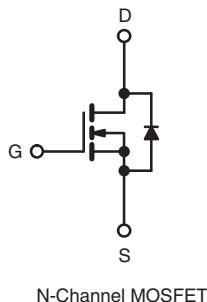
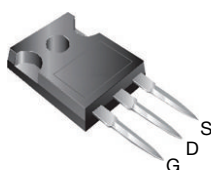


## Power MOSFET

### PRODUCT SUMMARY

|                           |                        |      |
|---------------------------|------------------------|------|
| $V_{DS}$ (V)              | 600                    |      |
| $R_{DS(on)}$ ( $\Omega$ ) | $V_{GS} = 10\text{ V}$ | 0.21 |
| $Q_g$ (Max.) (nC)         | 180                    |      |
| $Q_{gs}$ (nC)             | 61                     |      |
| $Q_{gd}$ (nC)             | 85                     |      |
| Configuration             | Single                 |      |

**TO-247AC**


### FEATURES

- Superfast body diode eliminates the need for external diodes in ZVS applications
- Lower gate charge results in simpler drive requirements
- Enhanced dV/dt capabilities offer improved ruggedness
- Higher gate voltage threshold offers improved noise immunity
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS\***  
Available

### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.

### APPLICATIONS

- Zero voltage switching (SMPS)
- Telecom and server power supplies
- Uninterruptible power supplies
- Motor control applications

### ORDERING INFORMATION

|                |                |
|----------------|----------------|
| Package        | TO-247AC       |
| Lead (Pb)-free | IRFP26N60LPbF  |
|                | SiHFP26N60L-E3 |
| SnPb           | IRFP26N60L     |
|                | SiHFP26N60L    |

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

| PARAMETER                                                 |                  |                                     | SYMBOL         | LIMIT       | UNIT                  |
|-----------------------------------------------------------|------------------|-------------------------------------|----------------|-------------|-----------------------|
| Drain-Source Voltage                                      |                  |                                     | $V_{DS}$       | 600         | V                     |
| Gate-Source Voltage                                       |                  |                                     | $V_{GS}$       | $\pm 30$    |                       |
| Continuous Drain Current                                  | $V_{GS}$ at 10 V | $T_C = 25\text{ }^{\circ}\text{C}$  | $I_D$          | 26          | A                     |
|                                                           |                  | $T_C = 100\text{ }^{\circ}\text{C}$ |                | 17          |                       |
| Pulsed Drain Current <sup>a</sup>                         |                  |                                     | $I_{DM}$       | 100         |                       |
| Linear Derating Factor                                    |                  |                                     |                | 3.8         | W/ $^{\circ}\text{C}$ |
| Single Pulse Avalanche Energy <sup>b</sup>                |                  |                                     | $E_{AS}$       | 570         | mJ                    |
| Repetitive Avalanche Current <sup>a</sup>                 |                  |                                     | $I_{AR}$       | 26          | A                     |
| Repetitive Avalanche Energy <sup>a</sup>                  |                  |                                     | $E_{AR}$       | 47          | mJ                    |
| Maximum Power Dissipation                                 |                  | $T_C = 25\text{ }^{\circ}\text{C}$  | $P_D$          | 470         | W                     |
| Peak Diode Recovery dV/dt <sup>c</sup>                    |                  |                                     | dV/dt          | 21          | V/ns                  |
| Operating Junction and Storage Temperature Range          |                  |                                     | $T_J, T_{stg}$ | -55 to +150 | $^{\circ}\text{C}$    |
| Soldering Recommendations (Peak Temperature) <sup>d</sup> |                  | for 10 s                            |                | 300         |                       |
| Mounting Torque                                           | 6-32 or M3 screw |                                     |                | 10          | lbf · in              |
|                                                           |                  |                                     |                | 1.1         | N · m                 |

### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $L = 1.7\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 26\text{ A}$ , dV/dt = 21 V/ns (see fig. 12).
- $I_{SD} \leq 26\text{ A}$ , dI/dt  $\leq 480\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150\text{ }^{\circ}\text{C}$ .
- 1.6 mm from case.

**THERMAL RESISTANCE RATINGS**

| PARAMETER                           | SYMBOL     | TYP. | MAX. | UNIT |
|-------------------------------------|------------|------|------|------|
| Maximum Junction-to-Ambient         | $R_{thJA}$ | -    | 40   | °C/W |
| Case-to-Sink, Flat, Greased Surface | $R_{thCS}$ | 0.24 | -    |      |
| Maximum Junction-to-Case (Drain)    | $R_{thJC}$ | -    | 0.27 |      |

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

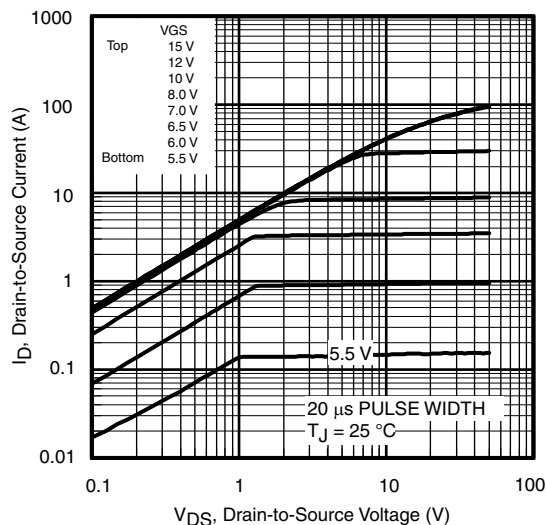
| PARAMETER                                     | SYMBOL                     | TEST CONDITIONS                                                                                                                                       |                                                                                   | MIN. | TYP. | MAX.      | UNIT                |
|-----------------------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|------|-----------|---------------------|
| Static                                        |                            |                                                                                                                                                       |                                                                                   |      |      |           |                     |
| Drain-Source Breakdown Voltage                | $V_{DS}$                   | $V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$                                                                                                |                                                                                   | 600  | -    | -         | V                   |
| $V_{DS}$ Temperature Coefficient              | $\Delta V_{DS}/T_J$        | Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$                                                                                         |                                                                                   | -    | 0.33 | -         | V/ $^\circ\text{C}$ |
| Gate-Source Threshold Voltage                 | $V_{GS(th)}$               | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                                                                                    |                                                                                   | 3.0  | -    | 5.0       | V                   |
| Gate-Source Leakage                           | $I_{GSS}$                  | $V_{GS} = \pm 30\text{ V}$                                                                                                                            |                                                                                   | -    | -    | $\pm 100$ | nA                  |
| Zero Gate Voltage Drain Current               | $I_{DSS}$                  | $V_{DS} = 600\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                                       |                                                                                   | -    | -    | 50        | $\mu\text{A}$       |
|                                               |                            | $V_{DS} = 480\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$                                                                   |                                                                                   | -    | -    | 2.0       | mA                  |
| Drain-Source On-State Resistance              | $R_{DS(on)}$               | $V_{GS} = 10\text{ V}$                                                                                                                                | $I_D = 10\text{ A}^b$                                                             | -    | 0.21 | 0.25      | $\Omega$            |
| Forward Transconductance                      | $g_{fs}$                   | $V_{DS} = 50\text{ V}$ , $I_D = 16\text{ A}$                                                                                                          |                                                                                   | 13   | -    | -         | S                   |
| Dynamic                                       |                            |                                                                                                                                                       |                                                                                   |      |      |           |                     |
| Input Capacitance                             | $C_{iss}$                  | $V_{GS} = 0\text{ V}$ ,<br>$V_{DS} = 25\text{ V}$ ,<br>$f = 1.0\text{ MHz}$ , see fig. 5                                                              |                                                                                   | -    | 5020 | -         | pF                  |
| Output Capacitance                            | $C_{oss}$                  |                                                                                                                                                       |                                                                                   | -    | 450  | -         |                     |
| Reverse Transfer Capacitance                  | $C_{rss}$                  |                                                                                                                                                       |                                                                                   | -    | 34   | -         |                     |
| Effective Output Capacitance                  | $C_{oss\text{ eff.}}$      | $V_{GS} = 0\text{ V}$                                                                                                                                 | $V_{DS} = 0\text{ V to } 480\text{ V}^c$                                          | -    | 230  | -         |                     |
| Effective Output Capacitance (Energy related) | $C_{oss\text{ eff. (ER)}}$ |                                                                                                                                                       |                                                                                   | -    | 170  | -         |                     |
| Total Gate Charge                             | $Q_g$                      | $V_{GS} = 10\text{ V}$                                                                                                                                | $I_D = 26\text{ A}$ , $V_{DS} = 480\text{ V}$ ,<br>see fig. 7 and 15 <sup>b</sup> | -    | -    | 180       | nC                  |
| Gate-Source Charge                            | $Q_{gs}$                   |                                                                                                                                                       |                                                                                   | -    | -    | 61        |                     |
| Gate-Drain Charge                             | $Q_{gd}$                   |                                                                                                                                                       |                                                                                   | -    | -    | 85        |                     |
| Turn-On Delay Time                            | $t_{d(on)}$                | $V_{DD} = 300\text{ V}$ , $I_D = 26\text{ A}$ ,<br>$R_g = 4.3\text{ }\Omega$ , $V_{GS} = 10\text{ V}$<br>see fig. 11a and 11b <sup>b</sup>            |                                                                                   | -    | 31   | -         | ns                  |
| Rise Time                                     | $t_r$                      |                                                                                                                                                       |                                                                                   | -    | 110  | -         |                     |
| Turn-Off Delay Time                           | $t_{d(off)}$               |                                                                                                                                                       |                                                                                   | -    | 47   | -         |                     |
| Fall Time                                     | $t_f$                      |                                                                                                                                                       |                                                                                   | -    | 42   | -         |                     |
| Drain-Source Body Diode Characteristics       |                            |                                                                                                                                                       |                                                                                   |      |      |           |                     |
| Continuous Source-Drain Diode Current         | $I_S$                      | MOSFET symbol showing the integral reverse p - n junction diode  |                                                                                   | -    | -    | 26        | A                   |
| Pulsed Diode Forward Current <sup>a</sup>     | $I_{SM}$                   |                                                                                                                                                       |                                                                                   | -    | -    | 100       |                     |
| Body Diode Voltage                            | $V_{SD}$                   | $T_J = 25\text{ }^\circ\text{C}$ , $I_S = 26\text{ A}$ , $V_{GS} = 0\text{ V}^b$                                                                      |                                                                                   | -    | -    | 1.5       | V                   |
| Body Diode Reverse Recovery Time              | $t_{rr}$                   | $T_J = 25\text{ }^\circ\text{C}$ , $I_F = 26\text{ A}$                                                                                                |                                                                                   | -    | 170  | 250       | ns                  |
|                                               |                            | $T_J = 125\text{ }^\circ\text{C}$ , $dI/dt = 100\text{ A}/\mu\text{s}^b$                                                                              |                                                                                   | -    | 210  | 320       |                     |
| Body Diode Reverse Recovery Charge            | $Q_{rr}$                   | $T_J = 25\text{ }^\circ\text{C}$ , $I_F = 26\text{ A}$ , $V_{GS} = 0\text{ V}^b$                                                                      |                                                                                   | -    | 670  | 1000      | nC                  |
|                                               |                            | $T_J = 125\text{ }^\circ\text{C}$ , $dI/dt = 100\text{ A}/\mu\text{s}^b$                                                                              |                                                                                   | -    | 1050 | 1570      |                     |
| Reverse Recovery Current                      | $I_{RRM}$                  | $T_J = 25\text{ }^\circ\text{C}$                                                                                                                      |                                                                                   | -    | 7.3  | 11        | A                   |
| Forward Turn-On Time                          | $t_{on}$                   | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )                                                                       |                                                                                   |      |      |           |                     |

**Notes**

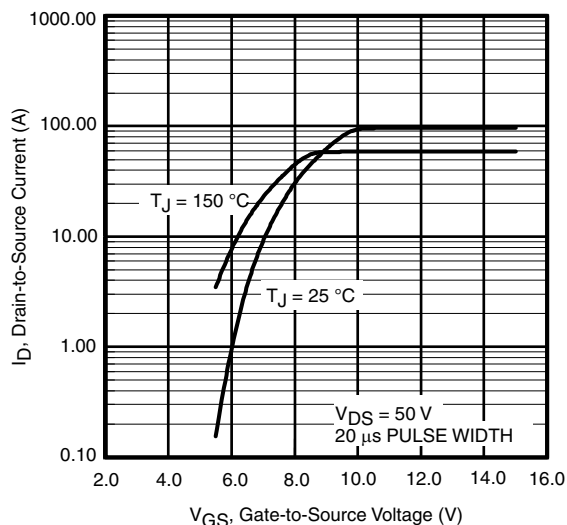
- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).  
b. Pulse width  $\leq 300\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$ .  
c.  $C_{oss\text{ eff.}}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DS}$ .  
 $C_{oss\text{ eff. (ER)}}$  is a fixed capacitance that stores the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DS}$ .



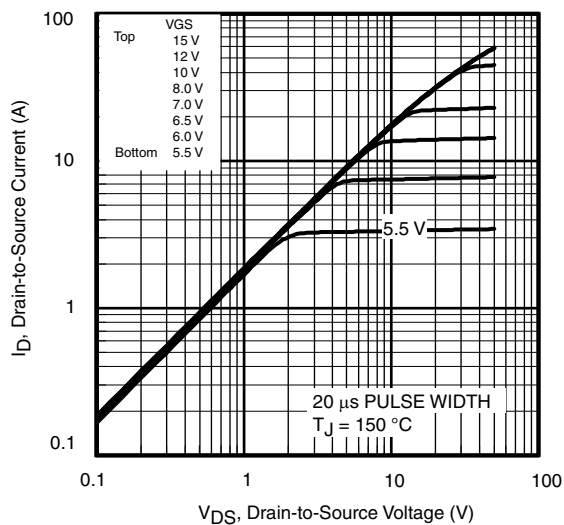
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



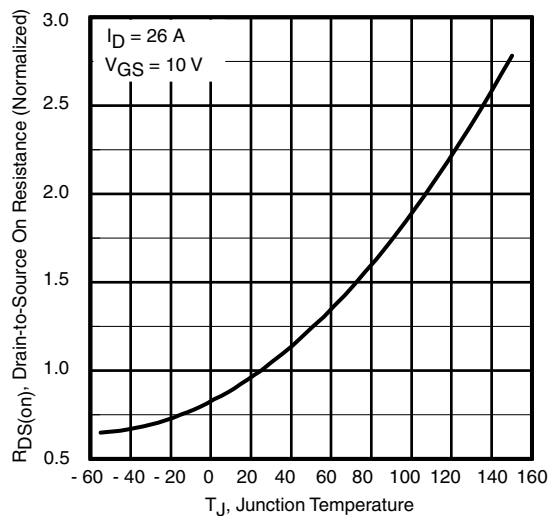
**Fig. 1 - Typical Output Characteristics**



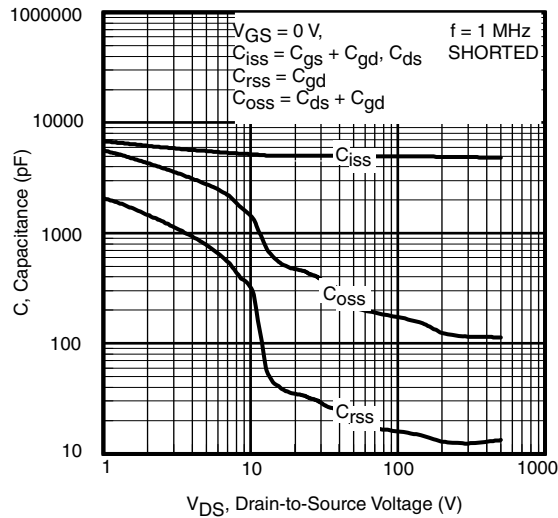
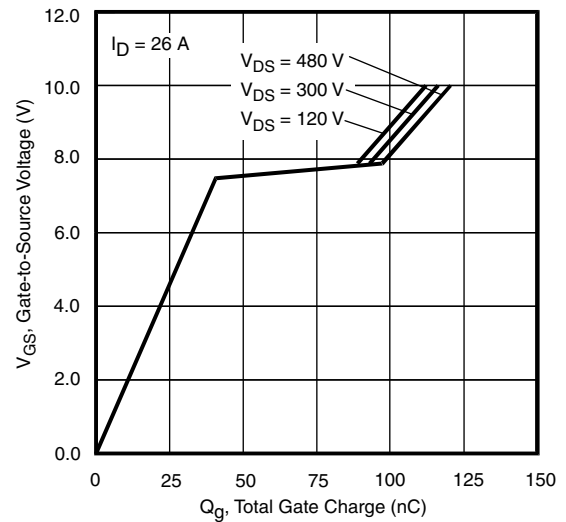
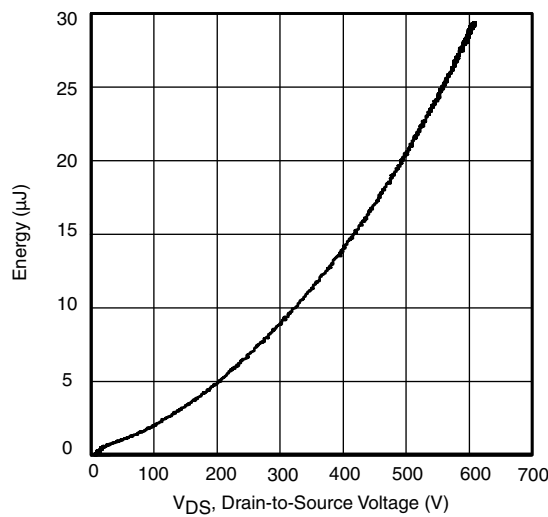
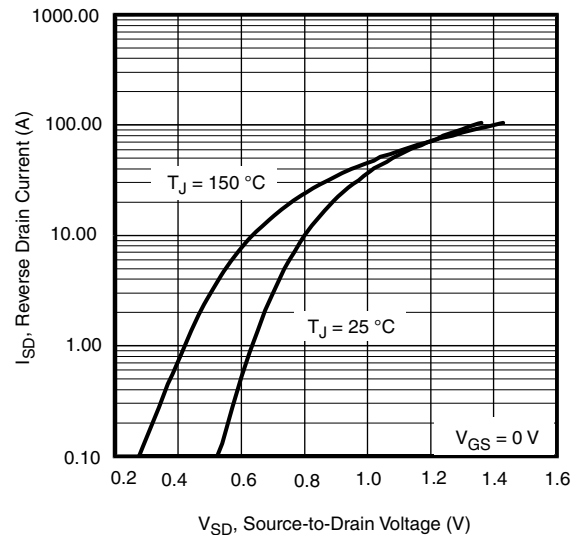
**Fig. 3 - Typical Transfer Characteristics**

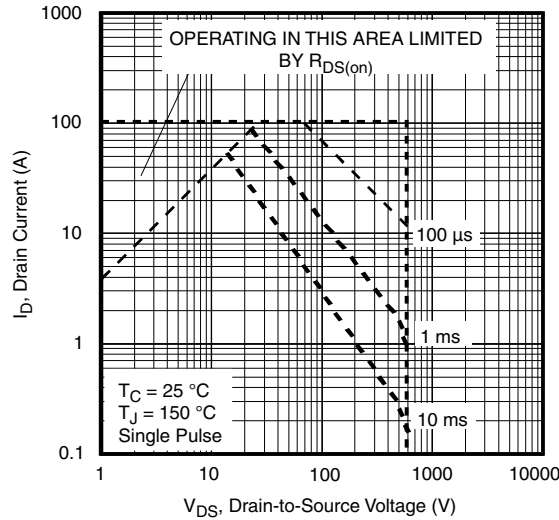
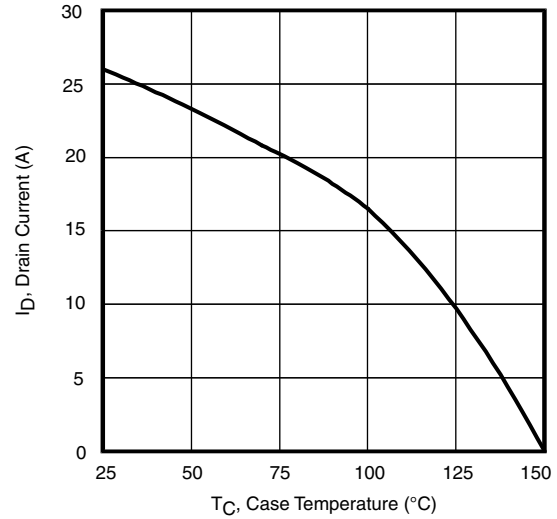
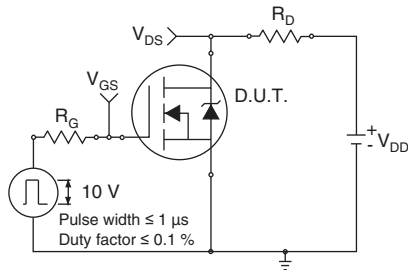
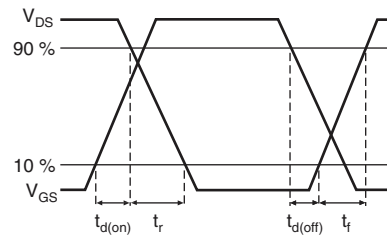
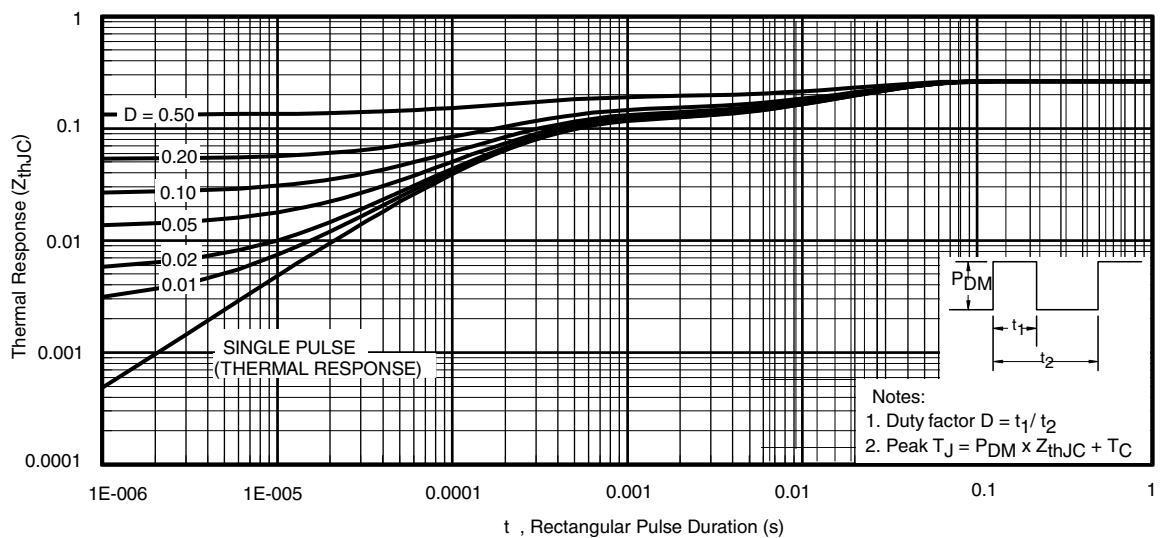


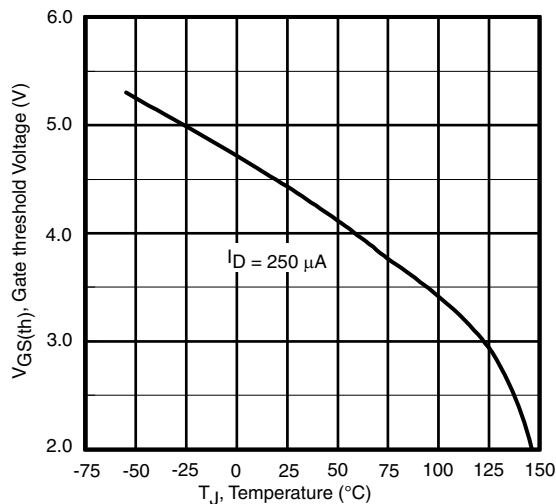
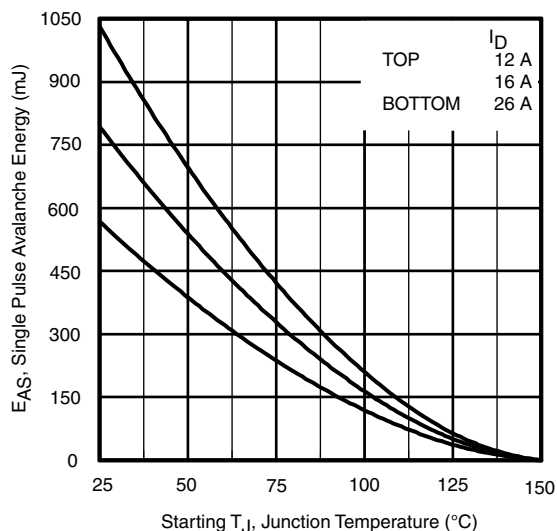
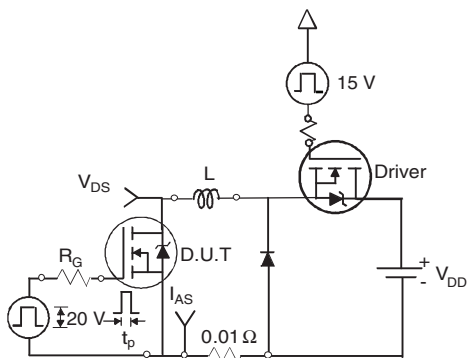
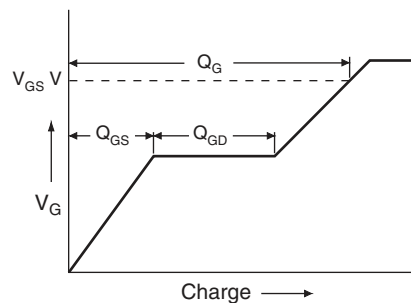
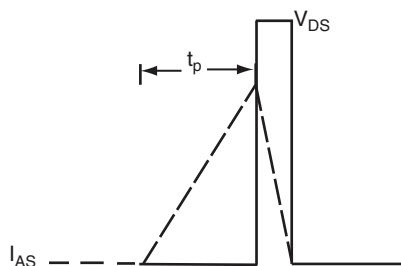
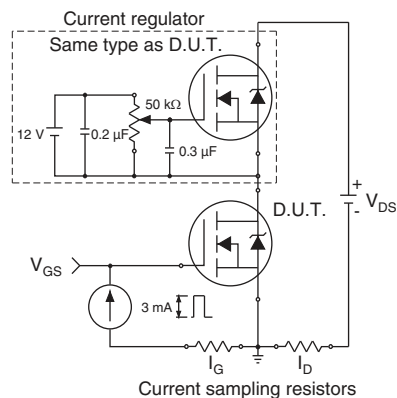
**Fig. 2 - Typical Output Characteristics**

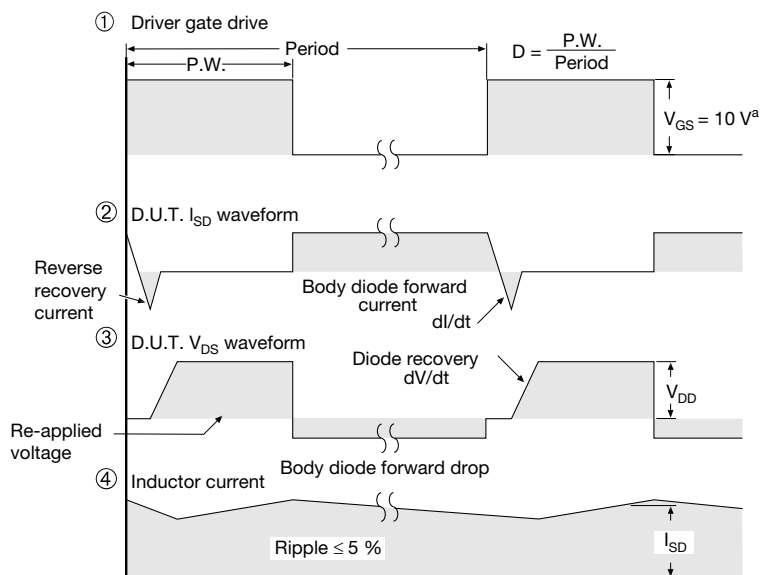
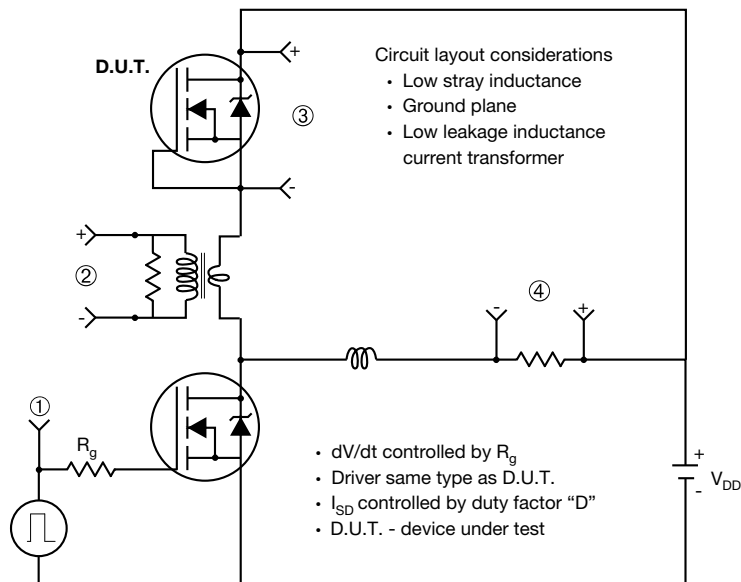


**Fig. 4 - Normalized On-Resistance vs. Temperature**


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

**Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage**

**Fig. 6 - Typical Output Capacitance Stored Energy vs.  $V_{DS}$** 

**Fig. 8 - Typical Source-Drain Diode Forward Voltage**


**Fig. 9 - Maximum Safe Operating Area**

**Fig. 10 - Maximum Drain Current vs. Case Temperature**

**Fig. 11a - Switching Time Test Circuit**

**Fig. 11b - Switching Time Waveforms**

**Fig. 12 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**


**Fig. 13 - Threshold Voltage vs. Temperature**

**Fig. 14c - Maximum Avalanche Energy vs. Drain Current**

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

**Fig. 15a - Basic Gate Charge Waveform**

**Fig. 14b - Unclamped Inductive Waveforms**

**Fig. 15b - Gate Charge Test Circuit**

**Peak Diode Recovery dV/dt Test Circuit**

**Note**

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

**Fig. 16 - For N-Channel**

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## TO-247AC (High Voltage)



| DIM. | MILLIMETERS |       | INCHES |       |
|------|-------------|-------|--------|-------|
|      | MIN.        | MAX.  | MIN.   | MAX.  |
| A    | 4.58        | 5.31  | 0.180  | 0.209 |
| A1   | 2.21        | 2.59  | 0.087  | 0.102 |
| A2   | 1.17        | 2.49  | 0.046  | 0.098 |
| b    | 0.99        | 1.40  | 0.039  | 0.055 |
| b1   | 0.99        | 1.35  | 0.039  | 0.053 |
| b2   | 1.53        | 2.39  | 0.060  | 0.094 |
| b3   | 1.65        | 2.37  | 0.065  | 0.093 |
| b4   | 2.42        | 3.43  | 0.095  | 0.135 |
| b5   | 2.59        | 3.38  | 0.102  | 0.133 |
| c    | 0.38        | 0.86  | 0.015  | 0.034 |
| c1   | 0.38        | 0.76  | 0.015  | 0.030 |
| D    | 19.71       | 20.82 | 0.776  | 0.820 |
| D1   | 13.08       | -     | 0.515  | -     |

ECN: X13-0103-Rev. D, 01-Jul-13  
DWG: 5971

| DIM. | MILLIMETERS |       | INCHES    |       |
|------|-------------|-------|-----------|-------|
|      | MIN.        | MAX.  | MIN.      | MAX.  |
| D2   | 0.51        | 1.30  | 0.020     | 0.051 |
| E    | 15.29       | 15.87 | 0.602     | 0.625 |
| E1   | 13.72       | -     | 0.540     | -     |
| e    | 5.46 BSC    |       | 0.215 BSC |       |
| Ø k  | 0.254       |       | 0.010     |       |
| L    | 14.20       | 16.25 | 0.559     | 0.640 |
| L1   | 3.71        | 4.29  | 0.146     | 0.169 |
| N    | 7.62 BSC    |       | 0.300 BSC |       |
| Ø P  | 3.51        | 3.66  | 0.138     | 0.144 |
| Ø P1 | -           | 7.39  | -         | 0.291 |
| Q    | 5.31        | 5.69  | 0.209     | 0.224 |
| R    | 4.52        | 5.49  | 0.178     | 0.216 |
| S    | 5.51 BSC    |       | 0.217 BSC |       |

## Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Contour of slot optional.
3. 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 outermost extremes of the plastic body.
4. Thermal pad contour optional with dimensions D1 and E1.
5. Lead finish uncontrolled in L1.
6. Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154").
7. Outline conforms to JEDEC outline TO-247 with exception of dimension c.
8. Xian and Mingxin actually photo.





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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

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