

## FP260-VB Datasheet

### Power MOSFET

#### PRODUCT SUMMARY

|                           |                        |       |
|---------------------------|------------------------|-------|
| $V_{DS}$ (V)              | 200                    |       |
| $R_{DS(on)}$ ( $\Omega$ ) | $V_{GS} = 10\text{ V}$ | 0.056 |
| $Q_g$ (Max.) (nC)         | 70                     |       |
| $Q_{gs}$ (nC)             | 13                     |       |
| $Q_{gd}$ (nC)             | 39                     |       |
| Configuration             | Single                 |       |

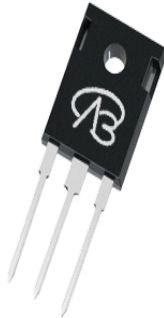
#### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Surface Mount
- Low-Profile Through-Hole
- Available in Tape and Reel
- Dynamic  $dV/dt$  Rating
- 150 °C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Compliant to RoHS Directive 2002/95/EC

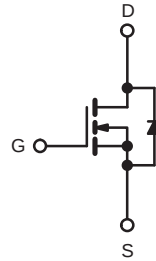


**RoHS\***  
 COMPLIANT  
 HALOGEN  
**FREE**  
 Available

TO-247



Top View



N-Channel MOSFET

#### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

| PARAMETER                                        | SYMBOL           | LIMIT                               | UNIT                  |
|--------------------------------------------------|------------------|-------------------------------------|-----------------------|
| Drain-Source Voltage                             | $V_{DS}$         | 200                                 | V                     |
| Gate-Source Voltage                              | $V_{GS}$         | $\pm 20$                            |                       |
| Continuous Drain Current                         | $V_{GS}$ at 10 V | $T_C = 25\text{ }^{\circ}\text{C}$  | A                     |
|                                                  |                  | $T_C = 100\text{ }^{\circ}\text{C}$ |                       |
| Pulsed Drain Current <sup>a, e</sup>             | $I_{DM}$         | 110                                 |                       |
| Linear Derating Factor                           |                  | 1.0                                 | W/ $^{\circ}\text{C}$ |
| Single Pulse Avalanche Energy <sup>b, e</sup>    | $E_{AS}$         | 450                                 | mJ                    |
| Avalanche Current <sup>a</sup>                   | $I_{AR}$         | 20                                  | A                     |
| Repetitive Avalanche Energy <sup>a</sup>         | $E_{AR}$         | 13                                  | mJ                    |
| Maximum Power Dissipation                        | $P_D$            | $T_C = 25\text{ }^{\circ}\text{C}$  | W                     |
|                                                  |                  | $T_A = 25\text{ }^{\circ}\text{C}$  |                       |
| Peak Diode Recovery $dV/dt$ <sup>c, e</sup>      | $dV/dt$          | 5.0                                 | V/ns                  |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$   | - 55 to + 150                       | $^{\circ}\text{C}$    |
| Soldering Recommendations (Peak Temperature)     | for 10 s         | 300 <sup>d</sup>                    |                       |

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 50\text{ V}$ , starting  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $L = 2.7\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 18\text{ A}$  (see fig. 12).
- $I_{SD} \leq 20\text{ A}$ ,  $dI/dt \leq 150\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150\text{ }^{\circ}\text{C}$ .
- 1.6 mm from case.

\* Pb containing terminations are not RoHS compliant, exemptions may apply

**THERMAL RESISTANCE RATINGS**

| PARAMETER                                                               | SYMBOL     | TYP. | MAX. | UNIT |
|-------------------------------------------------------------------------|------------|------|------|------|
| Maximum Junction-to-Ambient<br>(PCB Mounted, Steady-State) <sup>a</sup> | $R_{thJA}$ | -    | 40   | °C/W |
| Maximum Junction-to-Case (Drain)                                        | $R_{thJC}$ | -    | 1.0  |      |

**Note**

a. When mounted on 1" square PCB (FR-4 or G-10 material).

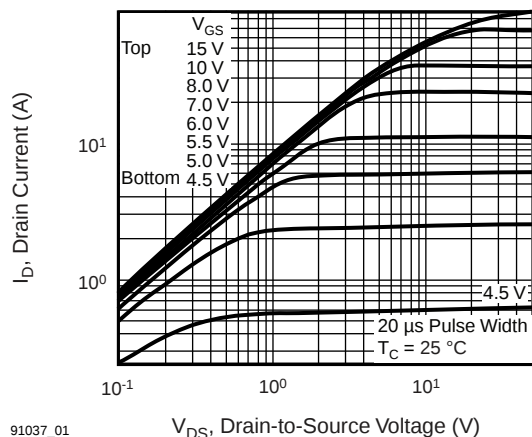
**SPECIFICATIONS** ( $T_J = 25\text{ °C}$ , unless otherwise noted)

| PARAMETER                                 | SYMBOL                           | TEST CONDITIONS                                                                                                                                         |                                                                                      | MIN. | TYP.  | MAX. | UNIT |
|-------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------|-------|------|------|
| Static                                    |                                  |                                                                                                                                                         |                                                                                      |      |       |      |      |
| Drain-Source Breakdown Voltage            | V <sub>DS</sub>                  | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                                                                          |                                                                                      | 200  | -     | -    | V    |
| V <sub>DS</sub> Temperature Coefficient   | ΔV <sub>DS</sub> /T <sub>J</sub> | Reference to 25 °C, I <sub>D</sub> = 1 mA <sup>c</sup>                                                                                                  |                                                                                      | -    | 0.29  | -    | V/°C |
| Gate-Source Threshold Voltage             | V <sub>GS(th)</sub>              | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                                                                             |                                                                                      | 2.0  | -     | 4.0  | V    |
| Gate-Source Leakage                       | I <sub>GSS</sub>                 | V <sub>GS</sub> = ± 20 V                                                                                                                                |                                                                                      | -    | -     | ± 10 | μA   |
| Zero Gate Voltage Drain Current           | I <sub>DSS</sub>                 | V <sub>DS</sub> = 200 V, V <sub>GS</sub> = 0 V                                                                                                          |                                                                                      | -    | -     | 25   | μA   |
|                                           |                                  | V <sub>DS</sub> = 160 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C                                                                                 |                                                                                      | -    | -     | 250  |      |
| Drain-Source On-State Resistance          | R <sub>DS(on)</sub>              | V <sub>GS</sub> = 10 V                                                                                                                                  | I <sub>D</sub> = 11 A <sup>b</sup>                                                   | -    | 0.056 | -    | Ω    |
| Forward Transconductance                  | g <sub>fs</sub>                  | V <sub>DS</sub> = 50 V, I <sub>D</sub> = 11 A <sup>d</sup>                                                                                              |                                                                                      | 6.7  | -     | -    | S    |
| Dynamic                                   |                                  |                                                                                                                                                         |                                                                                      |      |       |      |      |
| Input Capacitance                         | C <sub>iss</sub>                 | V <sub>GS</sub> = 0 V,<br>V <sub>DS</sub> = 25 V,<br>f = 1.0 MHz, see fig. 5 <sup>d</sup>                                                               |                                                                                      | -    | 3000  | -    | pF   |
| Output Capacitance                        | C <sub>oss</sub>                 |                                                                                                                                                         |                                                                                      | -    | 430   | -    |      |
| Reverse Transfer Capacitance              | C <sub>rss</sub>                 |                                                                                                                                                         |                                                                                      | -    | 130   | -    |      |
| Total Gate Charge                         | Q <sub>g</sub>                   | V <sub>GS</sub> = 10 V                                                                                                                                  | I <sub>D</sub> = 20 A, V <sub>DS</sub> = 160 V,<br>see fig. 6 and 13 <sup>b, c</sup> | -    | -     | 70   | nC   |
| Gate-Source Charge                        | Q <sub>gs</sub>                  |                                                                                                                                                         |                                                                                      | -    | -     | 13   |      |
| Gate-Drain Charge                         | Q <sub>gd</sub>                  |                                                                                                                                                         |                                                                                      | -    | -     | 39   |      |
| Turn-On Delay Time                        | t <sub>d(on)</sub>               | V <sub>DD</sub> = 100 V, I <sub>D</sub> = 20 A,<br>R <sub>g</sub> = 9.1 Ω, R <sub>D</sub> = 5.4 Ω, see fig. 10 <sup>b, c</sup>                          |                                                                                      | -    | 14    | -    | ns   |
| Rise Time                                 | t <sub>r</sub>                   |                                                                                                                                                         |                                                                                      | -    | 51    | -    |      |
| Turn-Off Delay Time                       | t <sub>d(off)</sub>              |                                                                                                                                                         |                                                                                      | -    | 45    | -    |      |
| Fall Time                                 | t <sub>f</sub>                   |                                                                                                                                                         |                                                                                      | -    | 36    | -    |      |
| Drain-Source Body Diode Characteristics   |                                  |                                                                                                                                                         |                                                                                      |      |       |      |      |
| Continuous Source-Drain Diode Current     | I <sub>S</sub>                   | MOSFET symbol showing the integral reverse p - n junction diode<br> |                                                                                      | -    | -     | 20   | A    |
| Pulsed Diode Forward Current <sup>a</sup> | I <sub>SM</sub>                  |                                                                                                                                                         |                                                                                      | -    | -     | 72   |      |
| Body Diode Voltage                        | V <sub>SD</sub>                  | T <sub>J</sub> = 25 °C, I <sub>S</sub> = 20 A, V <sub>GS</sub> = 0 V <sup>b</sup>                                                                       |                                                                                      | -    | -     | 2.0  | V    |
| Body Diode Reverse Recovery Time          | t <sub>rr</sub>                  | T <sub>J</sub> = 25 °C, I <sub>F</sub> = 20 A, dI/dt = 100 A/μs <sup>b, c</sup>                                                                         |                                                                                      | -    | 300   | 610  | ns   |
| Body Diode Reverse Recovery Charge        | Q <sub>rr</sub>                  |                                                                                                                                                         |                                                                                      | -    | 3.4   | 7.1  | μC   |
| Forward Turn-On Time                      | t <sub>on</sub>                  | Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> and L <sub>D</sub> )                                                       |                                                                                      |      |       |      |      |

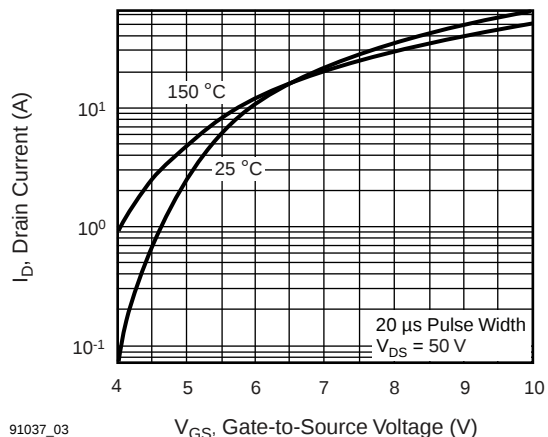
**Notes**

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).  
 b. Pulse width  $\leq 300\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$ .  
 c. Uses IRF640/SiHF640 data and test conditions.

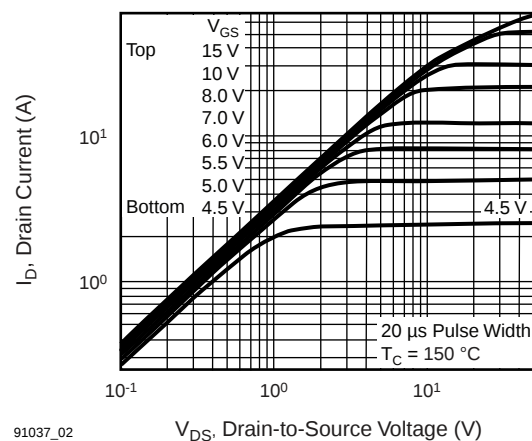
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



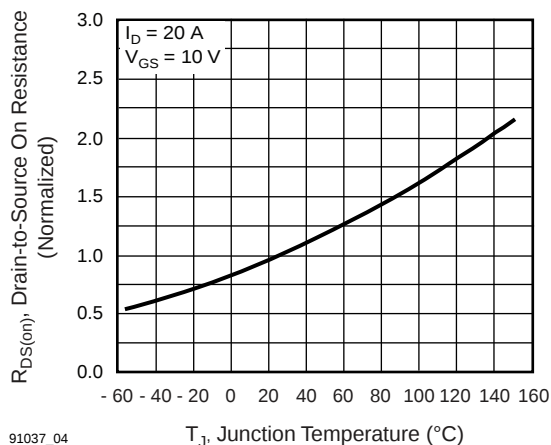
**Fig. 1 - Typical Output Characteristics,  $T_J = 25\text{ °C}$**



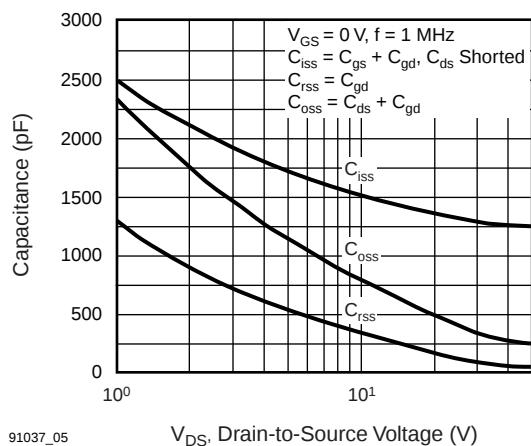
**Fig. 3 - Typical Transfer Characteristics**



**Fig. 2 - Typical Output Characteristics,  $T_J = 175\text{ °C}$**

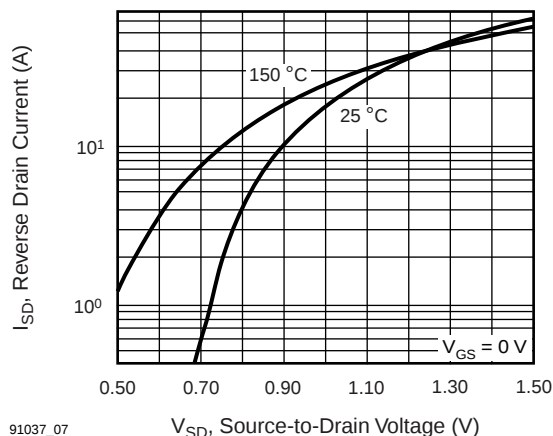


**Fig. 4 - Normalized On-Resistance vs. Temperature**



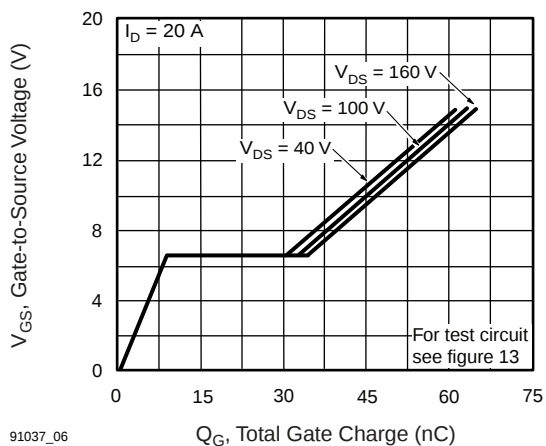
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Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



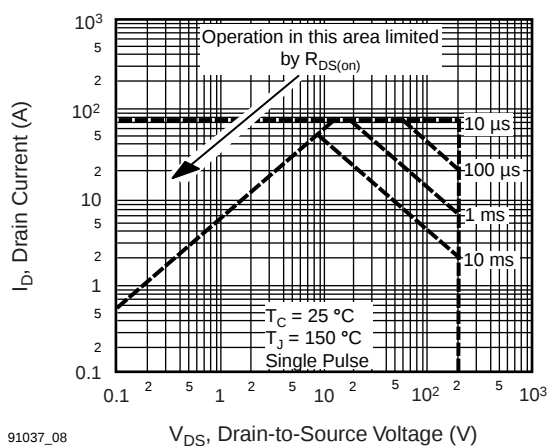
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Fig. 7 - Typical Source-Drain Diode Forward Voltage



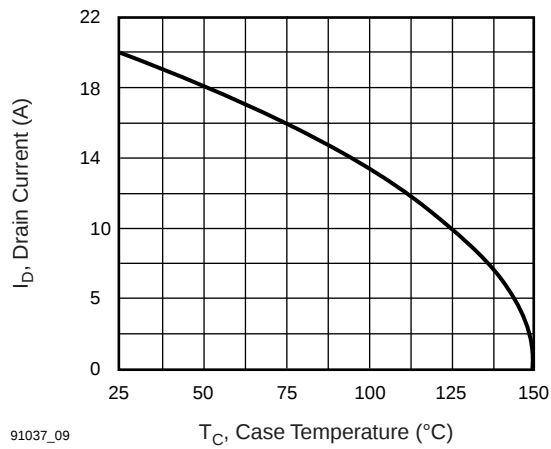
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Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

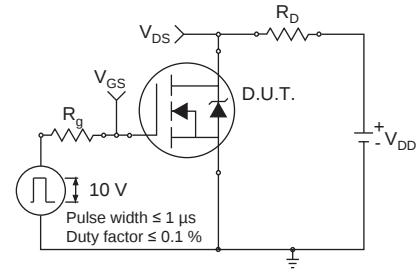


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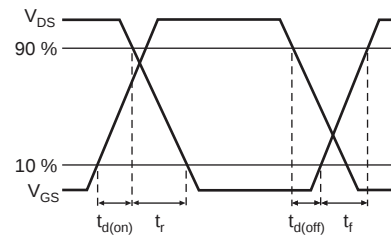
Fig. 8 - Maximum Safe Operating Area



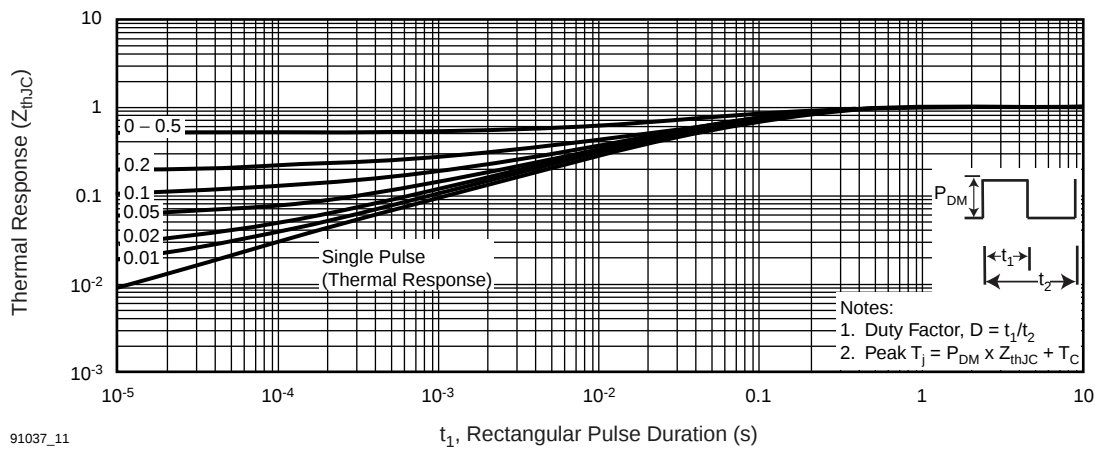
**Fig. 9 - Maximum Drain Current vs. Case Temperature**



**Fig. 10a - Switching Time Test Circuit**



**Fig. 10b - Switching Time Waveforms**



**Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**

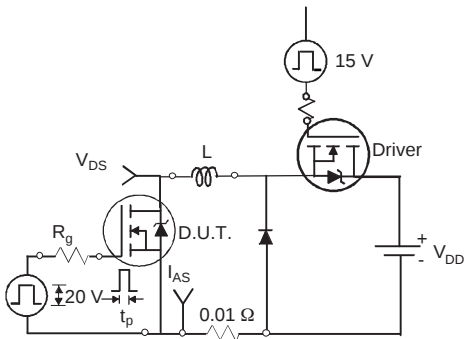


Fig. 12a - Unclamped Inductive Test Circuit

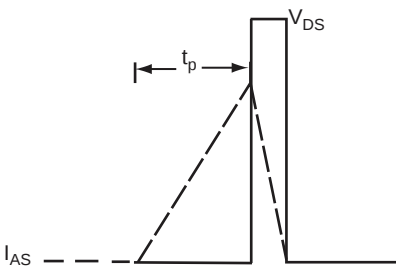


Fig. 12b - Unclamped Inductive Waveforms

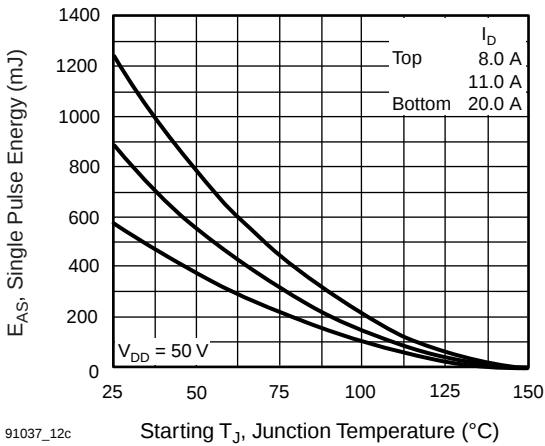


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

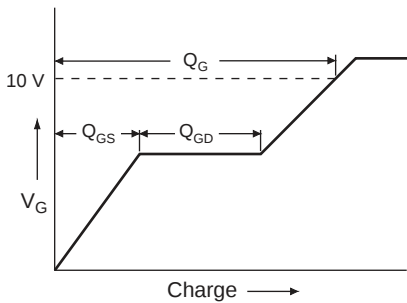


Fig. 13a - Basic Gate Charge Waveform

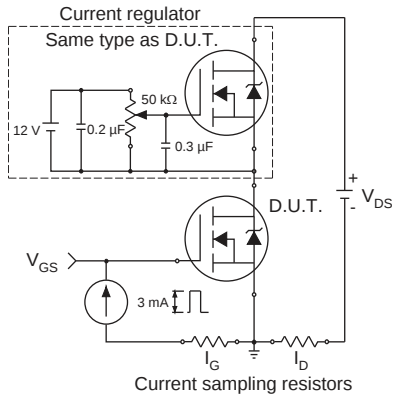
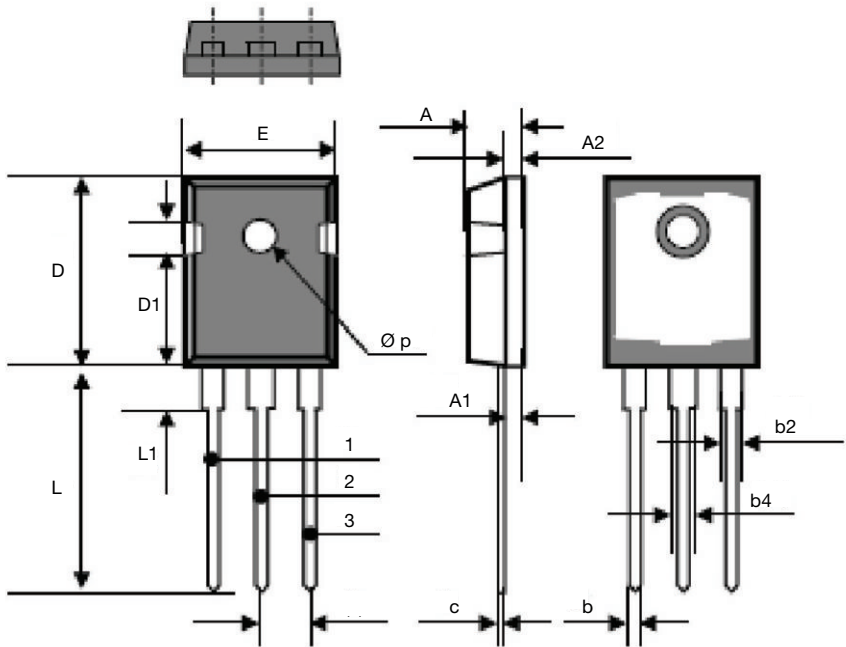


Fig. 13b - Gate Charge Test Circuit

# TO-247



| DIM.            | MILLIMETERS |       | INCHES    |       |
|-----------------|-------------|-------|-----------|-------|
|                 | MIN.        | MAX.  | MIN.      | MAX.  |
| A               | 4.70        | 5.31  | 0.185     | 0.209 |
| A1              | 2.21        | 2.59  | 0.087     | 0.102 |
| A2              | 1.50        | 2.49  | 0.059     | 0.098 |
| b               | 0.99        | 1.40  | 0.039     | 0.055 |
| b2              | 1.65        | 2.41  | 0.065     | 0.095 |
| b4              | 2.59        | 3.43  | 0.102     | 0.135 |
| c               | 0.61 BSC    |       | 0.024 BSC |       |
| D               | 20.80       | 21.46 | 0.819     | 0.845 |
| D1              | 3.68        | 5.49  | 0.145     | 0.216 |
| (e)             | 5.46 BSC    |       | 0.215 BSC |       |
| E               | 15.49       | 16.26 | 0.610     | 0.640 |
| L               | 19.81       | 20.32 | 0.780     | 0.800 |
| L1              | 4.06        | 4.50  | 0.160     | 0.177 |
| $\varnothing p$ | 3.51        | 3.66  | 0.138     | 0.144 |

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