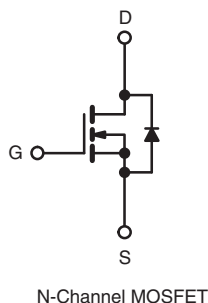
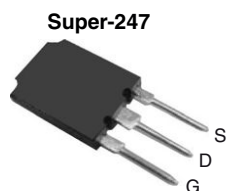


## D Series Power MOSFET

### PRODUCT SUMMARY

|                                         |                 |       |
|-----------------------------------------|-----------------|-------|
| $V_{DS}$ (V) at $T_J$ max.              | 550             |       |
| $R_{DS(on)}$ max. at 25 °C ( $\Omega$ ) | $V_{GS} = 10$ V | 0.130 |
| $Q_g$ max. (nC)                         | 125             |       |
| $Q_{gs}$ (nC)                           | 23              |       |
| $Q_{gd}$ (nC)                           | 37              |       |
| Configuration                           | Single          |       |



### FEATURES

- Optimal Design
  - Low Area specific On-Resistance
  - Low Input Capacitance ( $C_{iss}$ )
  - Reduced Capacitive Switching Losses
  - High Body Diode Ruggedness
  - Avalanche Energy Rated ( $U_{IS}$ )
- Optimal Efficiency and Operation
  - Low Cost
  - Simple Gate Drive Circuitry
  - Low Figure-Of-Merit (FOM):  $R_{on} \times Q_g$
  - Fast Switching
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### APPLICATIONS

- Consumer Electronics
  - Displays (LCD or Plasma TV)
- Server and Telecom Power Supplies
  - SMPS
- Industrial
  - Welding, Induction Heating, Motor Drives
- Battery Chargers

### ORDERING INFORMATION

|                |               |
|----------------|---------------|
| Package        | Super-247     |
| Lead (Pb)-free | SiHS36N50D-E3 |

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)

| PARAMETER                                        | SYMBOL           | LIMIT          | UNIT |
|--------------------------------------------------|------------------|----------------|------|
| Drain-Source Voltage                             | $V_{DS}$         | 500            | V    |
| Gate-Source Voltage                              | $V_{GS}$         | $\pm 30$       |      |
| Gate-Source Voltage AC ( $f > 1$ Hz)             |                  | 30             |      |
| Continuous Drain Current ( $T_J = 150$ °C)       | $V_{GS}$ at 10 V | $T_C = 25$ °C  | A    |
|                                                  |                  | $T_C = 100$ °C |      |
| Pulsed Drain Current <sup>a</sup>                | $I_{DM}$         | 112            |      |
| Linear Derating Factor                           |                  | 3.6            | W/°C |
| Single Pulse Avalanche Energy <sup>b</sup>       | $E_{AS}$         | 332            | mJ   |
| Maximum Power Dissipation                        | $P_D$            | 446            | W    |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$   | - 55 to + 150  | °C   |
| Drain-Source Voltage Slope                       | $dV/dt$          | 24             | V/ns |
| Reverse Diode $dV/dt$ <sup>d</sup>               |                  | 0.1            |      |
| Soldering Recommendations (Peak Temperature)     | for 10 s         | 300°           | °C   |

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$  V, starting  $T_J = 25$  °C,  $L = 2.3$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 17$  A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$ , starting  $T_J = 25$  °C.

**THERMAL RESISTANCE RATINGS**

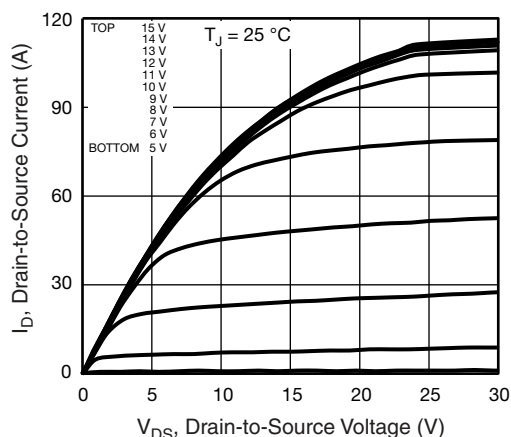
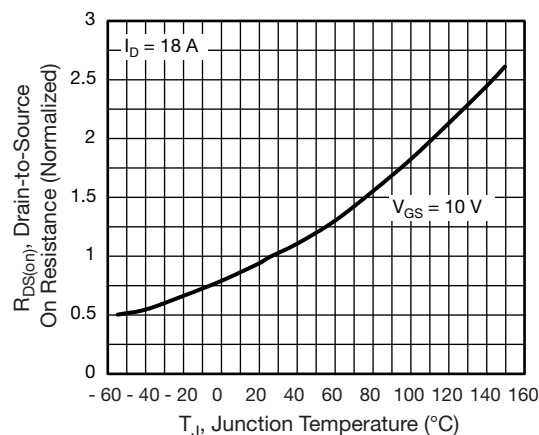
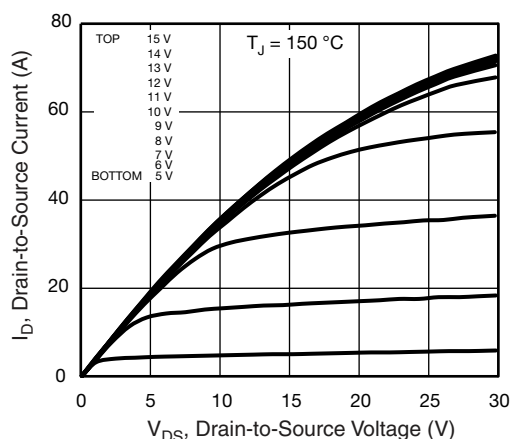
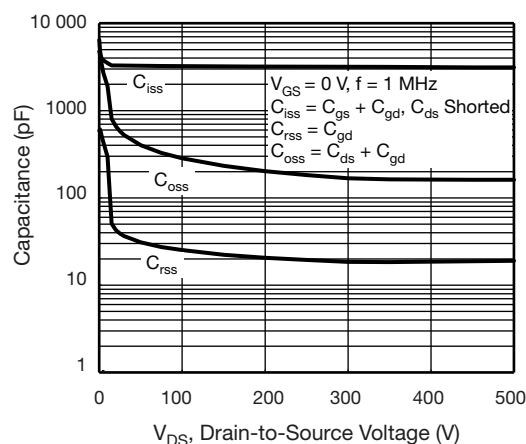
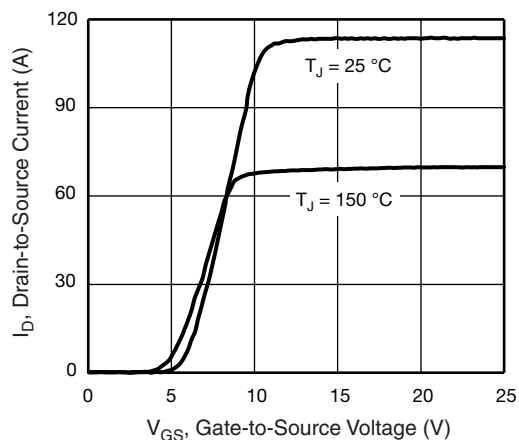
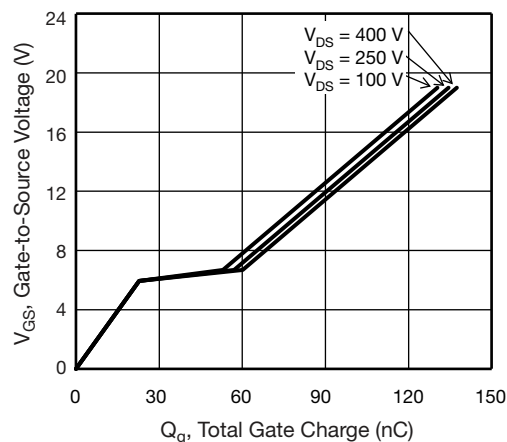
| PARAMETER                        | SYMBOL     | TYP. | MAX. | UNIT |
|----------------------------------|------------|------|------|------|
| Maximum Junction-to-Ambient      | $R_{thJA}$ | -    | 40   | °C/W |
| Maximum Junction-to-Case (Drain) | $R_{thJC}$ | -    | 0.28 |      |

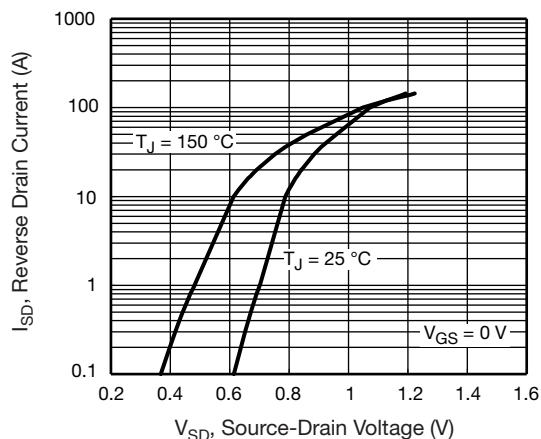
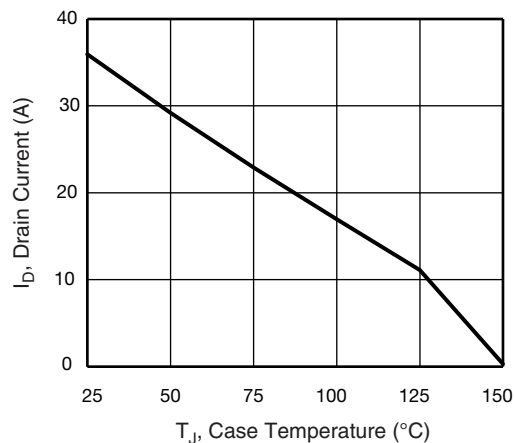
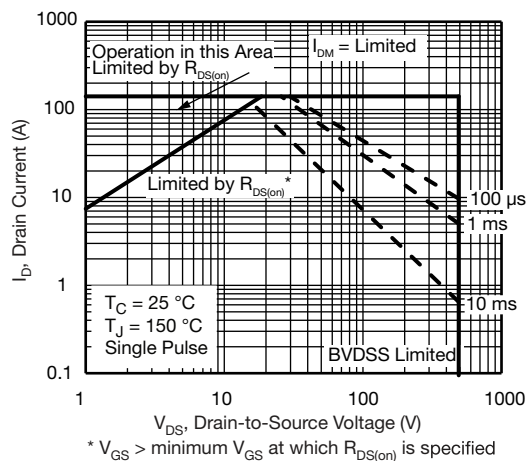
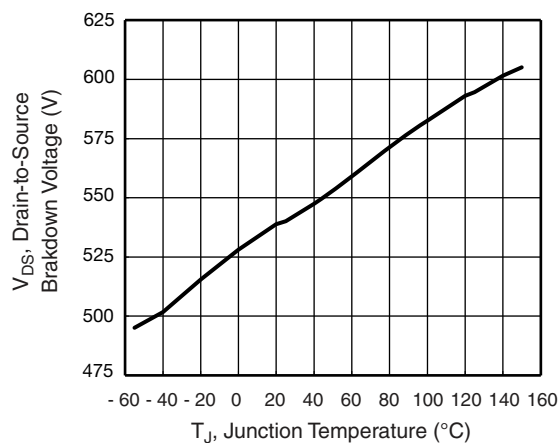
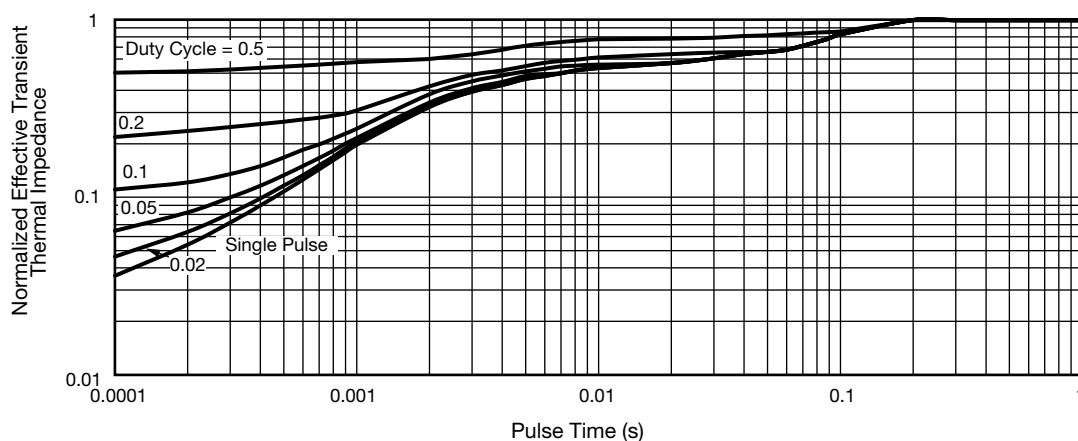
**SPECIFICATIONS** ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

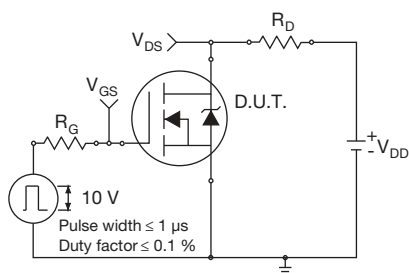
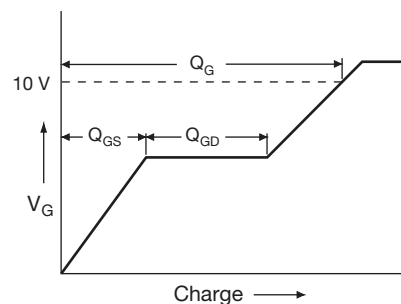
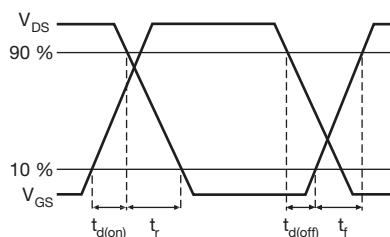
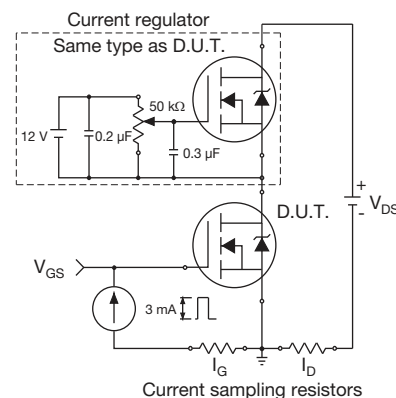
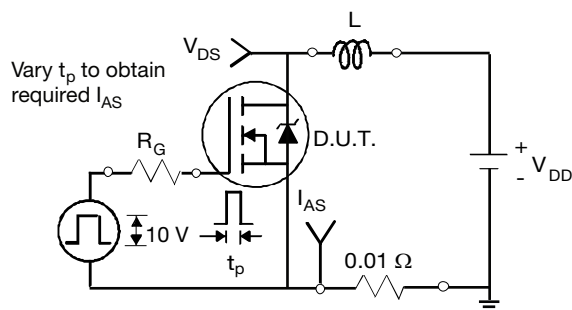
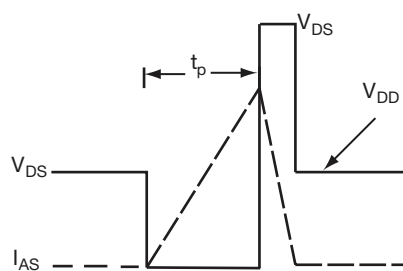
| PARAMETER                                                 | SYMBOL                           | TEST CONDITIONS                                                                                                                                          |                                                | 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                                                                                                           |                                                | 500  | -     | -     | V    |
| V <sub>DS</sub> Temperature Coefficient                   | ΔV <sub>DS</sub> /T <sub>J</sub> | Reference to 25 °C, I <sub>D</sub> = 250 μA                                                                                                              |                                                | -    | 0.52  | -     | V/°C |
| Gate Threshold Voltage (N)                                | V <sub>GS(th)</sub>              | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                                                                              |                                                | 3.0  | -     | 5.0   | V    |
| Gate-Source Leakage                                       | I <sub>GSS</sub>                 | V <sub>GS</sub> = ± 30 V                                                                                                                                 |                                                | -    | -     | ± 100 | nA   |
| Zero Gate Voltage Drain Current                           | I <sub>DSS</sub>                 | V <sub>DS</sub> = 500 V, V <sub>GS</sub> = 0 V                                                                                                           |                                                | -    | -     | 1     | μA   |
|                                                           |                                  | V <sub>DS</sub> = 400 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C                                                                                  |                                                | -    | -     | 10    |      |
| Drain-Source On-State Resistance                          | R <sub>DS(on)</sub>              | V <sub>GS</sub> = 10 V                                                                                                                                   | I <sub>D</sub> = 18 A                          | -    | 0.105 | 0.130 | Ω    |
| Forward Transconductance <sup>a</sup>                     | g <sub>fs</sub>                  | V <sub>DS</sub> = 50 V, I <sub>D</sub> = 18 A                                                                                                            |                                                | -    | 12.8  | -     | S    |
| Dynamic                                                   |                                  |                                                                                                                                                          |                                                |      |       |       |      |
| Input Capacitance                                         | C <sub>iss</sub>                 | V <sub>GS</sub> = 0 V,<br>V <sub>DS</sub> = 100 V,<br>f = 1 MHz                                                                                          |                                                | -    | 3233  | -     | pF   |
| Output Capacitance                                        | C <sub>oss</sub>                 |                                                                                                                                                          |                                                | -    | 285   | -     |      |
| Reverse Transfer Capacitance                              | C <sub>rss</sub>                 |                                                                                                                                                          |                                                | -    | 25    | -     |      |
| Effective Output Capacitance, Energy Related <sup>a</sup> | C <sub>o(er)</sub>               | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 0 V to 400 V                                                                                                    |                                                | -    | 240   | -     |      |
| Effective Output Capacitance, Time Related <sup>b</sup>   | C <sub>o(tr)</sub>               |                                                                                                                                                          |                                                | -    | 352   | -     |      |
| Total Gate Charge                                         | Q <sub>g</sub>                   | V <sub>GS</sub> = 10 V                                                                                                                                   | I <sub>D</sub> = 18 A, V <sub>DS</sub> = 400 V | -    | 83    | 125   | nC   |
| Gate-Source Charge                                        | Q <sub>gs</sub>                  |                                                                                                                                                          |                                                | -    | 23    | -     |      |
| Gate-Drain Charge                                         | Q <sub>gd</sub>                  |                                                                                                                                                          |                                                | -    | 37    | -     |      |
| Turn-On Delay Time                                        | t <sub>d(on)</sub>               | V <sub>DD</sub> = 400 V, I <sub>D</sub> = 18 A,<br>V <sub>GS</sub> = 10 V, R <sub>g</sub> = 9.1 Ω                                                        |                                                | -    | 33    | 66    | ns   |
| Rise Time                                                 | t <sub>r</sub>                   |                                                                                                                                                          |                                                | -    | 89    | 134   |      |
| Turn-Off Delay Time                                       | t <sub>d(off)</sub>              |                                                                                                                                                          |                                                | -    | 79    | 119   |      |
| Fall Time                                                 | t <sub>f</sub>                   |                                                                                                                                                          |                                                | -    | 68    | 102   |      |
| Gate Input Resistance                                     | R <sub>g</sub>                   | f = 1 MHz, open drain                                                                                                                                    |                                                | -    | 1.8   | -     | Ω    |
| 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> |                                                | -    | -     | 36    | A    |
| Pulsed Diode Forward Current                              | I <sub>SM</sub>                  |                                                                                                                                                          |                                                | -    | -     | 144   |      |
| Diode Forward Voltage                                     | V <sub>SD</sub>                  | T <sub>J</sub> = 25 °C, I <sub>S</sub> = 18 A, V <sub>GS</sub> = 0 V                                                                                     |                                                | -    | -     | 1.2   | V    |
| Reverse Recovery Time                                     | t <sub>rr</sub>                  | T <sub>J</sub> = 25 °C, I <sub>F</sub> = I <sub>S</sub> = 18 A,<br>dI/dt = 100 A/μs, V <sub>R</sub> = 20 V                                               |                                                | -    | 490   | -     | ns   |
| Reverse Recovery Charge                                   | Q <sub>rr</sub>                  |                                                                                                                                                          |                                                | -    | 8.2   | -     | μC   |
| Reverse Recovery Current                                  | I <sub>RRM</sub>                 |                                                                                                                                                          |                                                | -    | 31    | -     | A    |

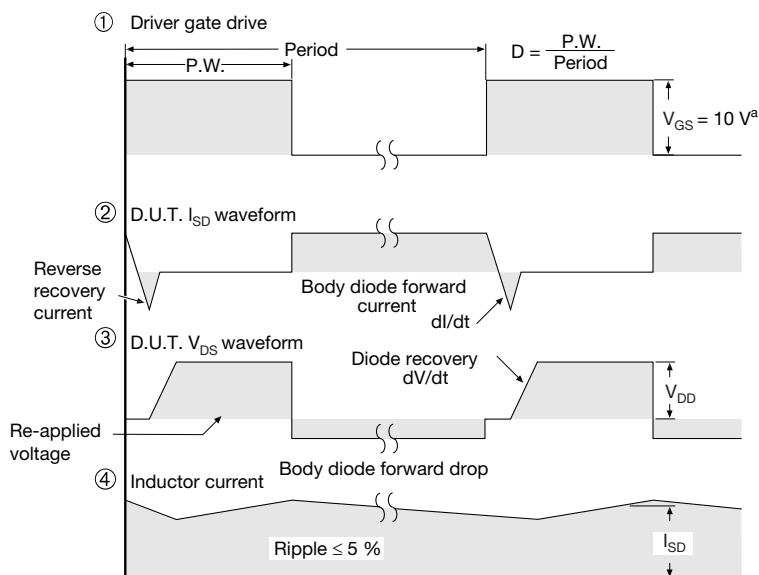
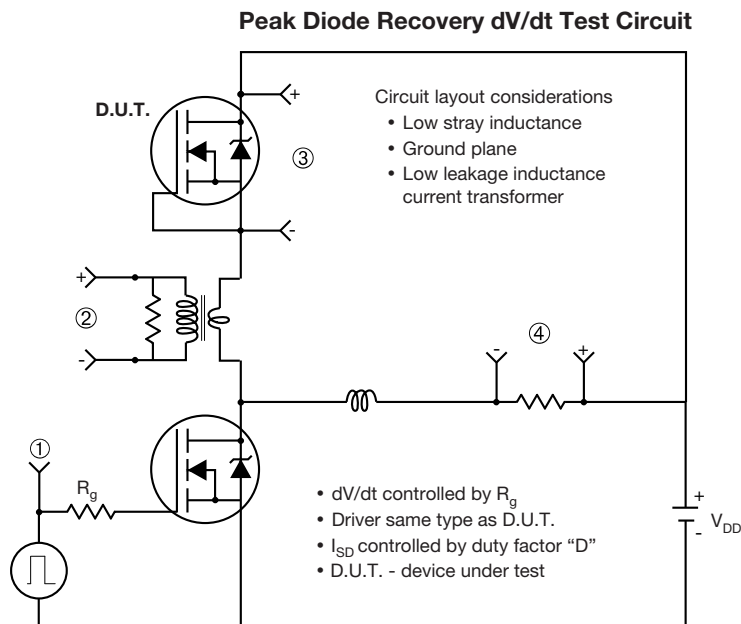
**Notes**

- a.  $C_{oss(er)}$  is a fixed capacitance that gives the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .  
b.  $C_{oss(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .

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

**Fig. 1 - Typical Output Characteristics**

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

**Fig. 2 - Typical Output Characteristics**

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

**Fig. 3 - Typical Transfer Characteristics**

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


**Fig. 7 - Typical Source-Drain Diode Forward Voltage**

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

**Fig. 8 - Maximum Safe Operating Area**

**Fig. 10 - Temperature vs. Drain-to-Source Voltage**

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


**Fig. 12 - Switching Time Test Circuit**

**Fig. 16 - Basic Gate Charge Waveform**

**Fig. 13 - Switching Time Waveforms**

**Fig. 17 - Gate Charge Test Circuit**

**Fig. 14 - Unclamped Inductive Test Circuit**

**Fig. 15 - Unclamped Inductive Waveforms**

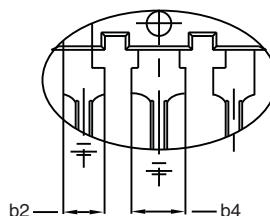
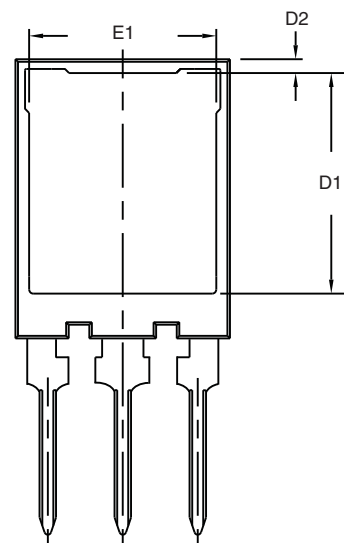
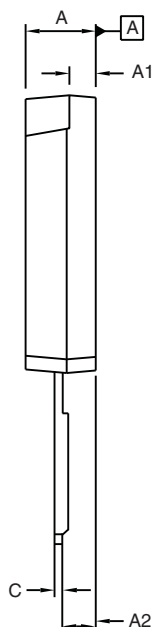
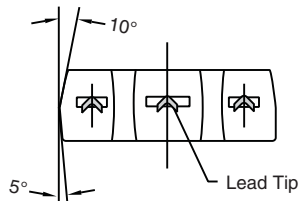
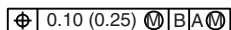
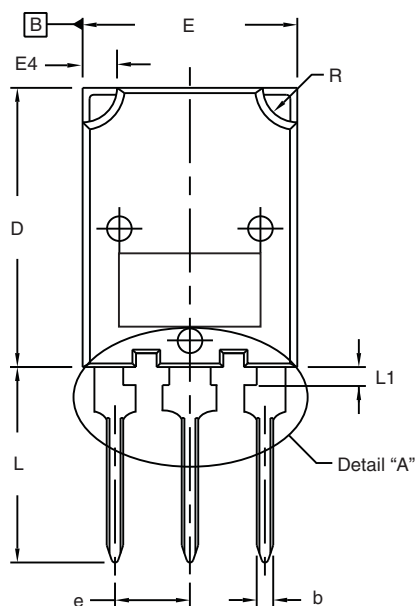

**Note**

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

**Fig. 18 - For N-Channel**

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## TO-274AA (High Voltage)



Detail "A"  
Scale: 2:1

|                  | MILLIMETERS |       | INCHES |       |
|------------------|-------------|-------|--------|-------|
| DIM.             | MIN.        | MAX.  | MIN.   | MAX.  |
| A                | 4.70        | 5.30  | 0.185  | 0.209 |
| A1               | 1.50        | 2.50  | 0.059  | 0.098 |
| A2               | 2.25        | 2.65  | 0.089  | 0.104 |
| b                | 1.30        | 1.60  | 0.051  | 0.063 |
| b2               | 1.80        | 2.20  | 0.071  | 0.087 |
| b4               | 3.00        | 3.25  | 0.118  | 0.128 |
| c <sup>(1)</sup> | 0.38        | 0.89  | 0.015  | 0.035 |
| D                | 19.80       | 20.80 | 0.780  | 0.819 |

|      | MILLIMETERS |       | INCHES    |       |
|------|-------------|-------|-----------|-------|
| DIM. | MIN.        | MAX.  | MIN.      | MAX.  |
| D1   | 15.50       | 16.10 | 0.610     | 0.634 |
| D2   | 0.70        | 1.30  | 0.028     | 0.051 |
| E    | 15.10       | 16.10 | 0.594     | 0.634 |
| E1   | 13.30       | 13.90 | 0.524     | 0.547 |
| e    | 5.45 BSC    |       | 0.215 BSC |       |
| L    | 13.70       | 14.70 | 0.539     | 0.579 |
| L1   | 1.00        | 1.60  | 0.039     | 0.063 |
| R    | 2.00        | 3.00  | 0.079     | 0.118 |

ECN: X17-0056-Rev. B, 27-Mar-17  
DWG: 5975

## Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
  - Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outer extremes of the plastic body
  - Outline conforms to JEDEC® outline to TO-274AA
- (1) Dimension measured at tip of lead



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