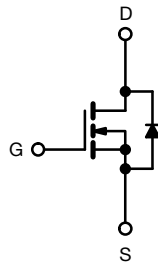
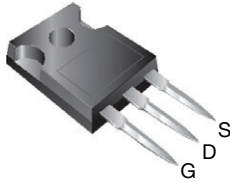




**THE DATASHEET OF
SIHG47N60AEF-GE3**



EF Series Power MOSFET With Fast Body Diode

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
 COMPLIANT
 HALOGEN
FREE

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)

PRODUCT SUMMARY

| | | |
|---|-----------------|-------|
| V_{DS} (V) at T_J max. | 650 | |
| $R_{DS(on)}$ typ. (Ω) at 25 °C | $V_{GS} = 10$ V | 0.061 |
| Q_g max. (nC) | 189 | |
| Q_{gs} (nC) | 26 | |
| Q_{gd} (nC) | 55 | |
| Configuration | Single | |

ORDERING INFORMATION

| | |
|---------------------------------|------------------|
| Package | TO-247AC |
| Lead (Pb)-free and halogen-free | SiHG47N60AEF-GE3 |

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


| PARAMETER | SYMBOL | LIMIT | UNIT |
|---|------------------|----------------|------|
| Drain-source voltage | V_{DS} | 600 | V |
| Gate-source voltage | V_{GS} | ± 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 ^a | I_{DM} | 111 | |
| Linear derating factor | | 2.5 | W/°C |
| Single pulse avalanche energy ^b | E_{AS} | 508 | mJ |
| Maximum power dissipation | P_D | 313 | W |
| Operating junction and storage temperature range | T_J, T_{stg} | -55 to +150 | °C |
| Drain-source voltage slope | dv/dt | $T_J = 125$ °C | V/ns |
| Reverse diode dv/dt ^d | | 100 | |
| Soldering recommendations (peak temperature) ^c | For 10 s | 260 | °C |

Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 140$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 6.0$ A
- 1.6 mm from case
- $I_{SD} = 23.5$ A, $di/dt = 250$ A/ μ s, 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} | - | 0.4 | |

| 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_{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 $25\text{ }^\circ\text{C}, I_D = 10\text{ mA}$ | - | 0.72 | - | V/ $^\circ\text{C}$ | |
| Gate-source threshold voltage (N) | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 2 | - | 4 | V | |
| Gate-source leakage | I_{GSS} | $V_{GS} = \pm 20\text{ V}$ | - | - | ± 100 | nA | |
| | | $V_{GS} = \pm 30\text{ V}$ | - | - | ± 1 | μA | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}$ | - | - | 1 | μA | |
| | | $V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | - | - | 2 | mA | |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 23.5\text{ A}$ | - | 0.061 | 0.070 | Ω | |
| Forward transconductance ^a | g_{fs} | $V_{DS} = 30\text{ V}, I_D = 23.5\text{ A}$ | - | 13 | - | S | |
| Dynamic | | | | | | | |
| Input capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, f = 1\text{ MHz}$ | - | 3576 | - | pF | |
| Output capacitance | C_{oss} | | - | 167 | - | | |
| Reverse transfer capacitance | C_{rss} | | - | 5 | - | | |
| Effective output capacitance, energy related ^a | $C_{o(er)}$ | | $V_{DS} = 0\text{ V to } 480\text{ V}, V_{GS} = 0\text{ V}$ | - | 104 | | - |
| Effective output capacitance, time related ^b | $C_{o(tr)}$ | | | - | 535 | | - |
| Total gate charge | Q_g | $V_{GS} = 10\text{ V}, I_D = 23.5\text{ A}, V_{DS} = 480\text{ V}$ | - | 126 | 189 | nC | |
| Gate-source charge | Q_{gs} | | - | 26 | - | | |
| Gate-drain charge | Q_{gd} | | - | 55 | - | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD} = 480\text{ V}, I_D = 23.5\text{ A}, V_{GS} = 10\text{ V}, R_g = 9.1\text{ }\Omega$ | - | 35 | 70 | ns | |
| Rise time | t_r | | - | 63 | 126 | | |
| Turn-off delay time | $t_{d(off)}$ | | - | 143 | 286 | | |
| Fall time | t_f | | - | 67 | 134 | | |
| Gate input resistance | R_g | | $f = 1\text{ MHz}, \text{open drain}$ | 0.2 | 0.5 | | 1.0 |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous source-drain diode current | I_S | MOSFET symbol showing the integral reverse p - n junction diode  | - | - | 40 | A | |
| Pulsed diode forward current | I_{SM} | | - | - | 111 | | |
| Diode forward voltage | V_{SD} | $T_J = 25\text{ }^\circ\text{C}, I_S = 23.5\text{ A}, V_{GS} = 0\text{ V}$ | - | - | 1.2 | V | |
| Reverse recovery time | t_{rr} | $T_J = 25\text{ }^\circ\text{C}, I_F = I_S = 23.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_R = 400\text{ V}$ | - | 160 | 320 | ns | |
| Reverse recovery charge | Q_{rr} | | - | 1.2 | 2.4 | μC | |
| Reverse recovery current | I_{RRM} | | - | 14.3 | - | 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)

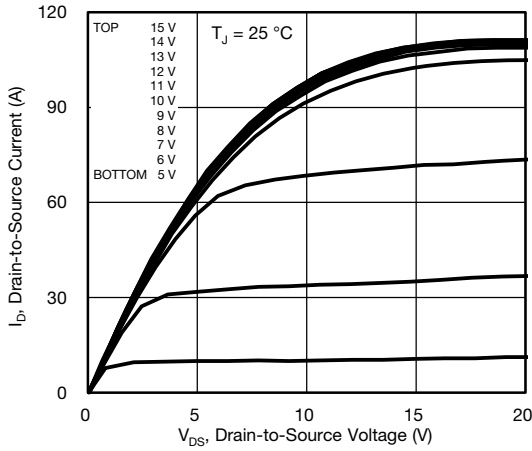


Fig. 1 - Typical Output Characteristics

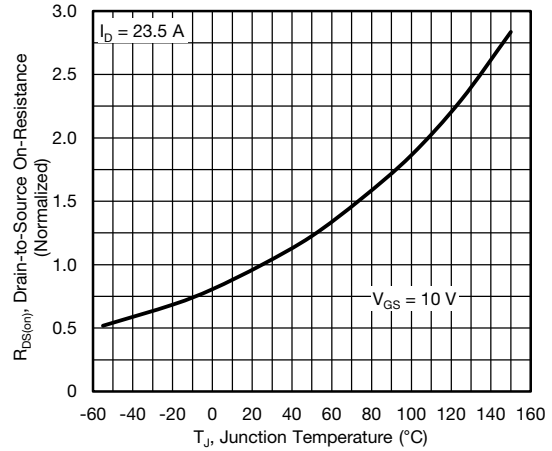


Fig. 4 - Normalized On-Resistance vs. Temperature

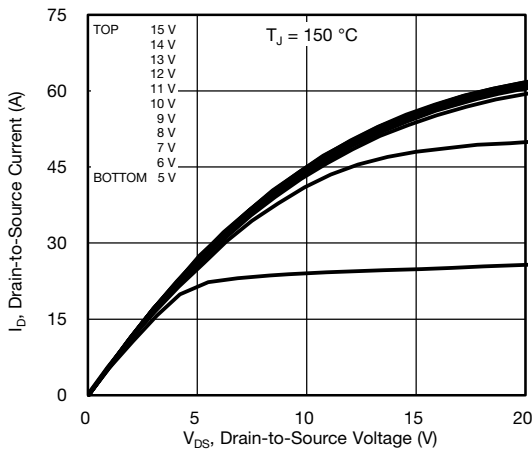


Fig. 2 - Typical Output Characteristics

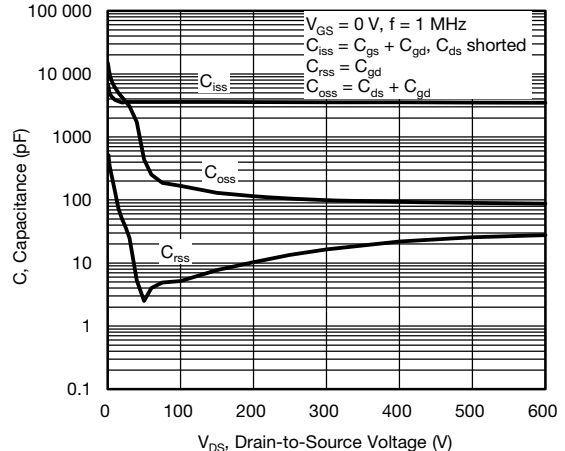


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

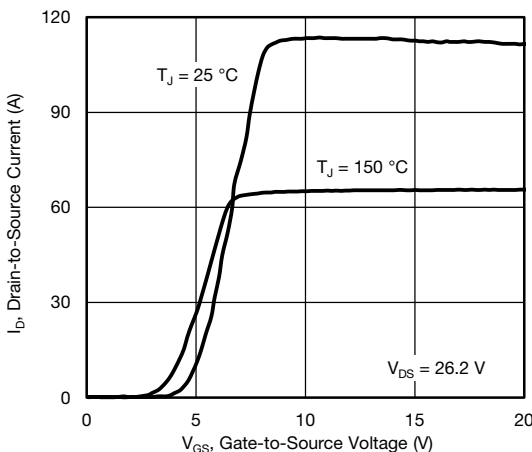


Fig. 3 - Typical Transfer Characteristics

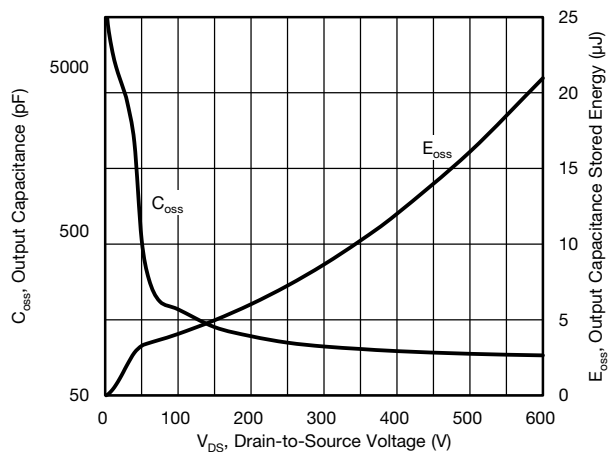


Fig. 6 - C_{OSS} and E_{OSS} vs. V_{DS}

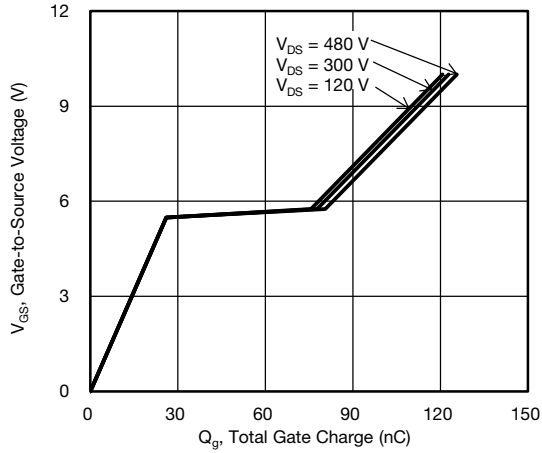


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

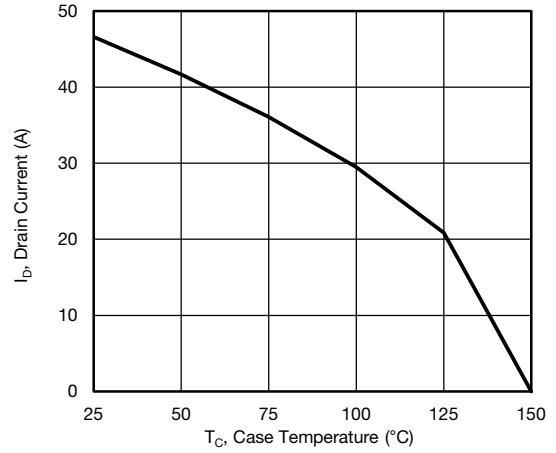


Fig. 10 - Maximum Drain Current vs. Case Temperature

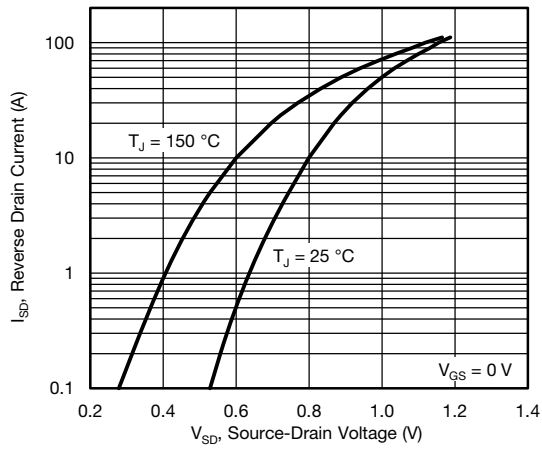


Fig. 8 - Typical Source-Drain Diode Forward Voltage

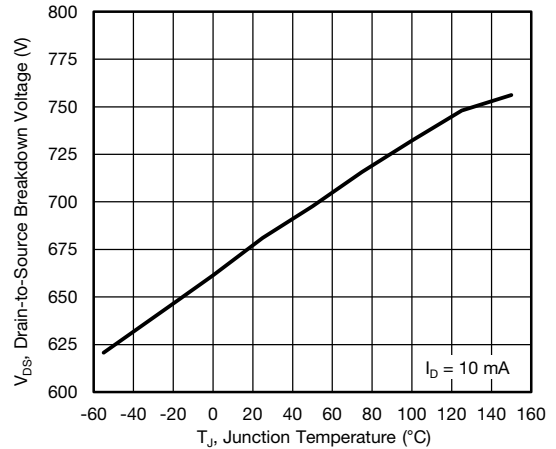


Fig. 11 - Temperature vs. Drain-to-Source Voltage

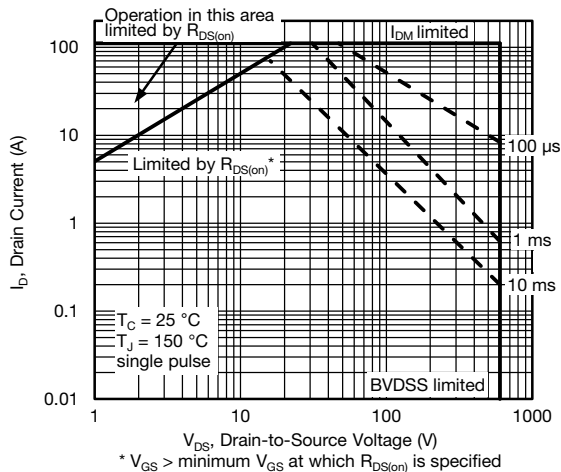


Fig. 9 - Maximum Safe Operating Area

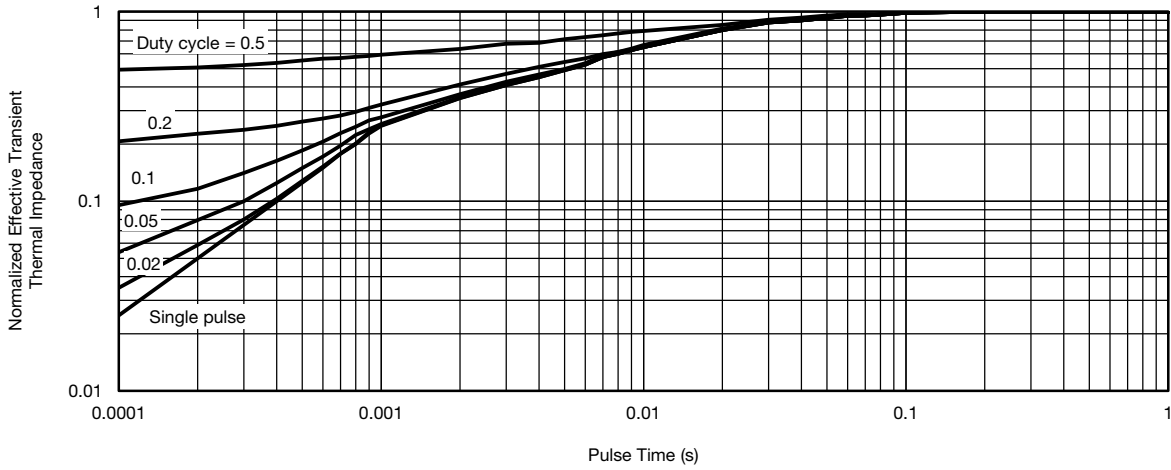


Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case

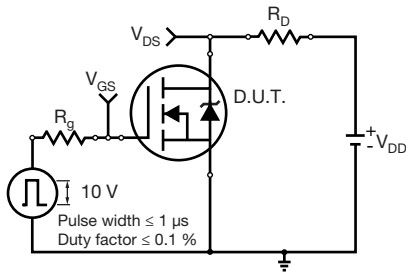


Fig. 13 - Switching Time Test Circuit

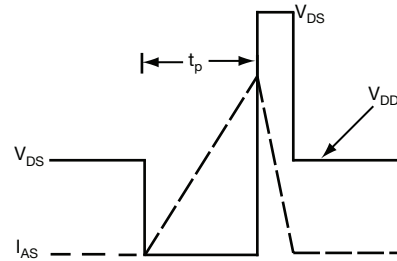


Fig. 16 - Unclamped Inductive Waveforms

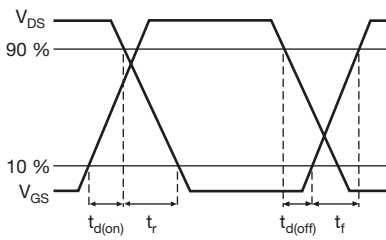


Fig. 14 - Switching Time Waveforms

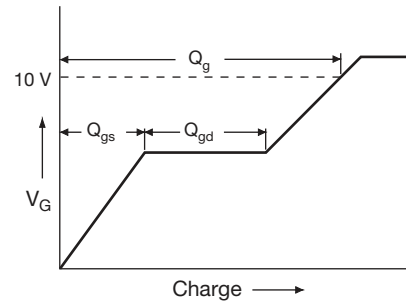


Fig. 17 - Basic Gate Charge Waveform

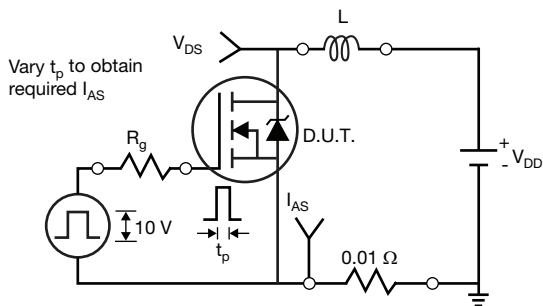


Fig. 15 - Unclamped Inductive Test Circuit

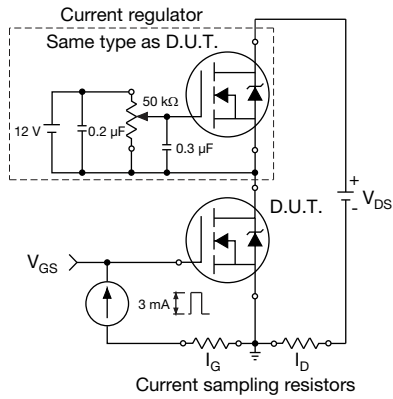
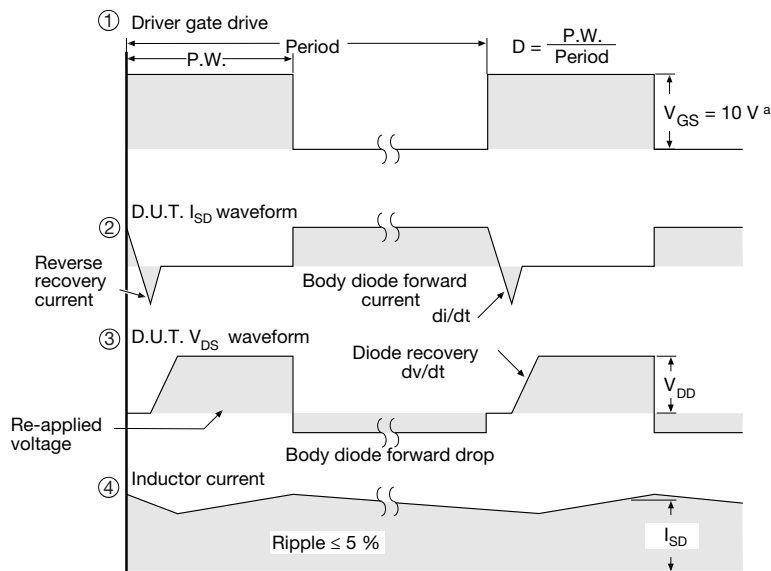
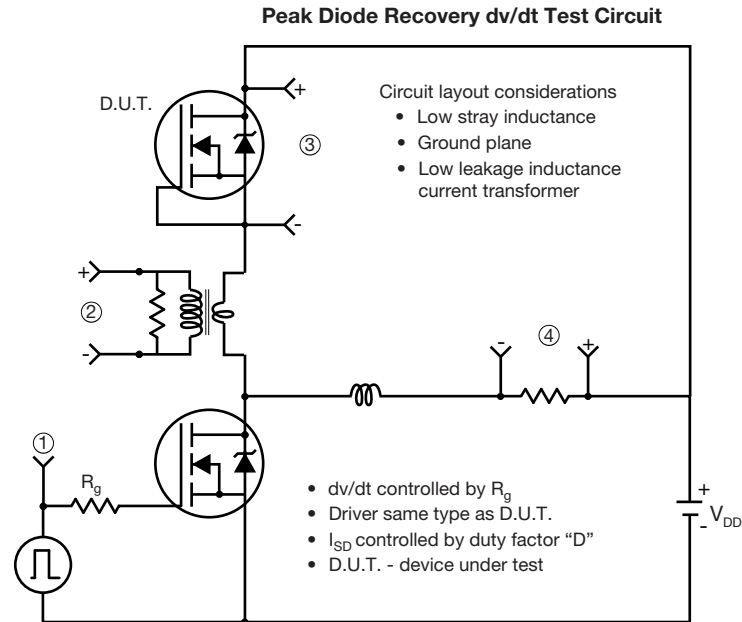


Fig. 18 - Gate Charge Test Circuit



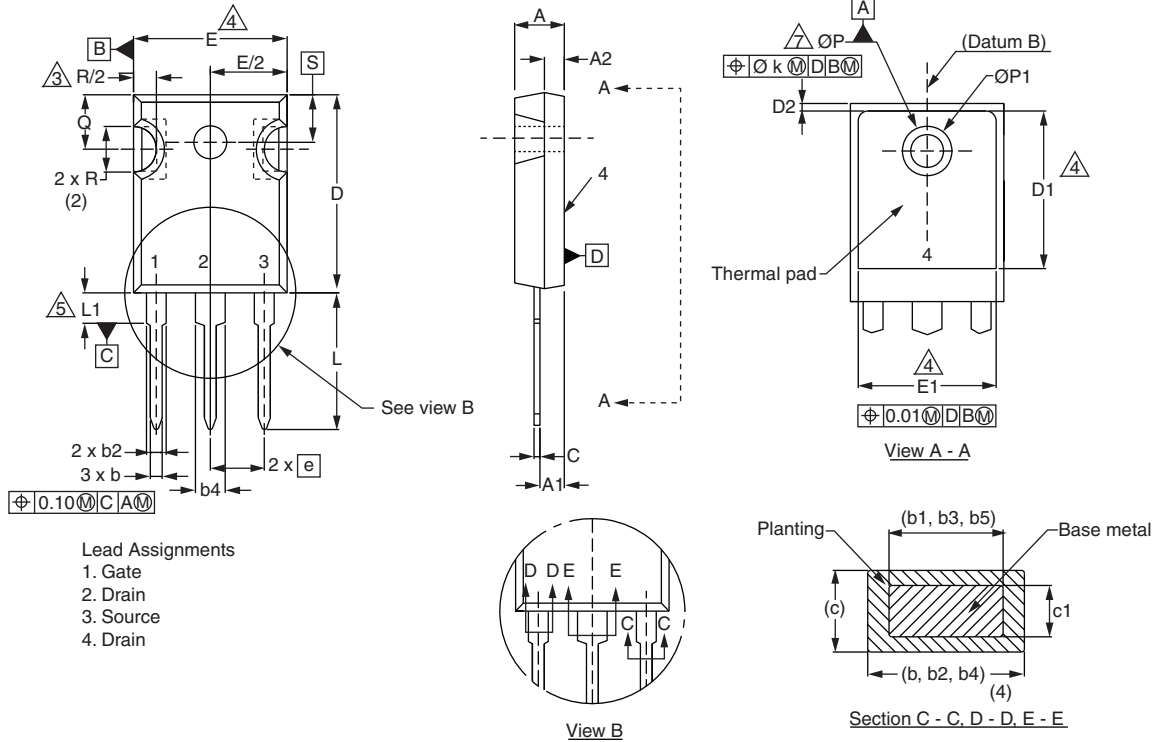
Note
a. $V_{GS} = 5\text{ V}$ for logic level devices

Fig. 19 - For N-Channel

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VERSION 2: FACILITY CODE = Y



| DIM. | MILLIMETERS | | NOTES |
|------|-------------|-------|-------|
| | MIN. | MAX. | |
| A | 4.58 | 5.31 | |
| A1 | 2.21 | 2.59 | |
| A2 | 1.17 | 2.49 | |
| b | 0.99 | 1.40 | |
| b1 | 0.99 | 1.35 | |
| b2 | 1.53 | 2.39 | |
| b3 | 1.65 | 2.37 | |
| b4 | 2.42 | 3.43 | |
| b5 | 2.59 | 3.38 | |
| c | 0.38 | 0.86 | |
| c1 | 0.38 | 0.76 | |
| D | 19.71 | 20.82 | |
| D1 | 13.08 | - | |

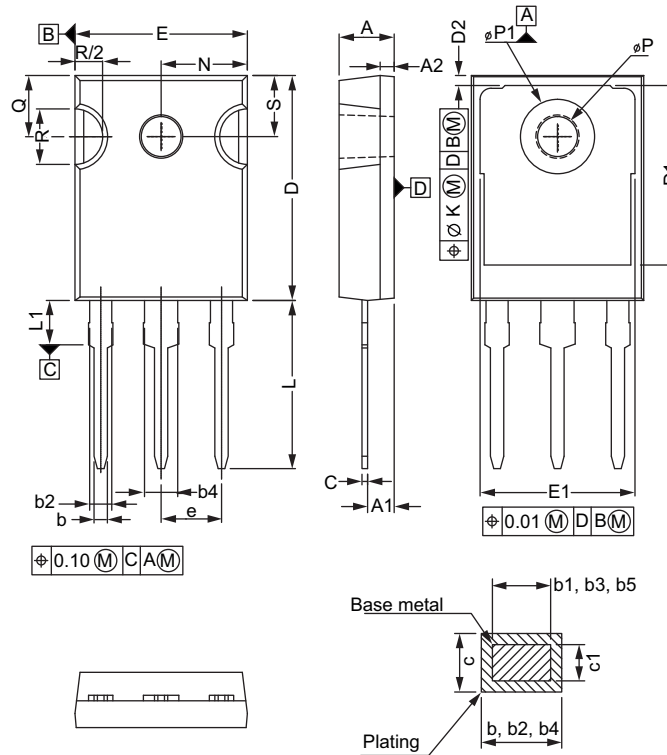
| DIM. | MILLIMETERS | | NOTES |
|------|-------------|-------|-------|
| | MIN. | MAX. | |
| D2 | 0.51 | 1.30 | |
| E | 15.29 | 15.87 | |
| E1 | 13.72 | - | |
| e | 5.46 BSC | | |
| Ø k | 0.254 | | |
| L | 14.20 | 16.25 | |
| L1 | 3.71 | 4.29 | |
| Ø P | 3.51 | 3.66 | |
| Ø P1 | - | 7.39 | |
| Q | 5.31 | 5.69 | |
| R | 4.52 | 5.49 | |
| S | 5.51 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



VERSION 3: FACILITY CODE = N



| MILLIMETERS | | |
|-------------|-------|-------|
| DIM. | MIN. | MAX. |
| A | 4.65 | 5.31 |
| A1 | 2.21 | 2.59 |
| A2 | 1.17 | 1.37 |
| b | 0.99 | 1.40 |
| b1 | 0.99 | 1.35 |
| b2 | 1.65 | 2.39 |
| b3 | 1.65 | 2.34 |
| b4 | 2.59 | 3.43 |
| b5 | 2.59 | 3.38 |
| c | 0.38 | 0.89 |
| c1 | 0.38 | 0.84 |
| D | 19.71 | 20.70 |
| D1 | 13.08 | - |

| MILLIMETERS | | |
|-------------|----------|-------|
| DIM. | MIN. | MAX. |
| D2 | 0.51 | 1.35 |
| E | 15.29 | 15.87 |
| E1 | 13.46 | - |
| e | 5.46 BSC | |
| k | 0.254 | |
| L | 14.20 | 16.10 |
| L1 | 3.71 | 4.29 |
| N | 7.62 BSC | |
| P | 3.56 | 3.66 |
| P1 | - | 7.39 |
| Q | 5.31 | 5.69 |
| R | 4.52 | 5.49 |
| S | 5.51 BSC | |

ECN: E22-0452-Rev. G, 31-Oct-2022
 DWG: 5971

- 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")



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