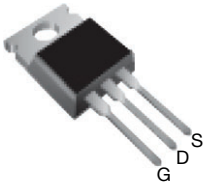
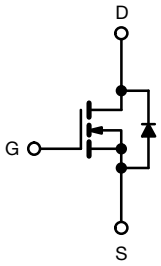
# Power MOSFET

TO-220AB




N-Channel MOSFET

## FEATURES

- Dynamic dV/dt rating
- Logic-level gate drive
- $R_{DS(on)}$ specified at $V_{GS}$ = 4 V and 5 V
- 175 °C operating temperature
- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Available

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

| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) | 60 | |
| $R_{DS(on)}$ (Ω) | $V_{GS}$ = 5.0 V | 0.028 |
| $Q_g$ (Max.) (nC) | 66 | |
| $Q_{gs}$ (nC) | 12 | |
| $Q_{gd}$ (nC) | 43 | |
| Configuration | Single | |

## 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 | IRLZ44PbF |
| Lead (Pb)-free and halogen-free | IRLZ44PbF-BE3 |

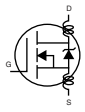
**ABSOLUTE MAXIMUM RATINGS** ($T_C$ = 25 °C, unless otherwise noted)

| PARAMETER | | | SYMBOL | LIMIT | UNIT |
|---|---|---|---|---|---|
| Drain-source voltage | | | $V_{DS}$ | 60 | V |
| Gate-source voltage | | | $V_{GS}$ | ± 10 | |
| Continuous drain current | $V_{GS}$ at 5 V | $T_C$ = 25 °C | $I_D$ | 50 | A |
| | | $T_C$ = 100 °C | | 36 | |
| Pulsed drain current [a] | | | $I_{DM}$ | 200 | |
| Linear derating factor | | | | 1.0 | W/°C |
| Single pulse avalanche energy [b] | | | $E_{AS}$ | 400 | mJ |
| Maximum power dissipation | $T_C$ = 25 °C | | $P_D$ | 150 | 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) [d] | For 10 s | | | 300 | |
| 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 = 179 µH, $R_g$ = 25 Ω, $I_{AS}$ = 51 A (see fig. 12)
c. $I_{SD}$ ≤ 51 A, dV/dt ≤ 250 A/s, $V_{DD}$ ≤ $V_{DS}$, $T_J$ ≤ 175 °C
d. 1.6 mm from case
e. Current limited by the package, (die current = 51 A)

| 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) | $R_{thJC}$ | - | 1.0 | |

| **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 | | - | 0.070 | - | V/°C |
| Gate-source threshold voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | | 1.0 | - | 2.0 | V |
| Gate-source leakage | $I_{GSS}$ | $V_{GS}$ = 10 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 | $R_{DS(on)}$ | $V_{GS}$ = 5.0 V | $I_D$ = 31 A [b] | - | - | 0.028 | Ω |
| | | $V_{GS}$ = 4.0 V | $I_D$ = 25 A [b] | - | - | 0.039 | |
| Forward transconductance | $g_{fs}$ | $V_{DS}$ = 25 V, $I_D$ = 31 A [b] | | 23 | - | - | S |
| **Dynamic** | | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1.0 MHz, see fig. 5 | | - | 3300 | - | pF |
| Output capacitance | $C_{oss}$ | | | - | 1200 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | | - | 200 | - | |
| Total gate charge | $Q_g$ | $V_{GS}$ = 5.0 V | $I_D$ = 51 A, $V_{DS}$ = 48 V, see fig. 6 and 13 [b] | - | - | 66 | nC |
| Gate-source charge | $Q_{gs}$ | | | - | - | 12 | |
| Gate-drain charge | $Q_{gd}$ | | | - | - | 43 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 30 V, $I_D$ = 51 A, $R_g$ = 4.6 Ω, $R_D$ = 0.56 Ω, see fig. 10 [b] | | - | 17 | - | ns |
| Rise time | $t_r$ | | | - | 230 | - | |
| Turn-off delay time | $t_{d(off)}$ | | | - | 42 | - | |
| Fall time | $t_f$ | | | - | 110 | - | |
| 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  | | - | - | 50[c] | A |
| Pulsed diode forward current [a] | $I_{SM}$ | | | - | - | 200 | |
| Body diode voltage | $V_{SD}$ | $T_J$ = 25 °C, $I_S$ = 51 A, $V_{GS}$ = 0 V [b] | | - | - | 2.5 | V |
| Body diode reverse recovery time | $t_{rr}$ | $T_J$ = 25 °C, $I_F$ = 51 A, dI/dt = 100 A/µs [b] | | - | 130 | 180 | ns |
| Body diode reverse recovery charge | $Q_{rr}$ | | | - | 0.84 | 1.3 | µC |
| 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 %
c. Current limited by the package, (die current = 51 A)

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

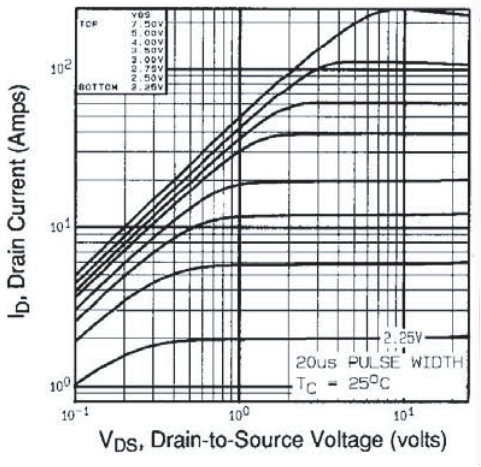



**Fig. 1 - Typical Output Characteristics, $T_C$ = 25 °C**

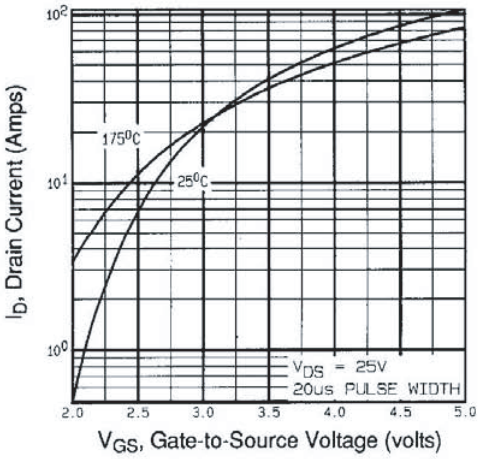



**Fig. 3 - Typical Transfer Characteristics**

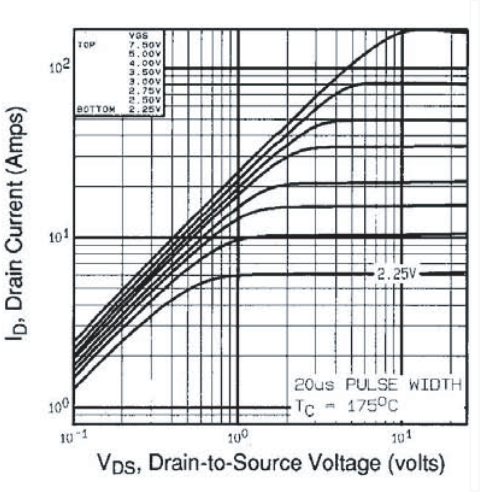



**Fig. 2 - Typical Output Characteristics, $T_C$ = 175 °C**

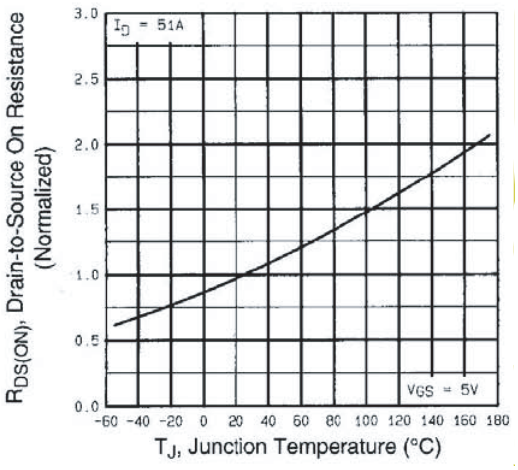



**Fig. 4 - Normalized On-Resistance vs. Temperature**

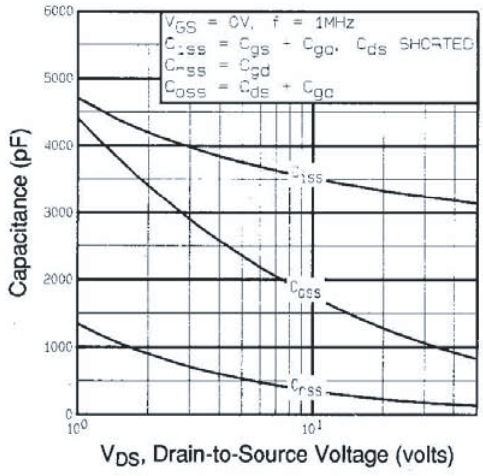



**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**

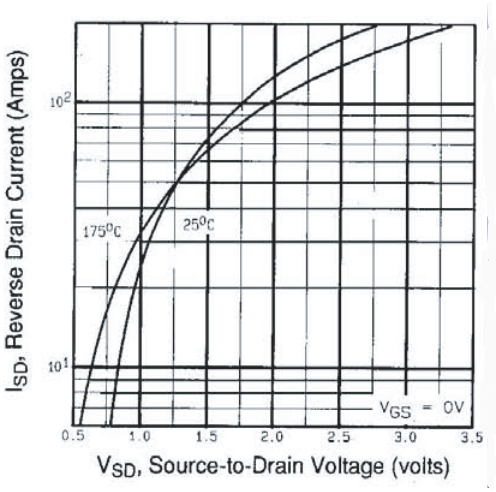



**Fig. 7 - Typical Source-Drain Diode Forward Voltage**

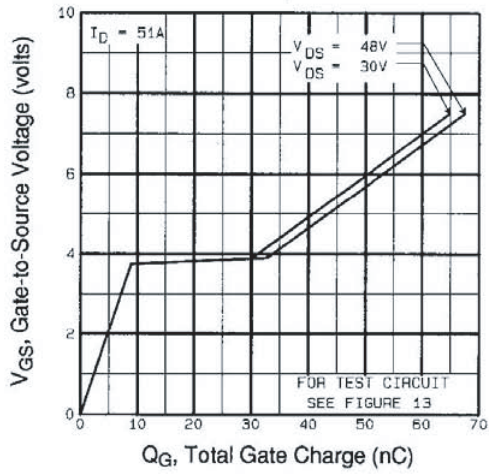



**Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage**

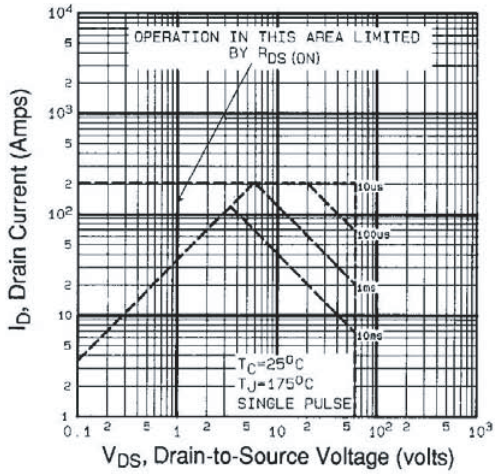



**Fig. 8 - Maximum Safe Operating Area**

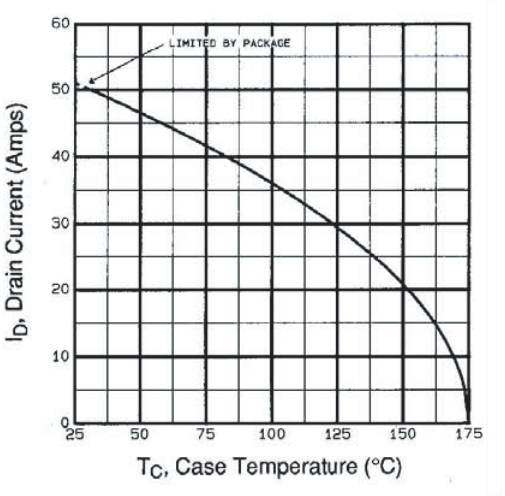



**Fig. 9 - Maximum Drain Current vs. Case Temperature**

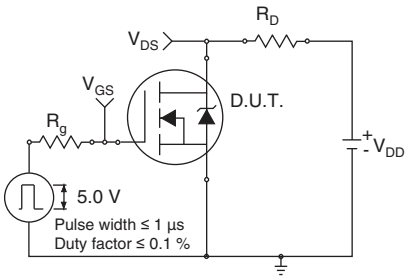



**Fig. 10a - Switching Time Test Circuit**

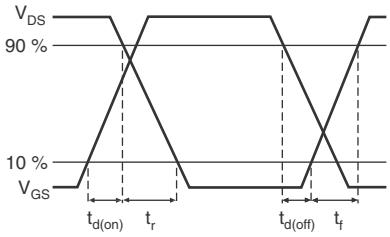



**Fig. 10b - Switching Time Waveforms**

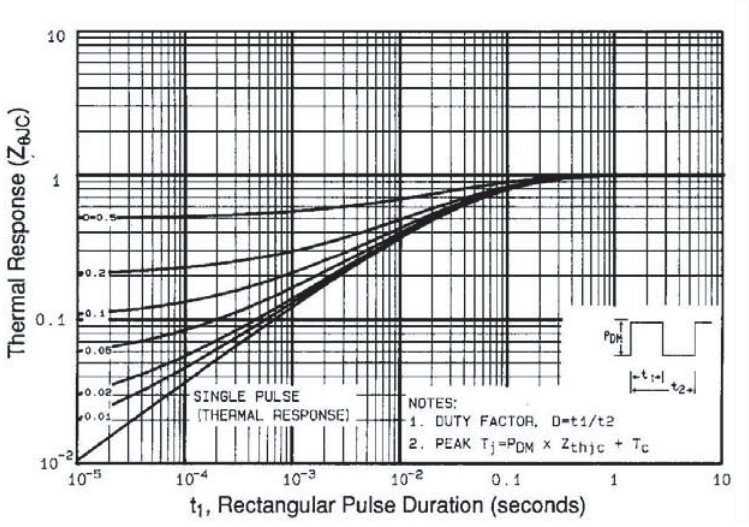



**Fig. 10 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**

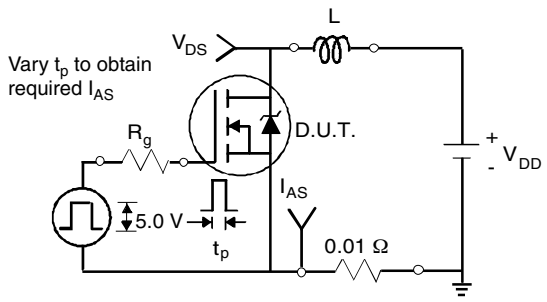



**Fig. 12a - Unclamped Inductive Test Circuit**

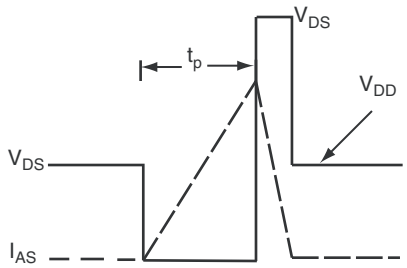



**Fig. 12b - Unclamped Inductive Waveforms**

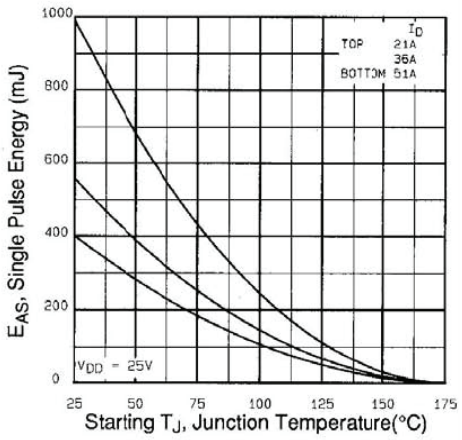



**Fig. 12c - Maximum Avalanche Energy vs. Drain Current**

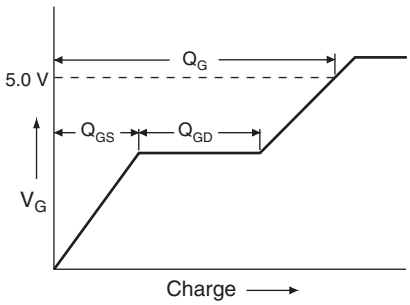



**Fig. 13a - Basic Gate Charge Waveform**

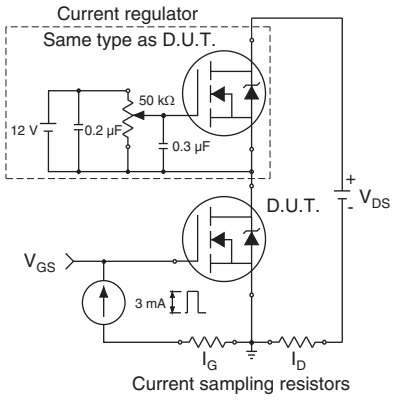
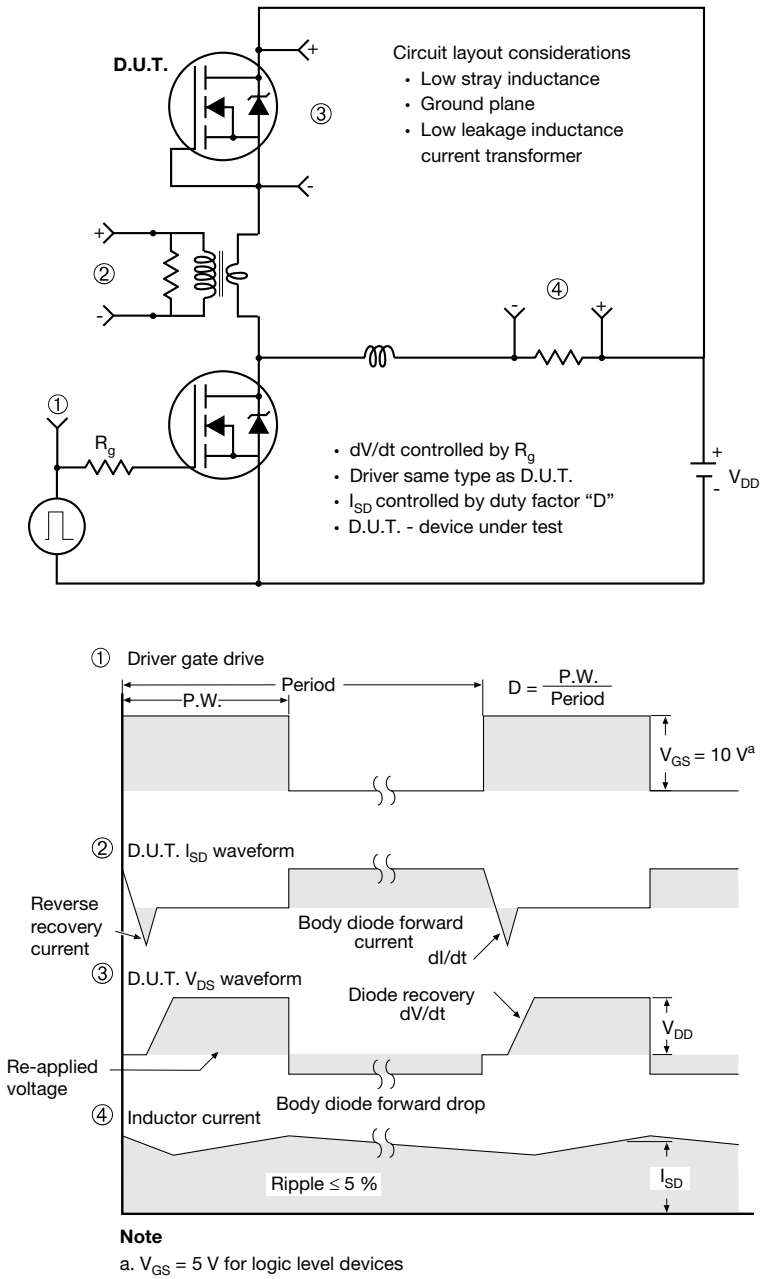



**Fig. 13b - Gate Charge Test Circuit**

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




**Note**

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

**Fig. 11 - For N-Channel**

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