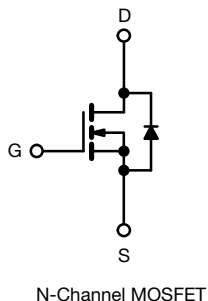
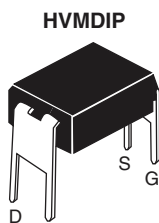


## Power MOSFET



### FEATURES

- Dynamic dV/dt rating
- Repetitive avalanche rated
- For automatic insertion
- End stackable
- Logic-level gate drive
- $R_{DS(on)}$  specified at  $V_{GS} = 4\text{ V}$  and  $5\text{ V}$
- $175\text{ }^{\circ}\text{C}$  operating temperature
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### PRODUCT SUMMARY

|                           |                       |      |
|---------------------------|-----------------------|------|
| $V_{DS}$ (V)              | 100                   |      |
| $R_{DS(on)}$ ( $\Omega$ ) | $V_{GS} = 5\text{ V}$ | 0.54 |
| $Q_g$ (Max.) (nC)         | 6.1                   |      |
| $Q_{gs}$ (nC)             | 2.6                   |      |
| $Q_{gd}$ (nC)             | 3.3                   |      |
| Configuration             | Single                |      |

### DESCRIPTION

Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The 4 pin DIP package is a low cost machine-insertable case style which can be stacked in multiple combinations on standard 0.1" pin centers. The dual drain serves as a thermal link to the mounting surface for power dissipation levels up to 1 W.

### ORDERING INFORMATION

|                |            |
|----------------|------------|
| Package        | HVMDIP     |
| Lead (Pb)-free | IRLD110PbF |

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

| PARAMETER                                                  | SYMBOL         | LIMIT                               | UNIT                  |
|------------------------------------------------------------|----------------|-------------------------------------|-----------------------|
| Drain-source voltage                                       | $V_{DS}$       | 100                                 | V                     |
| Gate-source voltage                                        | $V_{GS}$       | $\pm 10$                            |                       |
| Continuous drain current                                   | $I_D$          | $T_A = 25\text{ }^{\circ}\text{C}$  | A                     |
|                                                            |                | $T_A = 100\text{ }^{\circ}\text{C}$ |                       |
| Pulsed drain current <sup>a</sup>                          | $I_{DM}$       | 8                                   | W/ $^{\circ}\text{C}$ |
| Linear derating factor                                     |                | 0.0083                              |                       |
| Single pulse avalanche energy <sup>b</sup>                 | $E_{AS}$       | 100                                 | mJ                    |
| Repetitive avalanche current <sup>a</sup>                  | $I_{AR}$       | 1                                   | A                     |
| Repetitive avalanche energy <sup>a</sup>                   | $E_{AR}$       | 0.13                                | mJ                    |
| Maximum power dissipation                                  | $P_D$          | 1.3                                 | W                     |
| Peak diode recovery dv/dt <sup>c</sup>                     | dV/dt          | 5.5                                 | V/ns                  |
| Operating junction and storage temperature range           | $T_J, T_{stg}$ | - 55 to + 175                       | $^{\circ}\text{C}$    |
| Soldering rRecommendations (peak temperature) <sup>d</sup> | For 10 s       | 300 <sup>d</sup>                    |                       |

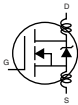
#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- $V_{DD} = 25\text{ V}$ , starting  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $L = 6.4\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 5.6\text{ A}$  (see fig. 12)
- $I_{SD} \leq 5.6\text{ A}$ ,  $dI/dt \leq 75\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 175\text{ }^{\circ}\text{C}$
- 1.6 mm from case

**THERMAL RESISTANCE RATINGS**

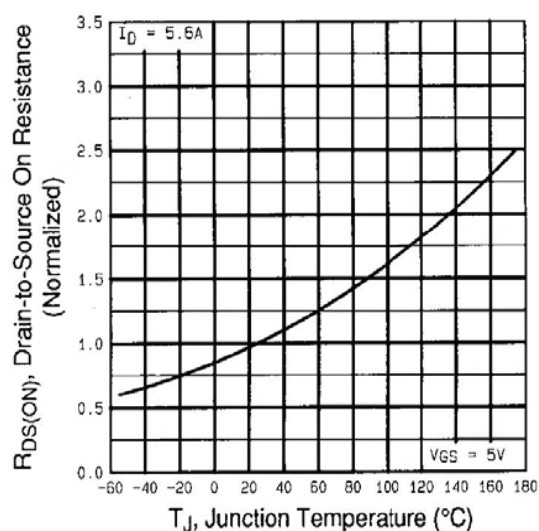
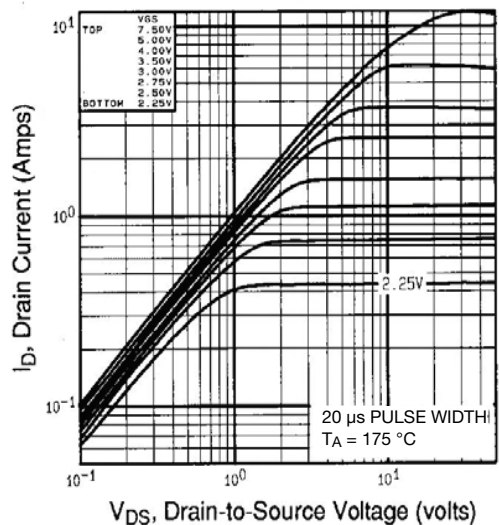
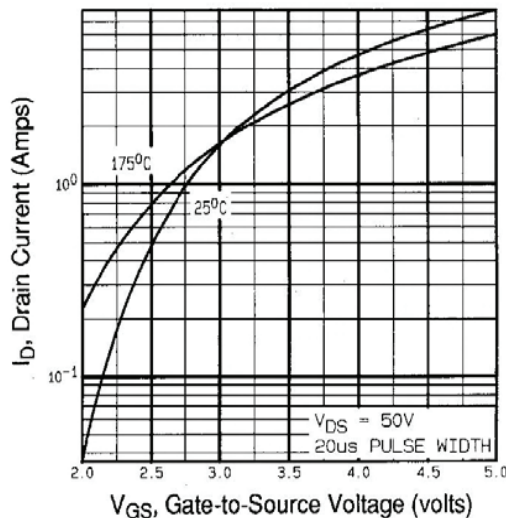
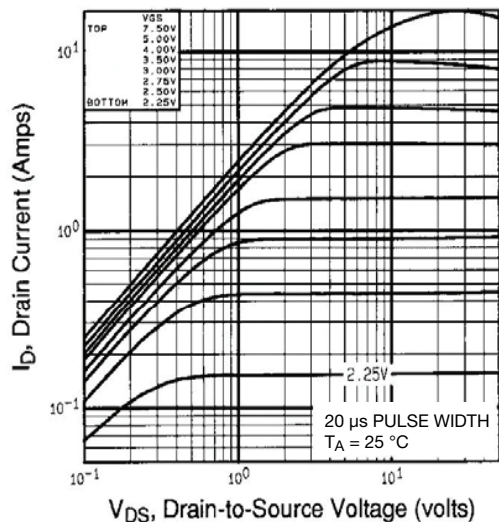
| PARAMETER                   | SYMBOL     | TYP. | MAX. | UNIT |
|-----------------------------|------------|------|------|------|
| Maximum Junction-to-Ambient | $R_{thJA}$ | -    | 120  | °C/W |

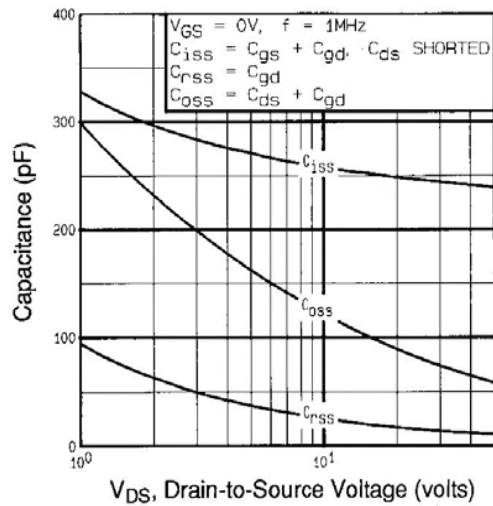
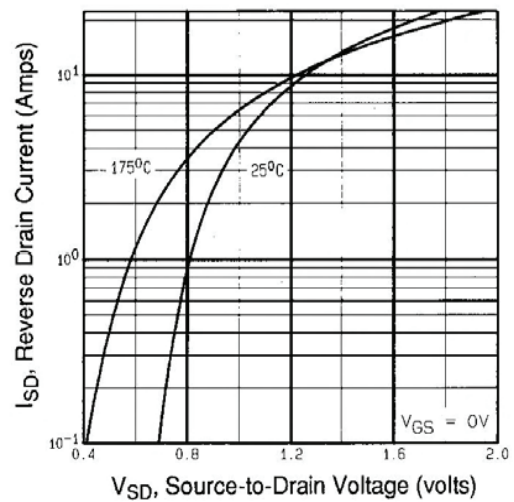
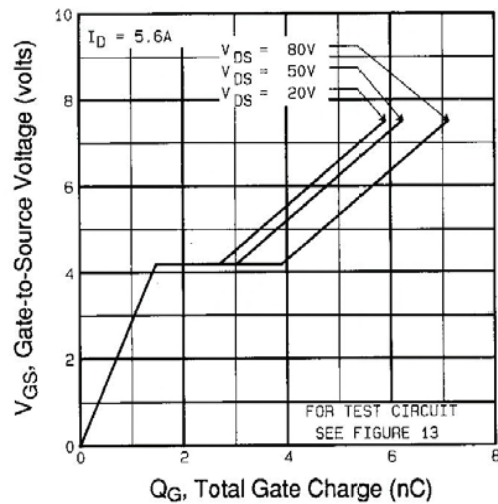
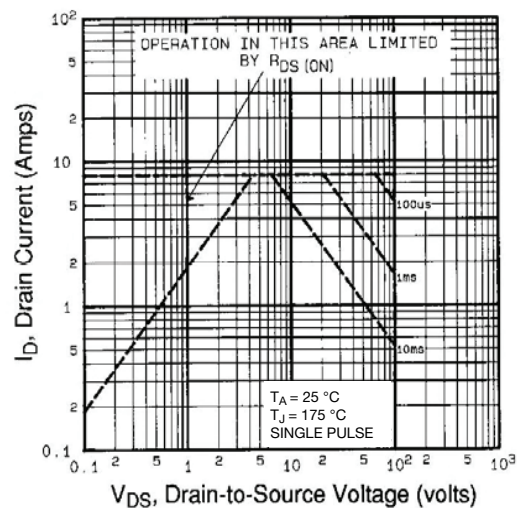
**SPECIFICATIONS** ( $T_J = 25\text{ °C}$ , unless otherwise noted)

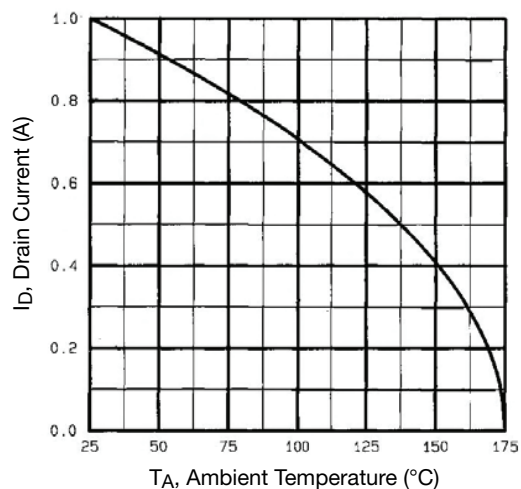
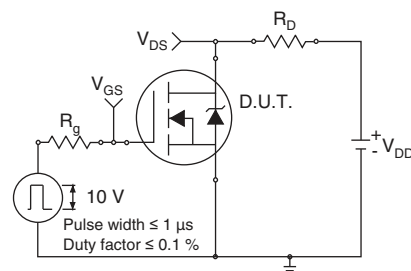
| PARAMETER                                 | SYMBOL              | TEST CONDITIONS                                                                                                                                                     |                                                                                   | MIN. | TYP. | MAX.      | UNIT                |
|-------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|------|-----------|---------------------|
| Static                                    |                     |                                                                                                                                                                     |                                                                                   |      |      |           |                     |
| Drain-Source Breakdown Voltage            | $V_{DS}$            | $V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$                                                                                                              |                                                                                   | 100  | -    | -         | V                   |
| $V_{DS}$ Temperature Coefficient          | $\Delta V_{DS}/T_J$ | Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$                                                                                                       |                                                                                   | -    | 0.12 | -         | V/ $^\circ\text{C}$ |
| Gate-Source Threshold Voltage             | $V_{GS(th)}$        | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                                                                                                  |                                                                                   | 1    | -    | 2         | V                   |
| Gate-Source Leakage                       | $I_{GSS}$           | $V_{GS} = \pm 10\text{ V}$                                                                                                                                          |                                                                                   | -    | -    | $\pm 100$ | nA                  |
| Zero Gate Voltage Drain Current           | $I_{DSS}$           | $V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                                                     |                                                                                   | -    | -    | 25        | $\mu\text{A}$       |
|                                           |                     | $V_{DS} = 80\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$                                                                                  |                                                                                   | -    | -    | 250       |                     |
| Drain-Source On-State Resistance          | $R_{DS(on)}$        | $V_{GS} = 5\text{ V}$                                                                                                                                               | $I_D = 0.60\text{ A}^b$                                                           | -    | -    | 0.54      | $\Omega$            |
|                                           |                     | $V_{GS} = 4\text{ V}$                                                                                                                                               | $I_D = 0.50\text{ A}^b$                                                           | -    | -    | 0.76      |                     |
| Forward Transconductance                  | $g_{fs}$            | $V_{DS} = 50\text{ V}$ , $I_D = 0.60\text{ A}^b$                                                                                                                    |                                                                                   | 1.3  | -    | -         | S                   |
| Dynamic                                   |                     |                                                                                                                                                                     |                                                                                   |      |      |           |                     |
| Input Capacitance                         | $C_{iss}$           | $V_{GS} = 0\text{ V}$ ,<br>$V_{DS} = 25\text{ V}$ ,<br>$f = 1\text{ MHz}$ , see fig. 5                                                                              |                                                                                   | -    | 250  | -         | pF                  |
| Output Capacitance                        | $C_{oss}$           |                                                                                                                                                                     |                                                                                   | -    | 80   | -         |                     |
| Reverse Transfer Capacitance              | $C_{rss}$           |                                                                                                                                                                     |                                                                                   | -    | 15   | -         |                     |
| Total Gate Charge                         | $Q_g$               | $V_{GS} = 5\text{ V}$                                                                                                                                               | $I_D = 5.6\text{ A}$ , $V_{DS} = 80\text{ V}$ ,<br>see fig. 6 and 13 <sup>b</sup> | -    | -    | 6.1       | nC                  |
| Gate-Source Charge                        | $Q_{gs}$            |                                                                                                                                                                     |                                                                                   | -    | -    | 2.6       |                     |
| Gate-Drain Charge                         | $Q_{gd}$            |                                                                                                                                                                     |                                                                                   | -    | -    | 3.3       |                     |
| Turn-On Delay Time                        | $t_{d(on)}$         | $V_{DD} = 50\text{ V}$ , $I_D = 5.6\text{ A}$ ,<br>$R_g = 12\text{ }\Omega$ , $R_D = 8.4\text{ }\Omega$ , see fig. 10 <sup>b</sup>                                  |                                                                                   | -    | 9.3  | -         | ns                  |
| Rise Time                                 | $t_r$               |                                                                                                                                                                     |                                                                                   | -    | 4.7  | -         |                     |
| Turn-Off Delay Time                       | $t_{d(off)}$        |                                                                                                                                                                     |                                                                                   | -    | 16   | -         |                     |
| Fall Time                                 | $t_f$               |                                                                                                                                                                     |                                                                                   | -    | 17   | -         |                     |
| Internal Drain Inductance                 | $L_D$               | Between lead,<br>6 mm (0.25") from<br>package and center of<br>die contact<br> |                                                                                   | -    | 4    | -         | nH                  |
| Internal Source Inductance                | $L_S$               |                                                                                                                                                                     |                                                                                   | -    | 6    | -         |                     |
| Drain-Source Body Diode Characteristics   |                     |                                                                                                                                                                     |                                                                                   |      |      |           |                     |
| Continuous Source-Drain Diode Current     | $I_S$               | MOSFET symbol<br>showing the<br>integral reverse<br>p - n junction diode<br>   |                                                                                   | -    | -    | 1         | A                   |
| Pulsed Diode Forward Current <sup>a</sup> | $I_{SM}$            |                                                                                                                                                                     |                                                                                   | -    | -    | 8         |                     |
| Body Diode Voltage                        | $V_{SD}$            | $T_J = 25\text{ }^\circ\text{C}$ , $I_S = 1\text{ A}$ , $V_{GS} = 0\text{ V}^b$                                                                                     |                                                                                   | -    | -    | 2.5       | V                   |
| Body Diode Reverse Recovery Time          | $t_{rr}$            | $T_J = 25\text{ }^\circ\text{C}$ , $I_F = 5.6\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}^b$                                                                      |                                                                                   | -    | 110  | 130       | ns                  |
| Body Diode Reverse Recovery Charge        | $Q_{rr}$            |                                                                                                                                                                     |                                                                                   | -    | 0.50 | 0.65      | $\mu\text{C}$       |
| Forward Turn-On Time                      | $t_{on}$            | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )                                                                                     |                                                                                   |      |      |           |                     |

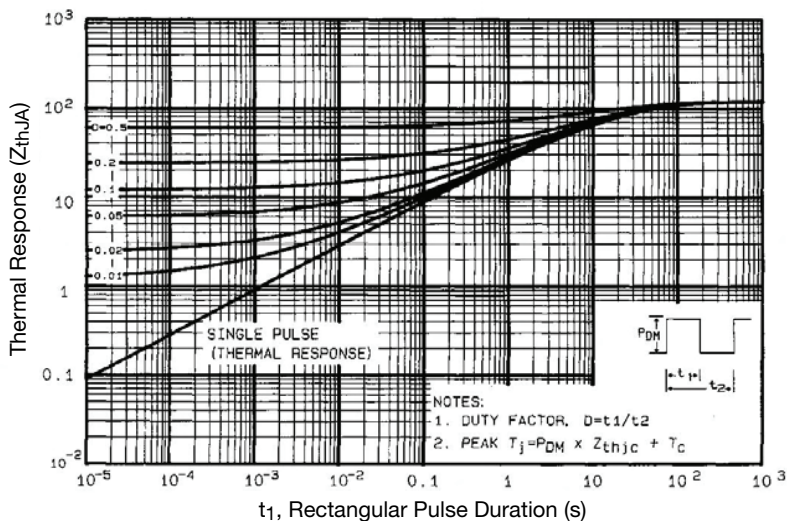
**Notes**

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)  
b. Pulse width  $\leq 300\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$

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



**Fig. 4 - Typical Capacitance vs. Drain-to-Source Voltage**

**Fig. 6 - Typical Source-Drain Diode Forward Voltage**

**Fig. 5 - Typical Gate Charge vs. Gate-to-Source Voltage**

**Fig. 7 - Maximum Safe Operating Area**


**Fig. 8 - Maximum Drain Current vs. Ambient Temperature**

**Fig. 9 - Switching Time Test Circuit**

**Fig. 10 - Switching Time Waveforms**

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

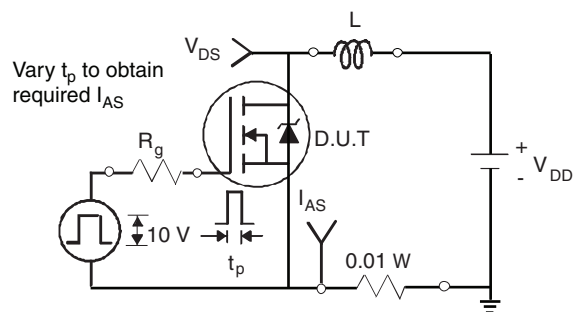


Fig. 12 - Unclamped Inductive Test Circuit

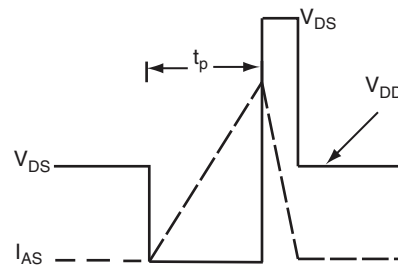


Fig. 13 - Unclamped Inductive Waveforms

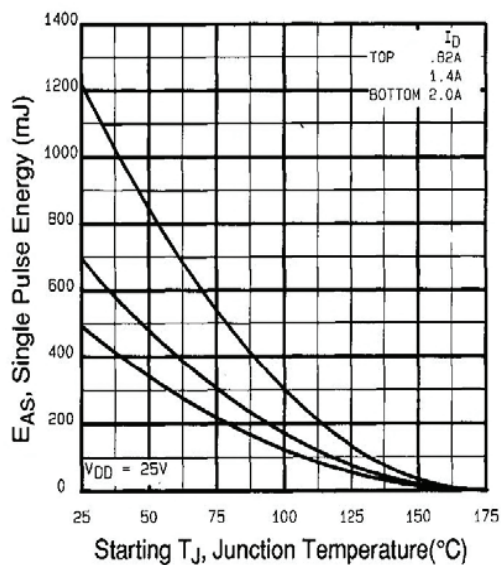


Fig. 14 - Maximum Avalanche Energy vs. Drain Current

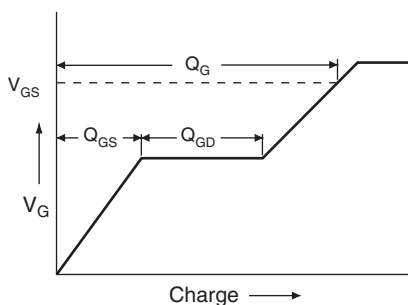


Fig. 15 - Basic Gate Charge Waveform

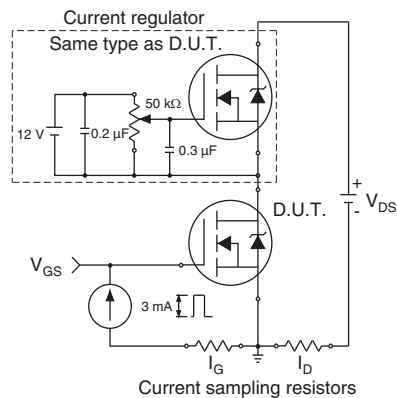
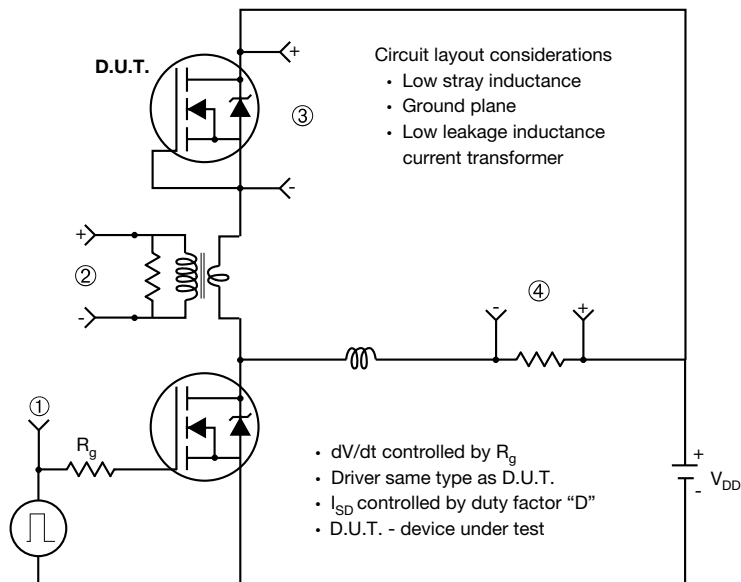


Fig. 16 - Gate Charge Test Circuit

## Peak Diode Recovery dV/dt Test Circuit



### Note

a.  $V_{GS} = 5\text{ V}$  for logic level devices

**Fig. 17 - For N-Channel**

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## HVM DIP (High voltage)



| DIM. | INCHES |       | MILLIMETERS |       |
|------|--------|-------|-------------|-------|
|      | MIN.   | MAX.  | MIN.        | MAX.  |
| A    | 0.310  | 0.330 | 7.87        | 8.38  |
| E    | 0.300  | 0.425 | 7.62        | 10.79 |
| L    | 0.270  | 0.290 | 6.86        | 7.36  |

ECN: X10-0386-Rev. B, 06-Sep-10  
DWG: 5974

### Note

- Package length does not include mold flash, protrusions or gate burrs. Package width does not include interlead flash or protrusions.



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