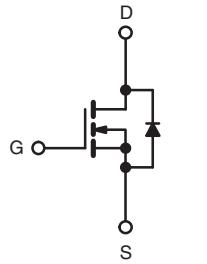
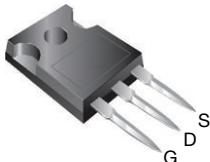


E Series Power MOSFET

| PRODUCT SUMMARY | |
|--------------------------------|----------------------|
| V_{DS} (V) at T_J max. | 700 |
| $R_{DS(on)}$ max. at 25 °C (Ω) | $V_{GS} = 10$ V 0.18 |
| Q_g max. (nC) | 110 |
| Q_{gs} (nC) | 15 |
| Q_{gd} (nC) | 32 |
| Configuration | Single |

TO-247AC



N-Channel MOSFET

FEATURES

- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS*
Available
HALOGEN
FREE
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

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Industrial
 - Welding
 - Induction heating
 - Motor drives
 - Battery chargers
 - Renewable energy
 - Solar (PV inverters)

ORDERING INFORMATION

| | |
|---------------------------------|----------------|
| Package | TO-247AC |
| Lead (Pb)-free | SiHG22N65E-E3 |
| Lead (Pb)-free and Halogen-free | SiHG22N65E-GE3 |

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

| PARAMETER | SYMBOL | LIMIT | UNIT |
|-----------------------------------------------------------|------------------|-------------|------|
| Drain-Source Voltage | V_{DS} | 650 | V |
| Gate-Source Voltage | V_{GS} | ± 30 | |
| Continuous Drain Current ($T_J = 150$ °C) | V_{GS} at 10 V | 22 | A |
| | | 14 | |
| Pulsed Drain Current ^a | I_{DM} | 56 | |
| Linear Derating Factor | | 1.8 | W/°C |
| Single Pulse Avalanche Energy ^b | E_{AS} | 691 | mJ |
| Maximum Power Dissipation | P_D | 227 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | °C |
| Drain-Source Voltage Slope | $T_J = 125$ °C | 70 | V/ns |
| Reverse Diode dV/dt ^d | | 26 | |
| Soldering Recommendations (Peak Temperature) ^c | for 10 s | 300 | °C |

Notes

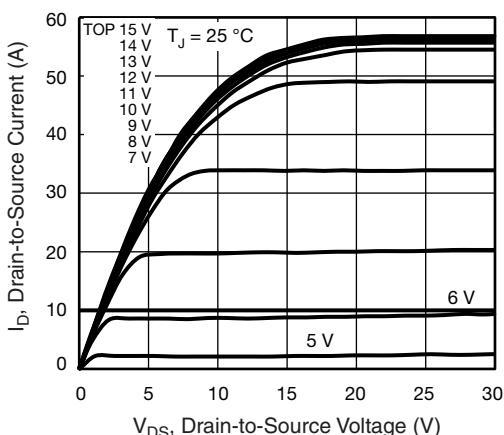
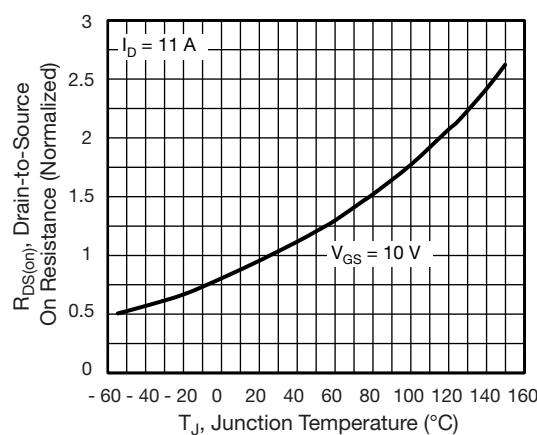
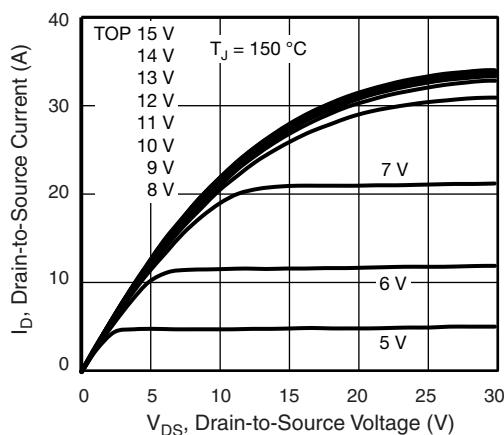
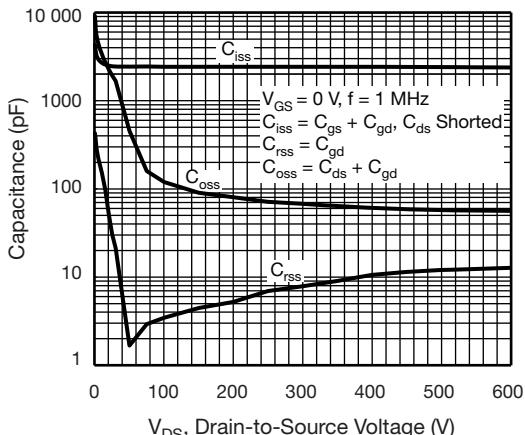
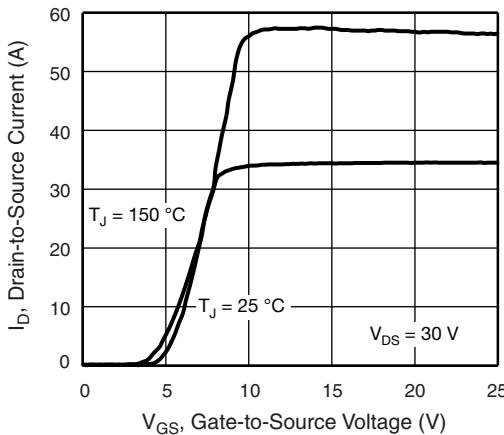
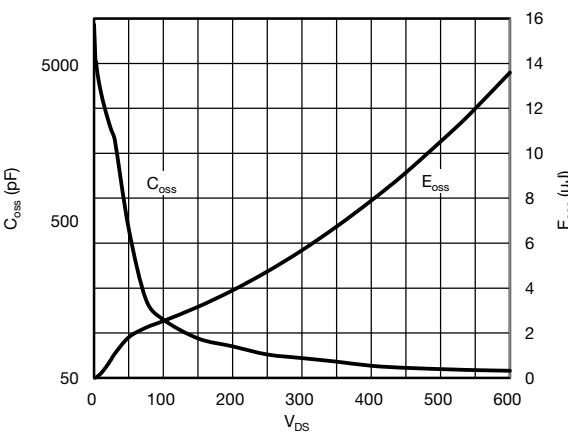
- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω, $I_{AS} = 7$ A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/μs, starting $T_J = 25$ °C.

| THERMAL RESISTANCE RATINGS | | | | |
|-----------------------------------|------------|------|------|------|
| PARAMETER | SYMBOL | TYP. | MAX. | UNIT |
| Maximum Junction-to-Ambient | R_{thJA} | - | 62 | |
| Maximum Junction-to-Case (Drain) | R_{thJC} | - | 0.55 | °C/W |

| SPECIFICATIONS ($T_J = 25$ °C, unless otherwise noted) | | | | | | | |
|----------------------------------------------------------------|---------------------|-------------------------------------------------------------------------|--------------------------------|------|------|-------|------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0$ V, $I_D = 250$ μA | | 650 | - | - | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | Reference to 25 °C, $I_D = 1$ mA | | - | 0.74 | - | V/°C |
| Gate-Source Threshold Voltage (N) | $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = 250$ μA | | 2 | - | 4 | V |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 20$ V | | - | - | ± 100 | nA |
| | | $V_{GS} = \pm 30$ V | | - | - | ± 1 | μA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 650$ V, $V_{GS} = 0$ V | | - | - | 1 | |
| | | $V_{DS} = 520$ V, $V_{GS} = 0$ V, $T_J = 125$ °C | | - | - | 10 | μA |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS} = 10$ V | $I_D = 11$ A | - | 0.15 | 0.18 | Ω |
| Forward Transconductance | g_{fs} | $V_{DS} = 8$ V, $I_D = 5$ A | | - | 6.7 | - | S |
| Dynamic | | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0$ V, $V_{DS} = 100$ V, $f = 1$ MHz | | - | 2415 | - | pF |
| Output Capacitance | C_{oss} | | | - | 118 | - | |
| Reverse Transfer Capacitance | C_{rss} | | | - | 4 | - | |
| Effective Output Capacitance, Energy Related ^a | $C_{o(er)}$ | $V_{DS} = 0$ V to 520 V, $V_{GS} = 0$ V | | - | 89 | - | |
| Effective Output Capacitance, Time Related ^b | $C_{o(tr)}$ | | | - | 307 | - | |
| Total Gate Charge | Q_g | | | - | 73 | 110 | nC |
| Gate-Source Charge | Q_{gs} | $V_{GS} = 10$ V | $I_D = 11$ A, $V_{DS} = 520$ V | - | 15 | - | |
| Gate-Drain Charge | Q_{gd} | | | - | 32 | - | |
| Turn-On Delay Time | $t_{d(on)}$ | | | - | 22 | 45 | ns |
| Rise Time | t_r | $V_{DD} = 520$ V, $I_D = 11$ A, $V_{GS} = 10$ V, $R_g = 9.1$ Ω | | - | 33 | 66 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 73 | 110 | | |
| Fall Time | t_f | | - | 38 | 76 | | |
| Gate Input Resistance | R_g | $f = 1$ MHz, open drain | | - | 0.64 | - | Ω |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous Source-Drain Diode Current | I_S | MOSFET symbol showing the integral reverse p - n junction diode | | - | - | 22 | A |
| Pulsed Diode Forward Current | I_{SM} | | | - | - | 56 | |
| Diode Forward Voltage | V_{SD} | $T_J = 25$ °C, $I_S = 11$ A, $V_{GS} = 0$ V | | - | - | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $T_J = 25$ °C, $I_F = I_S = 11$ A, $dI/dt = 100$ A/μs, $V_R = 400$ V | | - | 400 | - | ns |
| Reverse Recovery Charge | Q_{rr} | | | - | 5.9 | - | μC |
| Reverse Recovery Current | I_{RRM} | | | - | 20 | - | 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 - C_{oss} and E_{oss} vs. V_{DS}

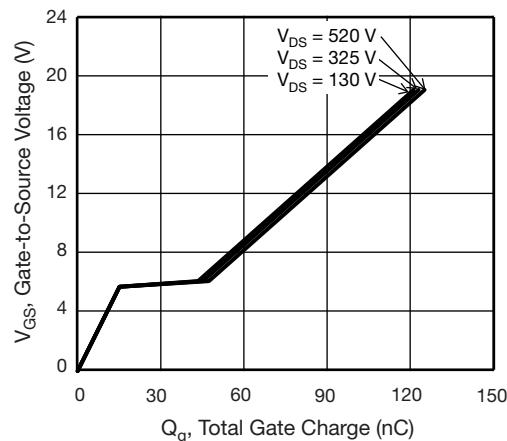


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

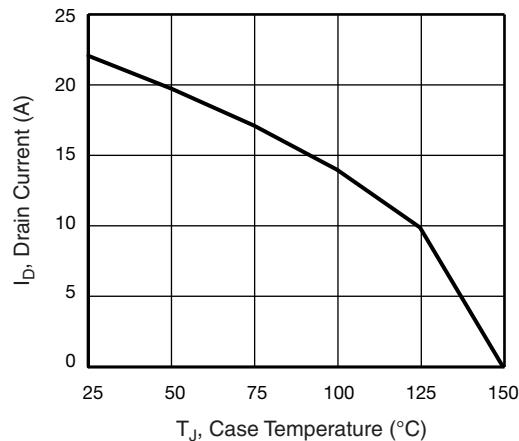


Fig. 10 - Maximum Drain Current vs. Case Temperature

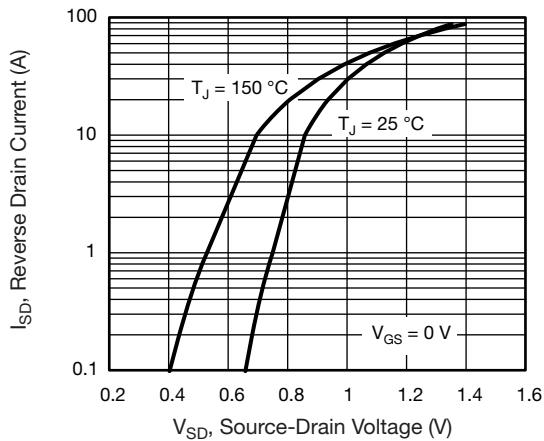


Fig. 8 - Typical Source-Drain Diode Forward Voltage

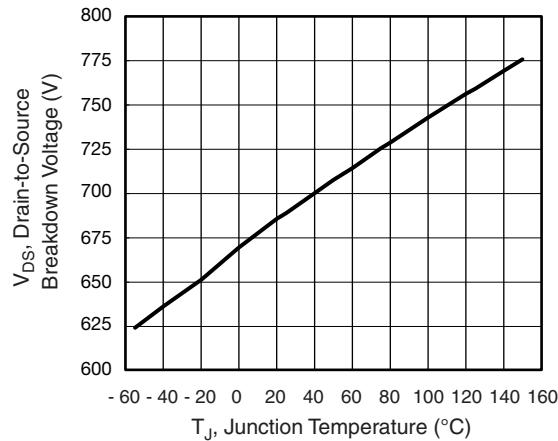


Fig. 11 - Temperature vs. Drain-to-Source Voltage

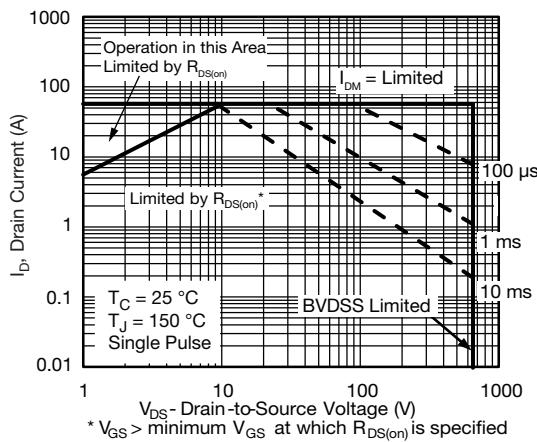


Fig. 9 - Maximum Safe Operating Area

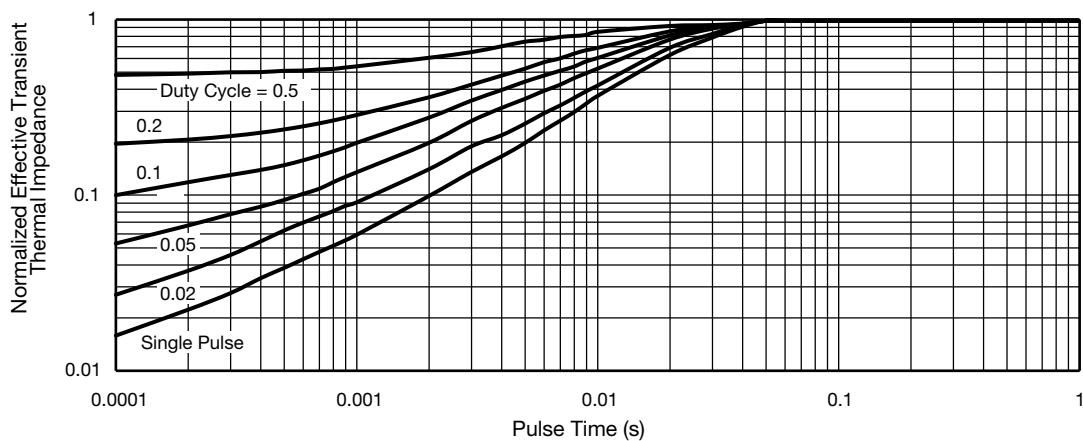


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

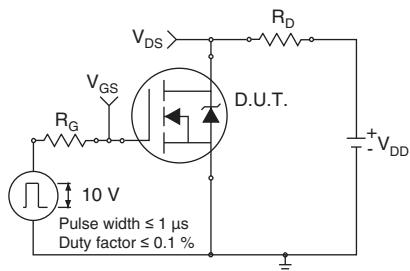


Fig. 13 - Switching Time Test Circuit

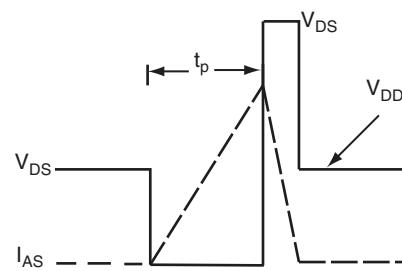


Fig. 16 - Unclamped Inductive Waveforms

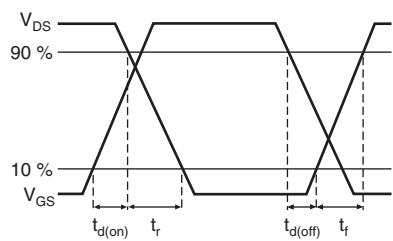


Fig. 14 - Switching Time Waveforms

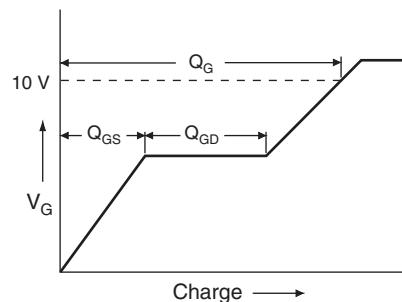


Fig. 17 - Basic Gate Charge Waveform

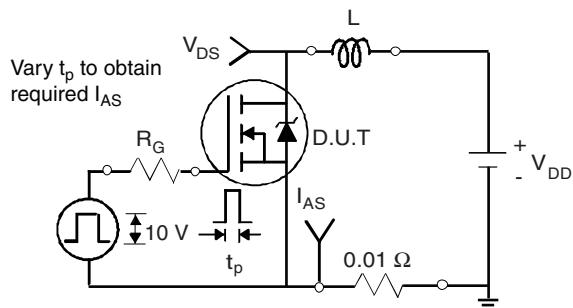


Fig. 15 - Unclamped Inductive Test Circuit

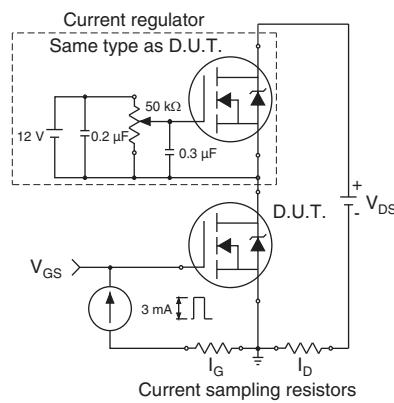
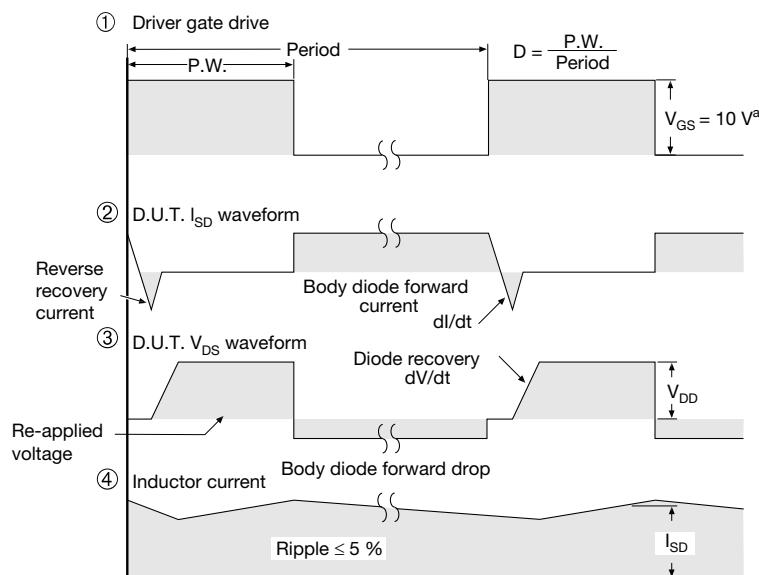
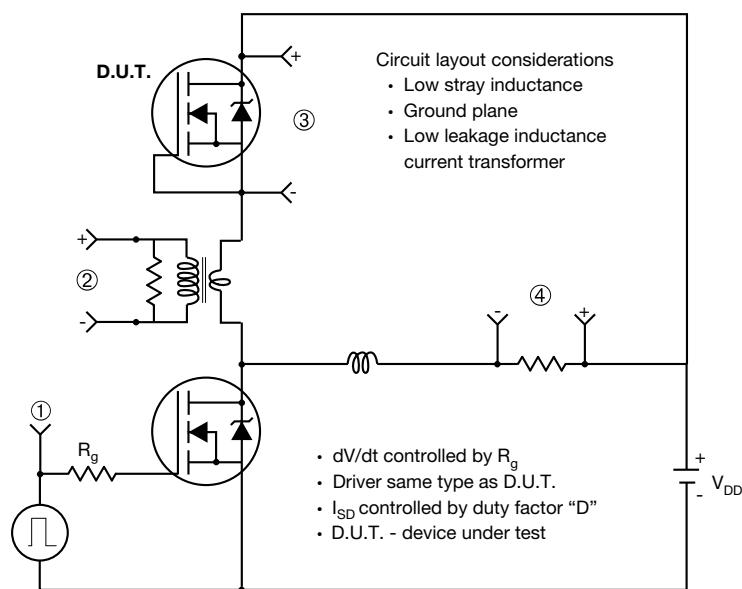


Fig. 18 - Gate Charge Test Circuit

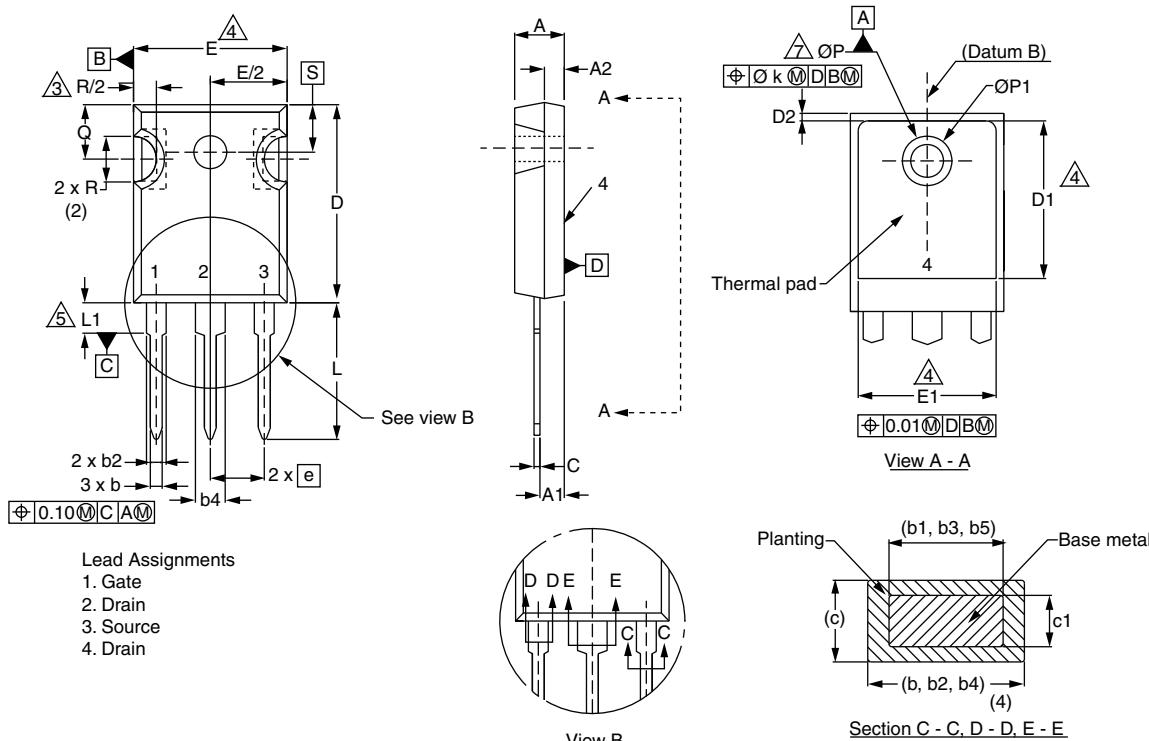
Peak Diode Recovery dV/dt Test Circuit

Note

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

Fig. 19 - For N-Channel

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?91539.

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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