs                                                                   |          | 45   |      | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                      |          | 90   |      | nC   |
| Dynamic Characteristics <sup>⑤</sup>     |                                  |                                                                                                                      |          |      |      |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                                                     |          | 1.8  |      | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> = 15V,<br>Frequency=1.0MHz                                                   |          | 3970 |      | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                      |          | 660  |      |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                      |          | 350  |      |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =15V, R <sub>L</sub> =0.2Ω,<br>I <sub>DS</sub> =75A, V <sub>GEN</sub> = 10V,<br>R <sub>G</sub> =4.7Ω |          | 30   |      | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                      |          | 105  |      |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                      |          | 83   |      |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                      |          | 45   |      |      |
| Gate Charge Characteristics <sup>⑤</sup> |                                  |                                                                                                                      |          |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =24V, V <sub>GS</sub> = 10V,<br>I <sub>DS</sub> =75A                                                 |          | 96   |      | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                      |          | 18   |      |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                      |          | 28   |      |      |

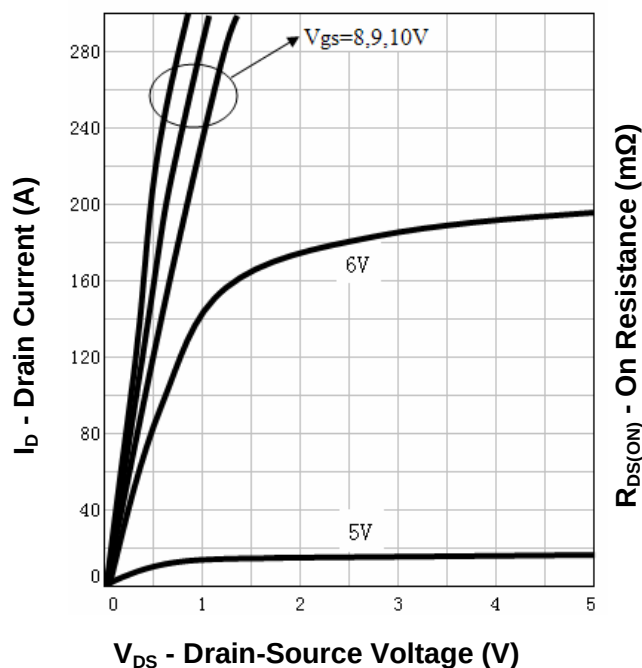
- Notes: ① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.  
 ② Pulse width limited by safe operating area.  
 ③ Limited by  $T_{Jmax}, I_{AS}=40A, V_{DD}=24V, R_G=50\Omega$ , Starting  $T_J=25^{\circ}\text{C}$ .  
 ④ Pulse test; Pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .  
 ⑤ Guaranteed by design, not subject to production testing.

## Typical Characteristics

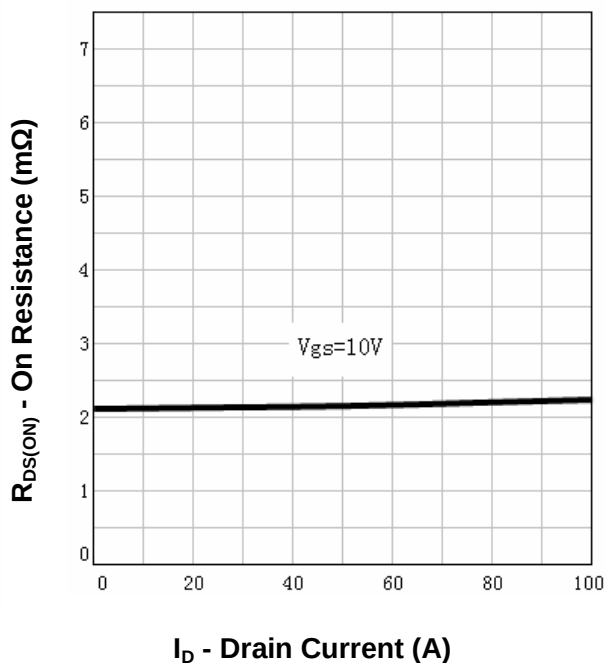


## Typical Characteristics

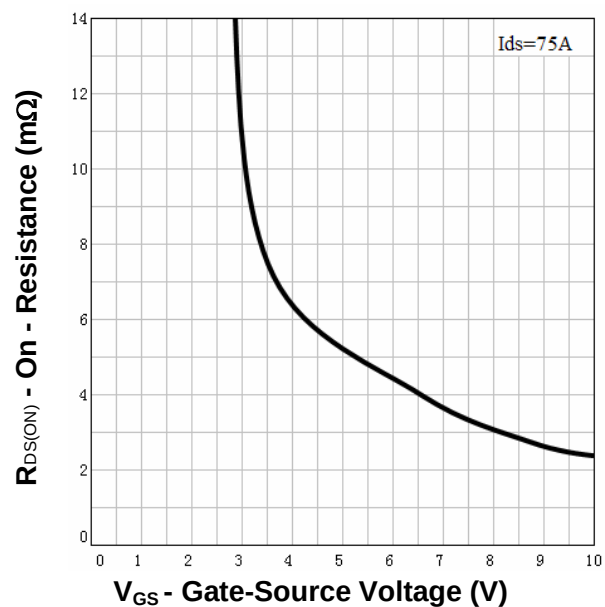
Output Characteristics



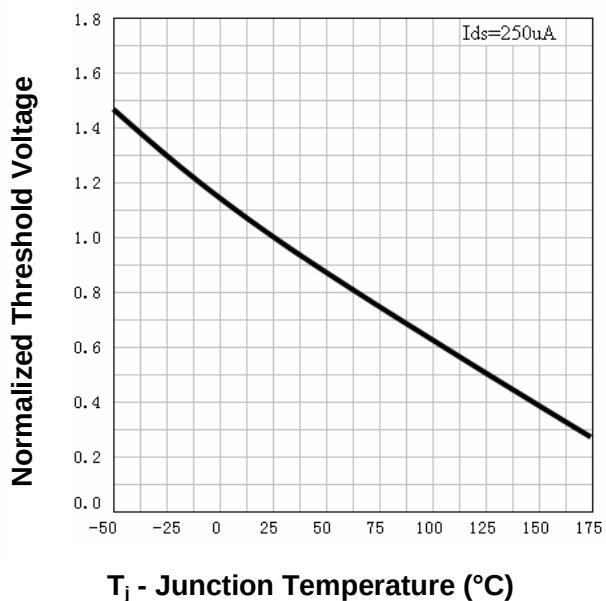
Drain-Source On Resistance



Drain-Source On Resistance

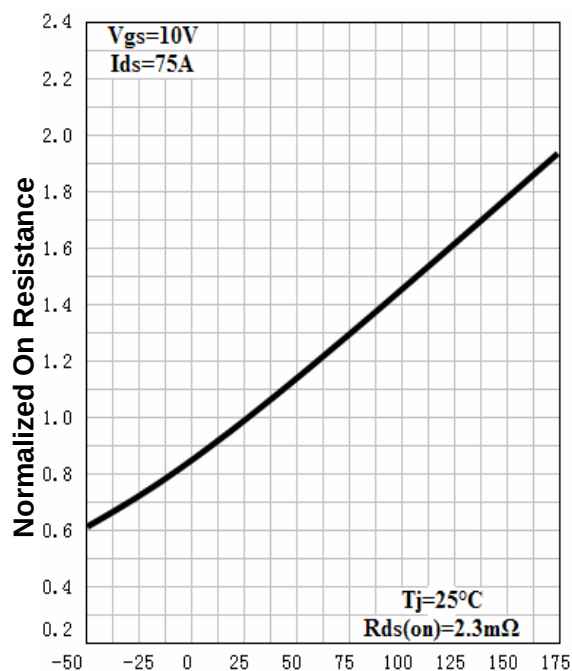


Gate Threshold Voltage



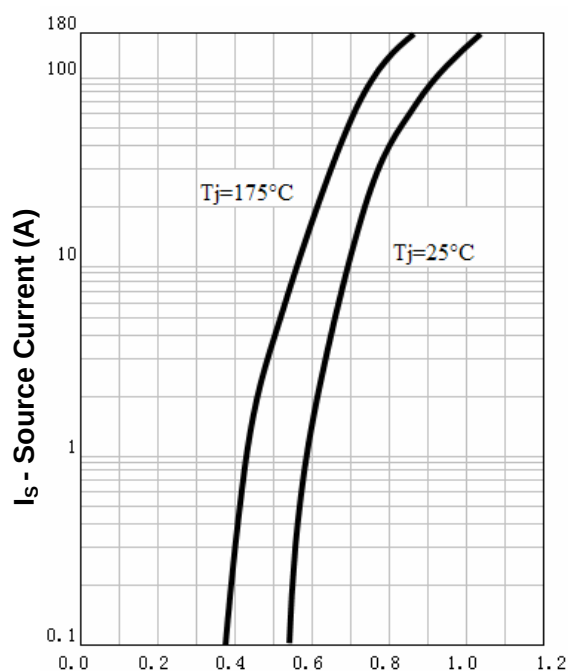
## Typical Characteristics

**Drain-Source On Resistance**



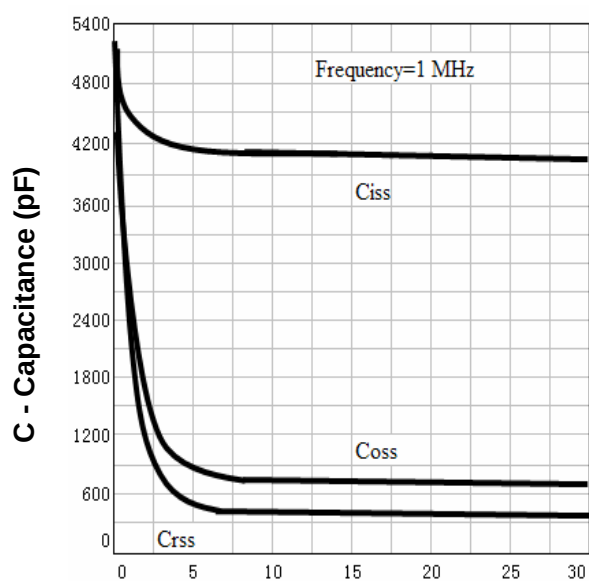
$T_j$  - Junction Temperature ( $^{\circ}\text{C}$ )

**Source-Drain Diode Forward**



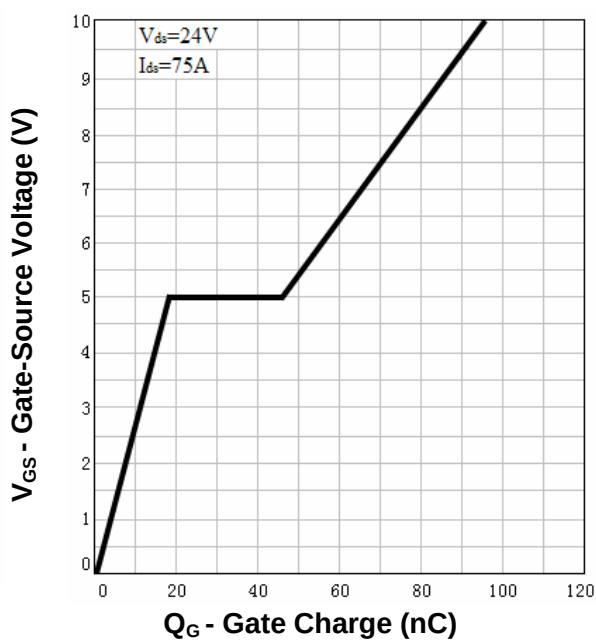
$V_{SD}$  - Source-Drain Voltage (V)

**Capacitance**

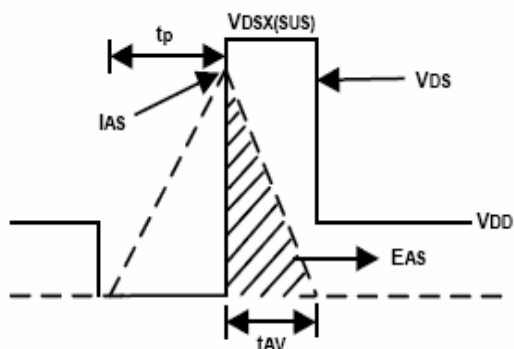
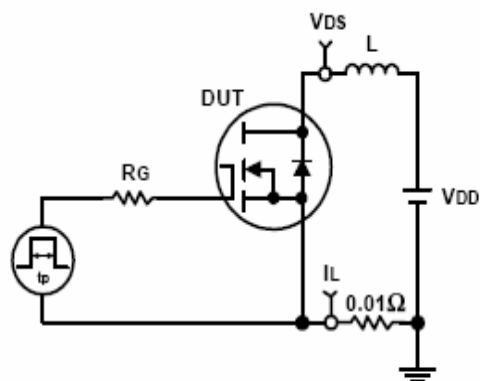


$V_{DS}$  - Drain-Source Voltage (V)

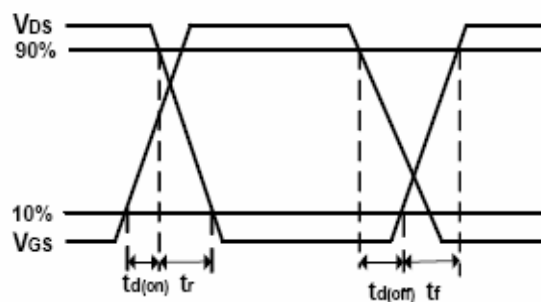
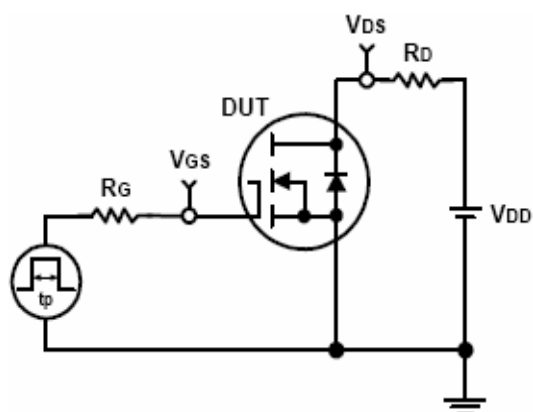
**Gate Charge**



## Avalanche Test Circuit and Waveforms



## Switching Time Test Circuit and Waveforms



## **Ordering and Marking Information**

### **RU30160**

**Package (Available)**

R : TO220

**Operating Temperature Range**

C : -55 to 175 °C

**Assembly Material**

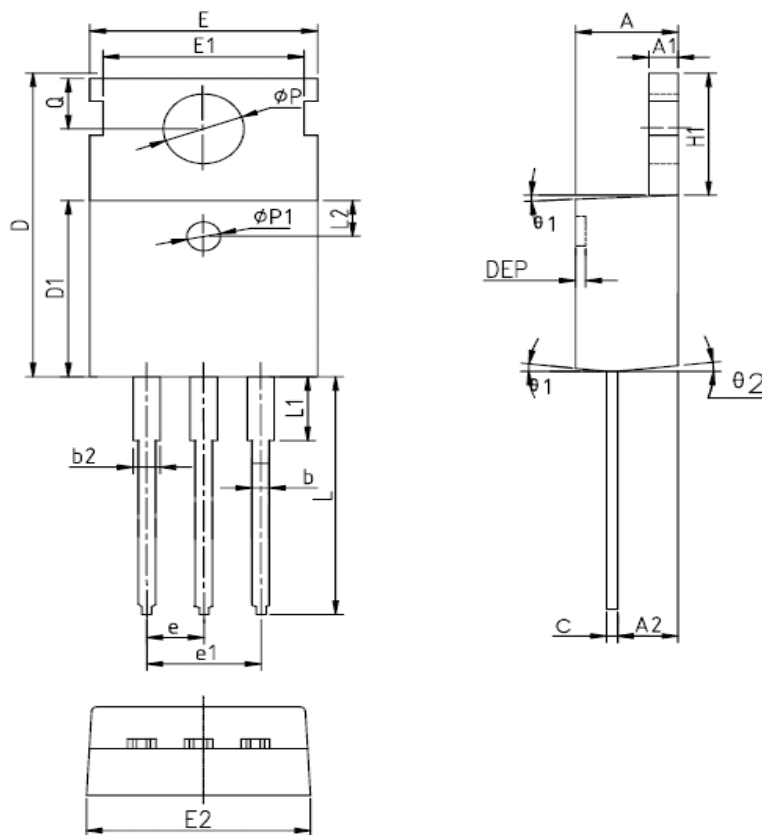
G : Green & Lead Free

**Packaging**

T : TUBE

## Package Information

### TO-220FB-3L



| SYMBOL | MM    |       |       | INCH  |       |       | SYMBOL | MM       |      |       | INCH      |       |       |
|--------|-------|-------|-------|-------|-------|-------|--------|----------|------|-------|-----------|-------|-------|
|        | MIN   | NOM   | MAX   | MIN   | NOM   | MAX   |        | MIN      | NOM  | MAX   | MIN       | NOM   | MAX   |
| A      | 4.40  | 4.57  | 4.70  | 0.173 | 0.180 | 0.185 | Øp1    | 1.40     | 1.50 | 1.60  | 0.055     | 0.059 | 0.063 |
| A1     | 1.27  | 1.30  | 1.33  | 0.050 | 0.051 | 0.052 | e      | 2.54BSC  |      |       | 0.1BSC    |       |       |
| A2     | 2.35  | 2.40  | 2.50  | 0.093 | 0.094 | 0.098 | e1     | 5.08BSC  |      |       | 0.2BSC    |       |       |
| b      | 0.77  | -     | 0.90  | 0.030 | -     | 0.035 | H1     | 6.40     | 6.50 | 6.60  | 0.252     | 0.256 | 0.260 |
| b2     | 1.23  | -     | 1.36  | 0.048 | -     | 0.054 | L      | 12.75    | -    | 13.17 | 0.502     | -     | 0.519 |
| C      | 0.48  | 0.50  | 0.52  | 0.019 | 0.020 | 0.021 | L1     | -        | -    | 3.95  | -         | -     | 0.156 |
| D      | 15.40 | 15.60 | 15.80 | 0.606 | 0.614 | 0.622 | L2     | 2.50REF. |      |       | 0.098REF. |       |       |
| D1     | 9.00  | 9.10  | 9.20  | 0.354 | 0.358 | 0.362 | Øp     | 3.57     | 3.60 | 3.63  | 0.141     | 0.142 | 0.143 |
| DEP    | 0.05  | 0.10  | 0.20  | 0.002 | 0.004 | 0.008 | Q      | 2.73     | 2.80 | 2.87  | 0.107     | 0.110 | 0.113 |
| E      | 9.70  | 9.90  | 10.10 | 0.382 | 0.389 | 0.398 | θ 1    | 5°       | 7°   | 9°    | 5°        | 7°    | 9°    |
| E1     | -     | 8.70  | -     | -     | 0.343 | -     | θ 2    | 1°       | 3°   | 5°    | 1°        | 3°    | 5°    |
| E2     | 9.80  | 10.00 | 10.20 | 0.386 | 0.394 | 0.401 |        |          |      |       |           |       |       |

ALL DIMENSIONS REFER TO JEDEC STANDARD  
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS



## **Customer Service**

**Worldwide Sales and Service:**

Sales@ruichips.com

**Technical Support:**

Technical@ruichips.com

**Investor Relations Contacts:**

Investor@ruichips.com

**Marcom Contact:**

Marcom@ruichips.com

**Editorial Contact:**

Editorial@ruichips.com

**HR Contact:**

HR@ruichips.com

**Legal Contact:**

Legal@ruichips.com

**Shen Zhen RUICHIPS Semiconductor CO., LTD**

Room 501, the 5floor An Tong Industrial Building,  
NO.207 Mei Hua Road Fu Tian Area Shen Zhen City, CHINA

**TEL:** (86-755) 8311-5334

**FAX:** (86-755) 8311-4278

**E-mail:** Sales-SZ@ruichips.com