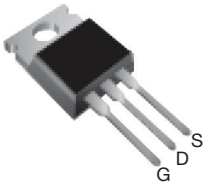
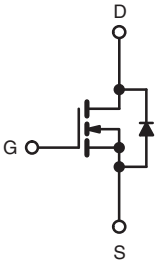
# Power MOSFET

| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) | 60 | |
| $R_{DS(on)}$ (Ω) | $V_{GS}$ = 10 V | 0.050 |
| $Q_g$ (Max.) (nC) | 46 | |
| $Q_{gs}$ (nC) | 11 | |
| $Q_{gd}$ (nC) | 22 | |
| Configuration | Single | |

TO-220AB




N-Channel MOSFET

## FEATURES

- Dynamic dV/dt Rating
- 175 °C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC

Available
RoHS* COMPLIANT

## 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 TO-220AB package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 W. The low thermal resistance and low package cost of the TO-220AB contribute to its wide acceptance throughout the industry.

| ORDERING INFORMATION | |
|---|---|
| Package | TO-220AB |
| Lead (Pb)-free | IRFZ34PbF |
| | SiHFZ34-E3 |
| SnPb | IRFZ34 |
| | SiHFZ34 |

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

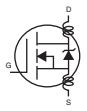
| PARAMETER | | | SYMBOL | LIMIT | UNIT |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | | | $V_{GS}$ | ± 20 | |
| Continuous Drain Current | $V_{GS}$ at 10 V | $T_C$ = 25 °C | $I_D$ | 30 | A |
| | | $T_C$ = 100 °C | | 21 | |
| Pulsed Drain Current[a] | | | $I_{DM}$ | 120 | |
| Linear Derating Factor | | | | 0.59 | W/°C |
| Single Pulse Avalanche Energy[b] | | | $E_{AS}$ | 200 | mJ |
| Maximum Power Dissipation | $T_C$ = 25 °C | | $P_D$ | 88 | W |
| Peak Diode Recovery dV/dt[c] | | | dV/dt | 4.5 | V/ns |
| Operating Junction and Storage Temperature Range | | | $T_J$, $T_{stg}$ | - 55 to + 175 | °C |
| Soldering Recommendations (Peak Temperature) | for 10 s | | | 300[d] | |
| Mounting Torque | 6-32 or M3 screw | | | 10 | lbf · in |
| | | | | 1.1 | N · m |

**Notes**

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. $V_{DD}$ = 25 V, starting $T_J$ = 25 °C, L = 259 µH, $R_g$ = 25 Ω, $I_{AS}$ = 30 A (see fig. 12).
c. $I_{SD}$ ≤ 30 A, dI/dt ≤ 200 A/µs, $V_{DD}$ ≤ $V_{DS}$, $T_J$ ≤ 175 °C.
d. 1.6 mm from case.

* Pb containing terminations are not RoHS compliant, exemptions may apply

| THERMAL RESISTANCE RATINGS | | | | |
|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TYP.** | **MAX.** | **UNIT** |
| Maximum Junction-to-Ambient | $R_{thJA}$ | - | 62 | °C/W |
| Case-to-Sink, Flat, Greased Surface | $R_{thCS}$ | 0.50 | - | |
| Maximum Junction-to-Case (Drain) | $R_{thJC}$ | - | 1.7 | |

| **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 | 60 | - | - | V |
| $V_{DS}$ Temperature Coefficient | $\Delta V_{DS}/T_J$ | Reference to 25 °C, $I_D$ = 1 mA | - | 0.065 | - | V/°C |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 2.0 | - | 4.0 | V |
| Gate-Source Leakage | $I_{GSS}$ | $V_{GS}$ = ± 20 V | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 60 V, $V_{GS}$ = 0 V | - | - | 25 | µA |
| | | $V_{DS}$ = 48 V, $V_{GS}$ = 0 V, $T_J$ = 150 °C | - | - | 250 | |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V; $I_D$ = 18 A[b] | - | - | 0.050 | Ω |
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 25 V, $I_D$ = 18 A | 9.3 | - | - | S |
| **Dynamic** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1.0 MHz, see fig. 5 | - | 1200 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 600 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 100 | - | |
| Total Gate Charge | $Q_g$ | $V_{GS}$ = 10 V; $I_D$ = 30 A, $V_{DS}$ = 48 V, see fig. 6 and 13[b] | - | - | 46 | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | - | 11 | |
| Gate-Drain Charge | $Q_{gd}$ | | - | - | 22 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = 30 V, $I_D$ = 30 A, $R_g$ = 12 Ω, $R_D$ = 1.0 Ω, see fig. 10[b] | - | 13 | - | ns |
| Rise Time | $t_r$ | | - | 100 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 29 | - | |
| Fall Time | $t_f$ | | - | 52 | - | |
| Internal Drain Inductance | $L_D$ | Between lead, 6 mm (0.25") from package and center of die contact  | - | 4.5 | - | nH |
| Internal Source Inductance | $L_S$ | | - | 7.5 | - | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Source-Drain Diode Current | $I_S$ | MOSFET symbol showing the integral reverse p - n junction diode  | - | - | 30 | A |
| Pulsed Diode Forward Current[a] | $I_{SM}$ | | - | - | 120 | |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25 °C, $I_S$ = 30 A, $V_{GS}$ = 0 V[b] | - | - | 1.6 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $T_J$ = 25 °C, $I_F$ = 30 A, dI/dt = 100 A/µs | - | 120 | 230 | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 0.7 | 1.4 | nC |
| 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 ≤ 300 µs; duty cycle ≤ 2 %.

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

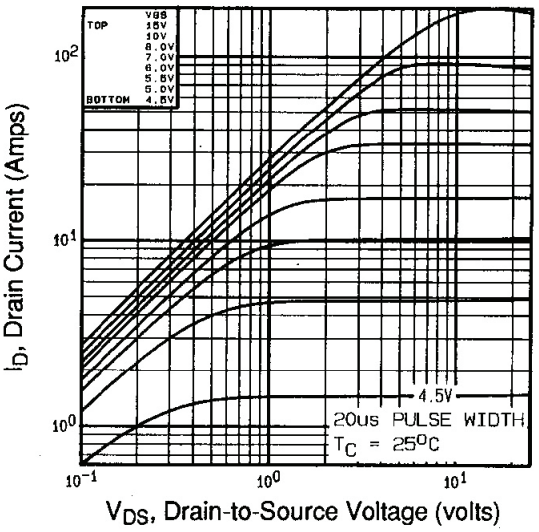



**Fig. 1 - Typical Output Characteristics, $T_C$ = 25 °C**

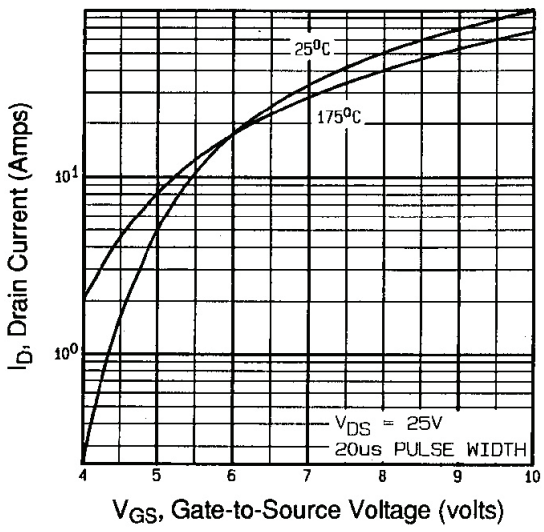



**Fig. 3 - Typical Transfer Characteristics**

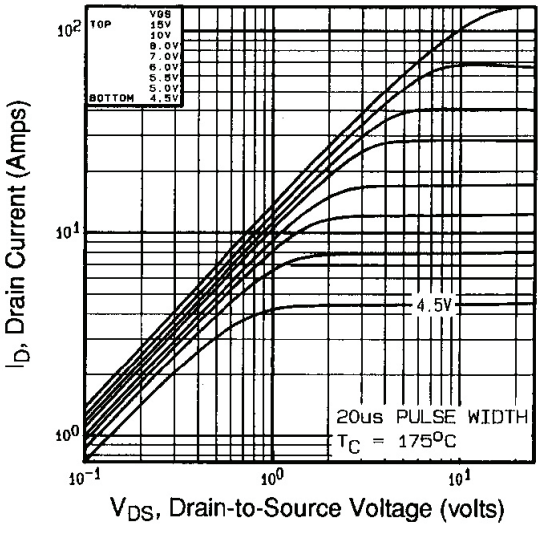



**Fig. 2 - Typical Output Characteristics, $T_C$ = 175 °C**

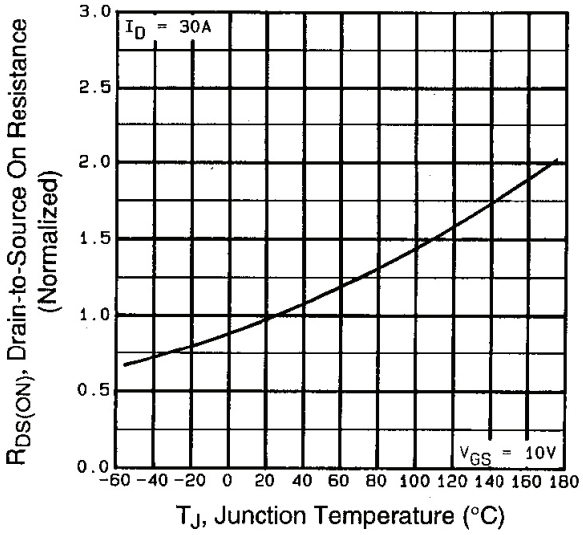



**Fig. 4 - Normalized On-Resistance vs. Temperature**

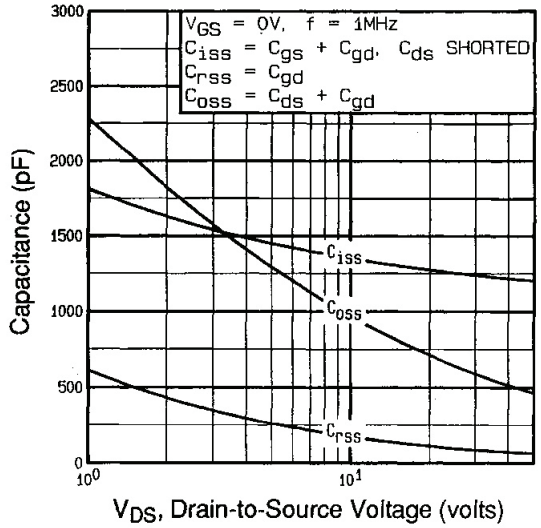



**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**

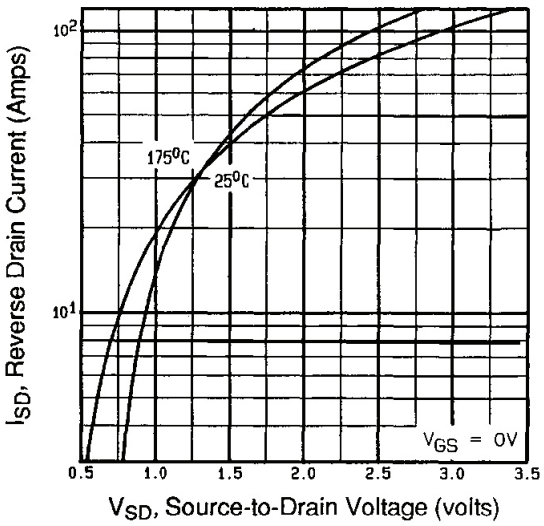



**Fig. 7 - Typical Source-Drain Diode Forward Voltage**

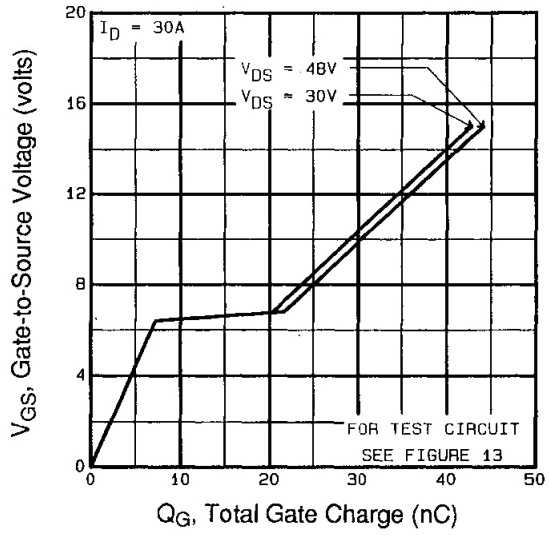



**Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage**

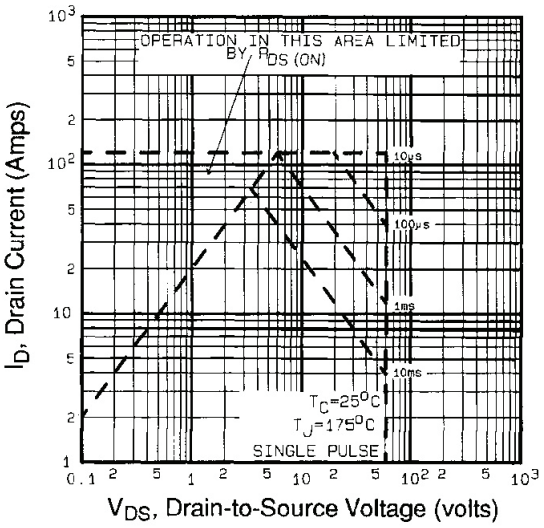



**Fig. 8 - Maximum Safe Operating Area**

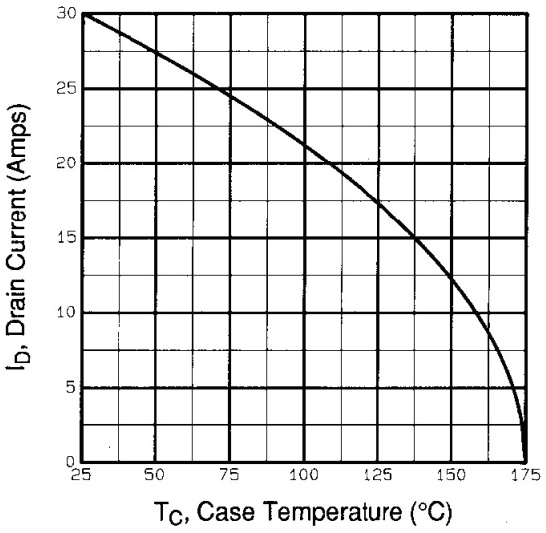



**Fig. 9 - Maximum Drain Current vs. Case Temperature**

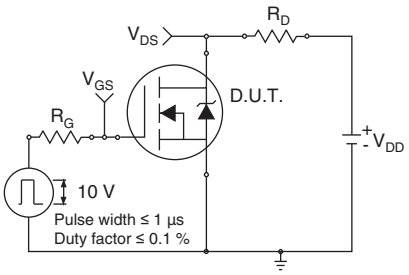



**Fig. 10a - Switching Time Test Circuit**

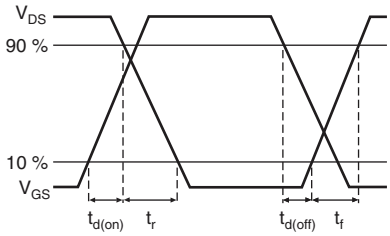



**Fig. 10b - Switching Time Waveforms**

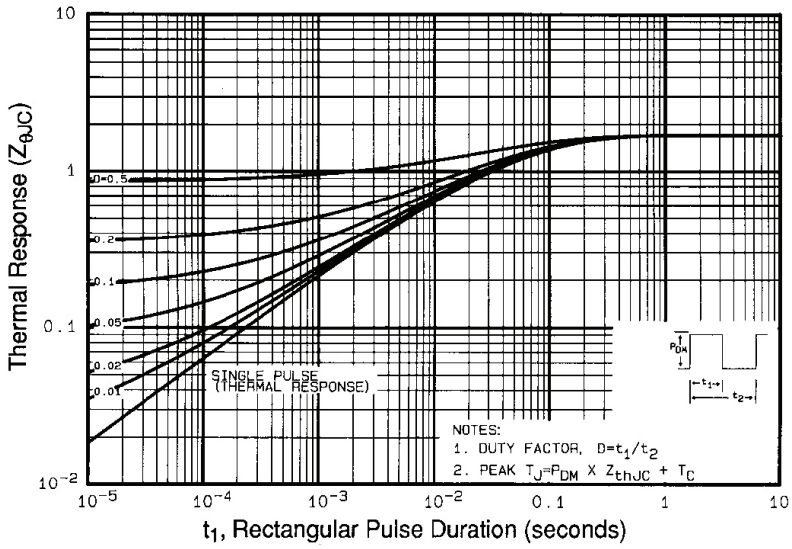



**Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**

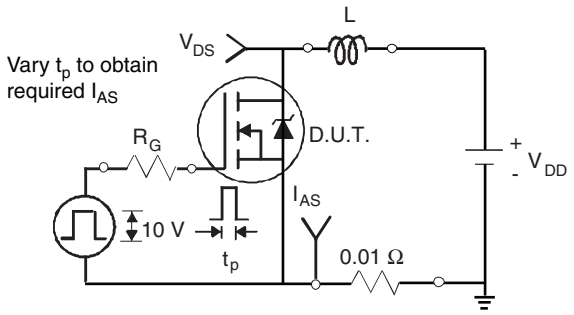



**Fig. 12a - Unclamped Inductive Test Circuit**

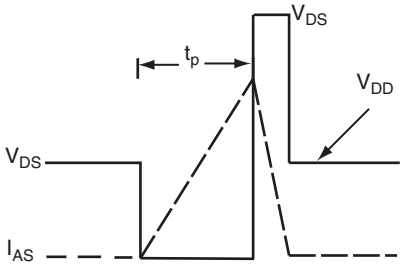



**Fig. 12b - Unclamped Inductive Waveforms**

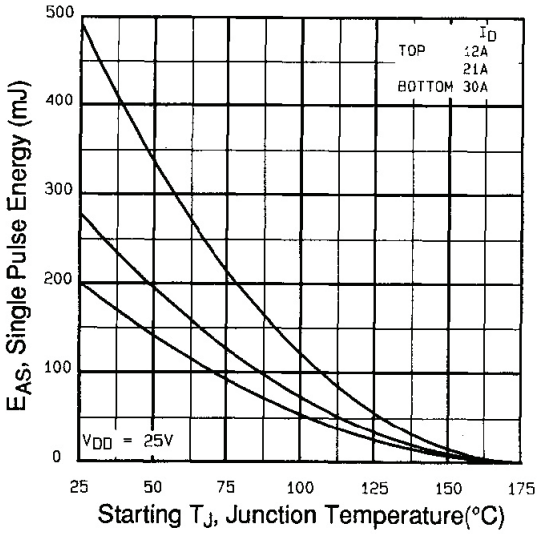



**Fig. 12c - Maximum Avalanche Energy vs. Drain Current**

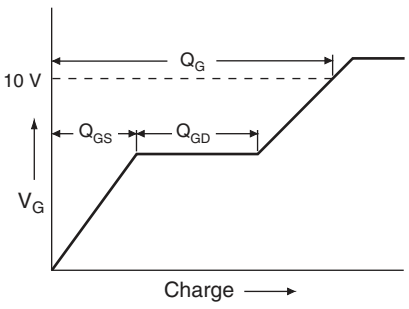



**Fig. 13a - Basic Gate Charge Waveform**

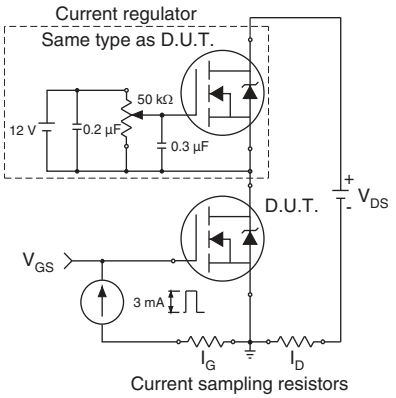
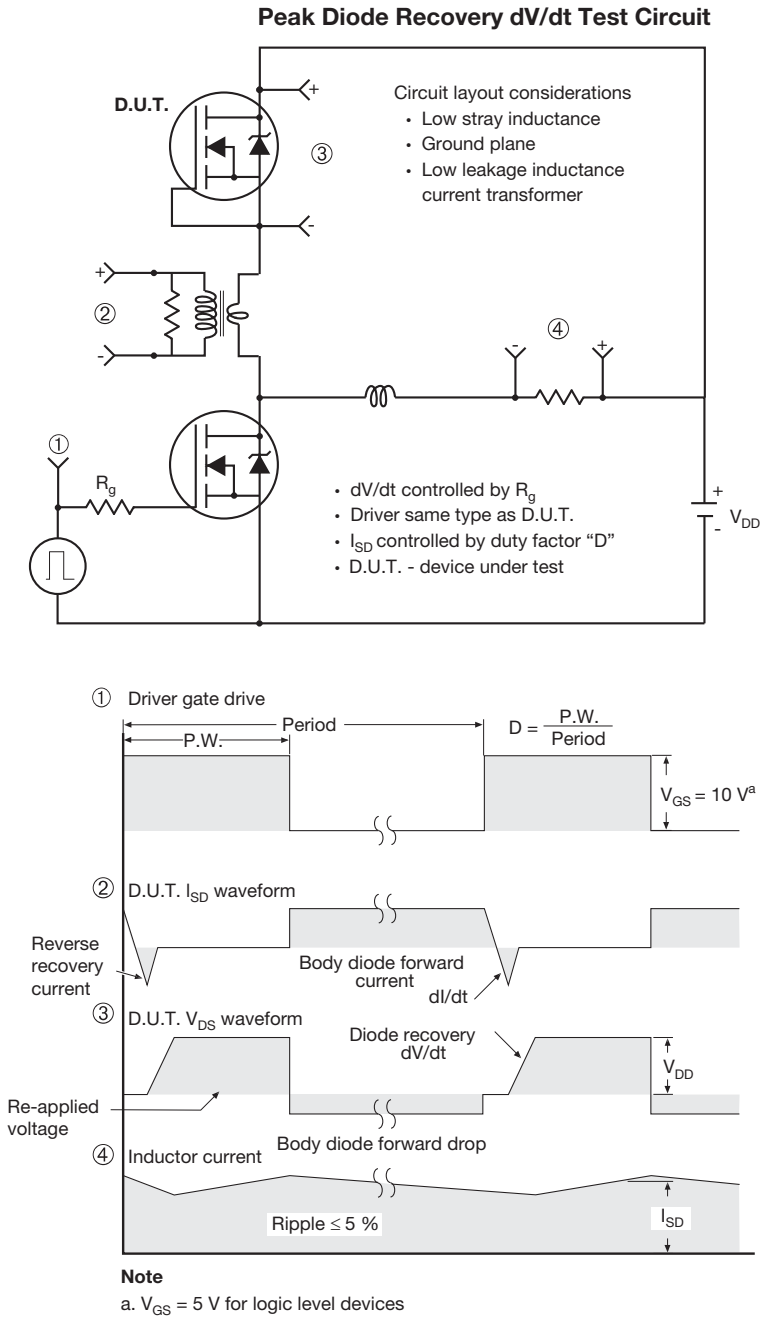



**Fig. 13b - Gate Charge Test**



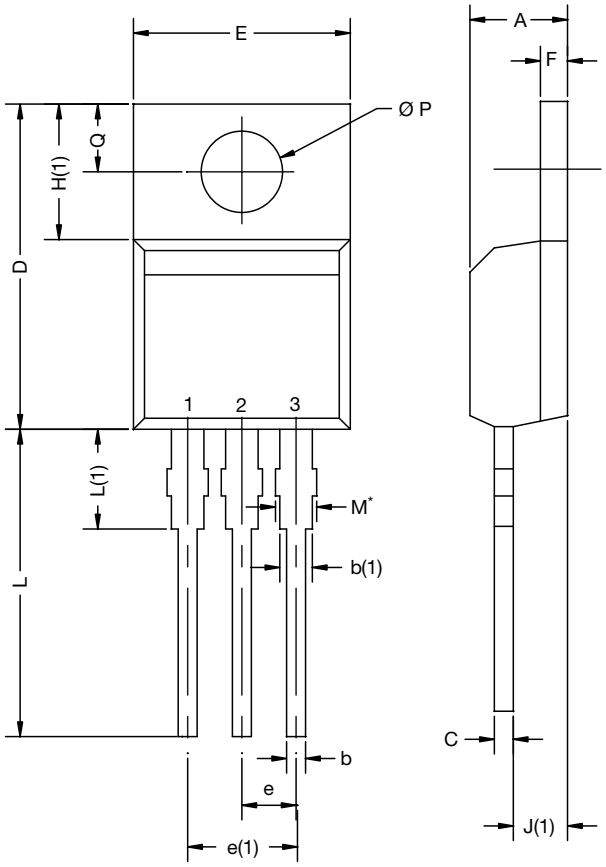

**Note**

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

**Fig. 14 - 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?91290.*

# TO-220-1

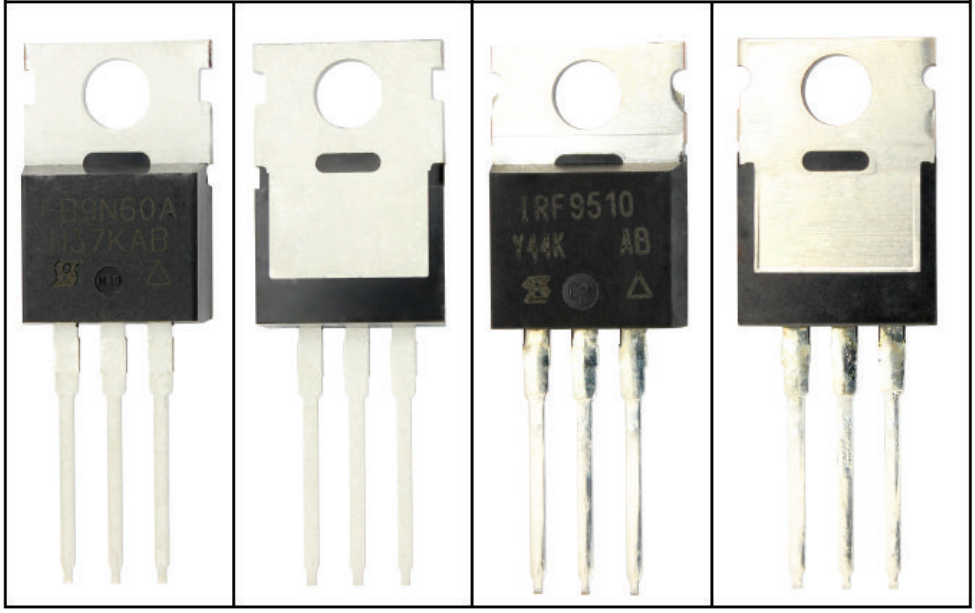



| DIM. | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.24 | 4.65 | 0.167 | 0.183 |
| b | 0.69 | 1.02 | 0.027 | 0.040 |
| b(1) | 1.14 | 1.78 | 0.045 | 0.070 |
| c | 0.36 | 0.61 | 0.014 | 0.024 |
| D | 14.33 | 15.85 | 0.564 | 0.624 |
| E | 9.96 | 10.52 | 0.392 | 0.414 |
| e | 2.41 | 2.67 | 0.095 | 0.105 |
| e(1) | 4.88 | 5.28 | 0.192 | 0.208 |
| F | 1.14 | 1.40 | 0.045 | 0.055 |
| H(1) | 6.10 | 6.71 | 0.240 | 0.264 |
| J(1) | 2.41 | 2.92 | 0.095 | 0.115 |
| L | 13.36 | 14.40 | 0.526 | 0.567 |
| L(1) | 3.33 | 4.04 | 0.131 | 0.159 |
| Ø P | 3.53 | 3.94 | 0.139 | 0.155 |
| Q | 2.54 | 3.00 | 0.100 | 0.118 |
| ECN: X15-0364-Rev. C, 14-Dec-15<br>DWG: 6031 | | | | |

**Note**

- M* = 0.052 inches to 0.064 inches (dimension including protrusion), heatsink hole for HVM

| Package Picture | |
|---|---|
| ASE | Xi'an |



# Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

# X-ON Electronics

Largest Supplier of Electrical and Electronic Components

***Click to view similar products for*** MOSFET ***category:***

***Click to view products by*** Vishay ***manufacturer:***

Other Similar products are found below :

614233C 648584F IRFD120 JANTX2N5237 FCA20N60_F109 FDZ595PZ 2SK2545(Q,T) 405094E 423220D TPCC8103,L1Q(CM MIC4420CM-TR VN1206L SBVS138LT1G 614234A 715780A NTNS3166NZT5G SSM6J414TU,LF(T 751625C BUK954R8-60E DMN3404LQ-7 NTE6400 SQJ402EP-T1-GE3 2SK2614(TE16L1,Q) 2N7002KW-FAI DMN1017UCP3-7 EFC2J004NUZTDG ECH8691-TL-W FCAB21350L1 P85W28HP2F-7071 DMN1053UCP4-7 NTE221 NTE2384 NTE2903 NTE2941 NTE2945 NTE2946 NTE2960 NTE2967 NTE2969 NTE2976 NTE455 NTE6400A NTE2910 NTE2916 NTE2956 NTE2911 DMN2080UCB4-7 TK10A80W,S4X(S SSM6P69NU,LF DMP22D4UFO-7B