

Power MOSFET

TO-220AB


N-Channel MOSFET

FEATURES

- Dynamic dV/dt rating
- Logic-level gate drive
- $R_{DS(on)}$ specified at $V_{GS} = 4\text{ V}$ and 5 V
- $175\text{ }^{\circ}\text{C}$ operating temperature
- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see 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

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.

PRODUCT SUMMARY

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

ORDERING INFORMATION

| | |
|---------------------------------|---------------|
| Package | TO-220AB |
| Lead (Pb)-free | IRLZ44PbF |
| Lead (Pb)-free and halogen-free | IRLZ44PbF-BE3 |

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^{\circ}\text{C}$, 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

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- $V_{DD} = 25\text{ V}$, starting $T_J = 25\text{ }^{\circ}\text{C}$, $L = 179\text{ }\mu\text{H}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 51\text{ A}$ (see fig. 12)
- $I_{SD} \leq 51\text{ A}$, $dV/dt \leq 250\text{ A/s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 175\text{ }^{\circ}\text{C}$
- 1.6 mm from case
- Current limited by the package, (die current = 51 A)

THERMAL RESISTANCE RATINGS

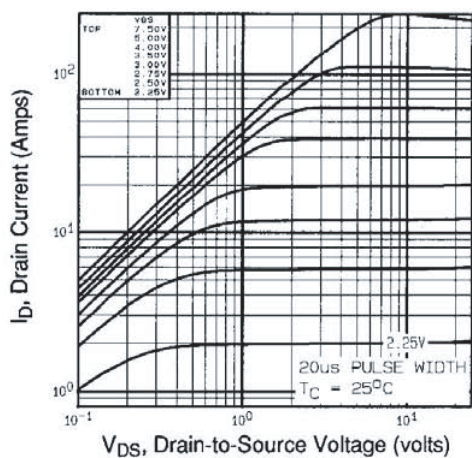
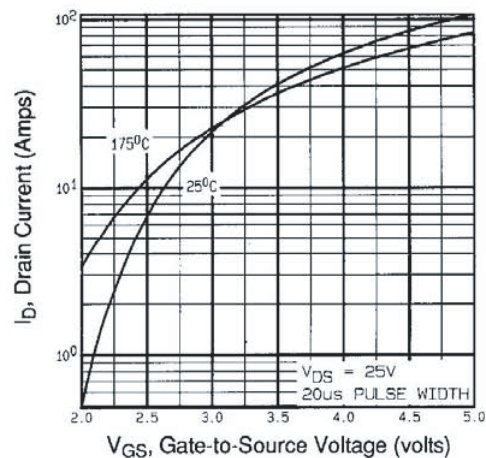
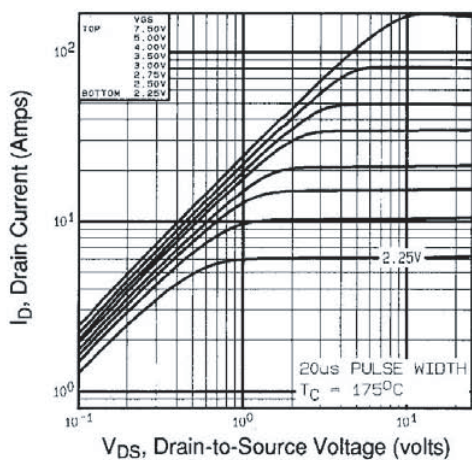
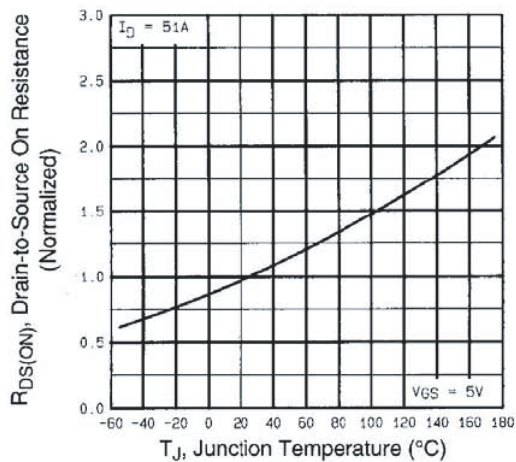
| PARAMETER | SYMBOL | TYP. | MAX. | UNIT |
|-------------------------------------|------------|------|------|------|
| Maximum junction-to-ambient | R_{thJA} | - | 62 | °C/W |
| Case-to-sink, flat, greased surface | R_{thCS} | 0.50 | - | |
| Maximum junction-to-case (drain) | R_{thJC} | - | 1.0 | |

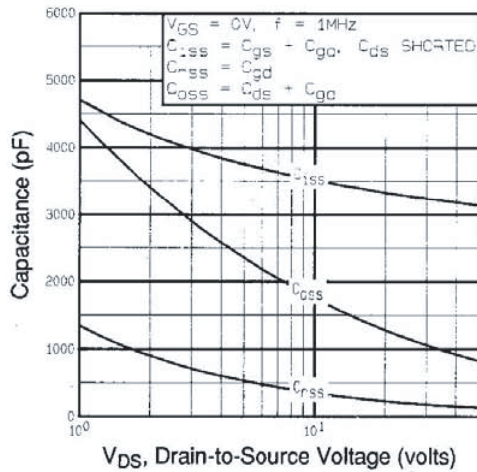
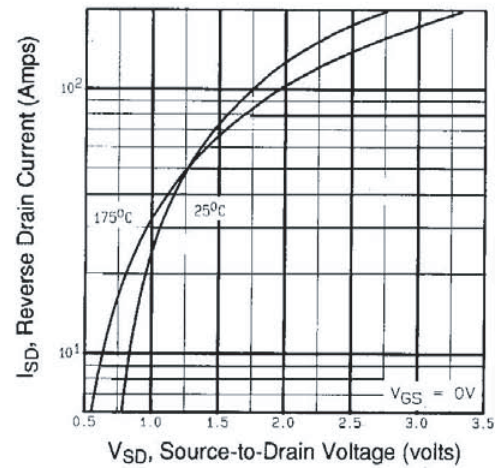
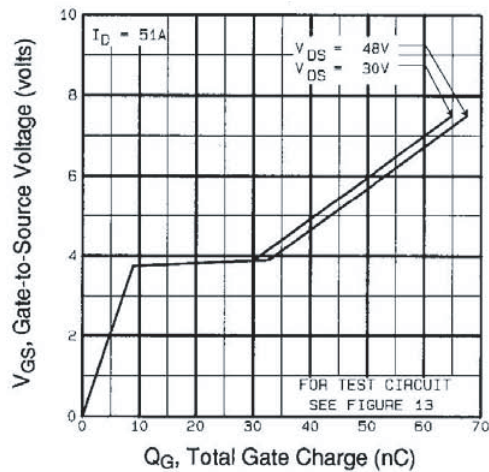
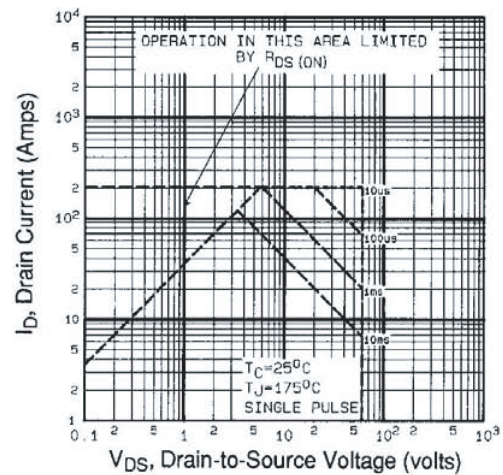
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

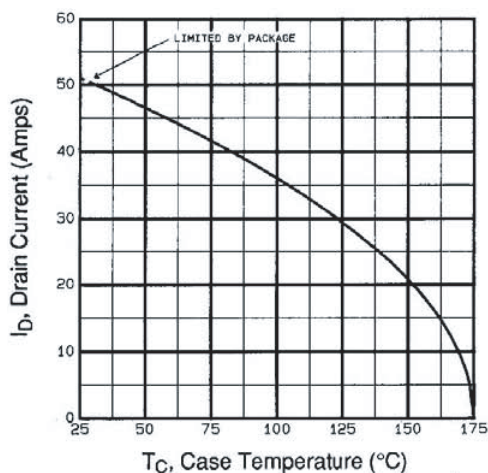
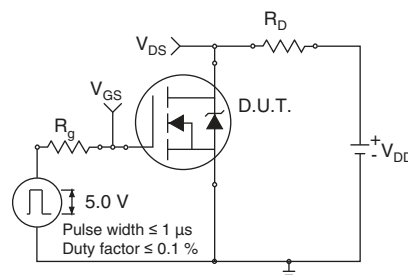
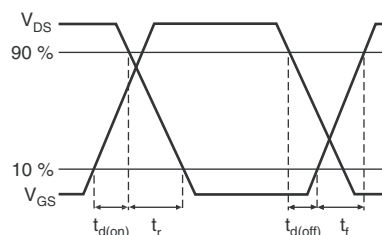
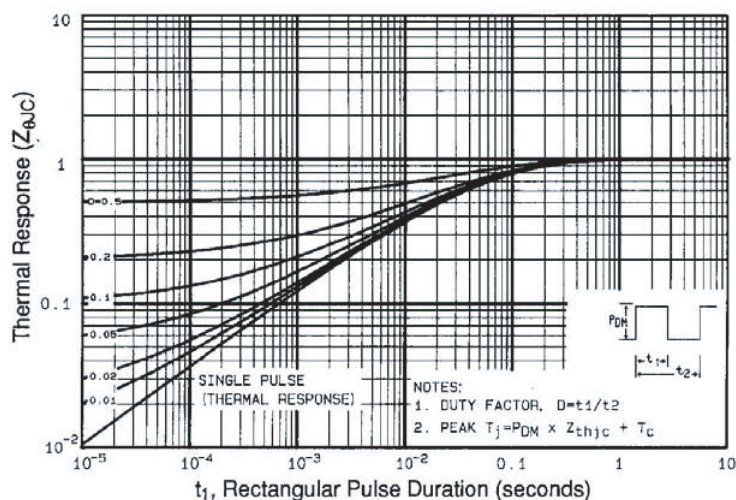
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|----------------------------------|---|--|------|-------|-----------------|------|
| Static | | | | | | | |
| Drain-source breakdown voltage | V _{DS} | V _{GS} = 0 V, I _D = 250 μA | | 60 | - | - | V |
| V _{DS} temperature coefficient | ΔV _{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) | | | | | |

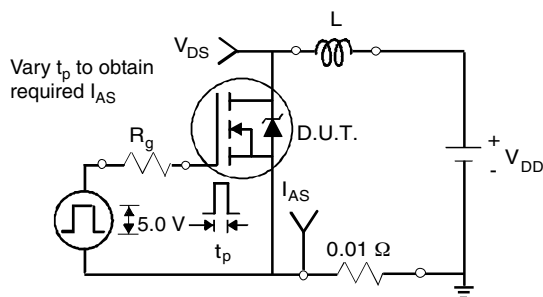
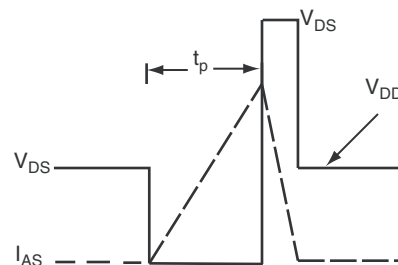
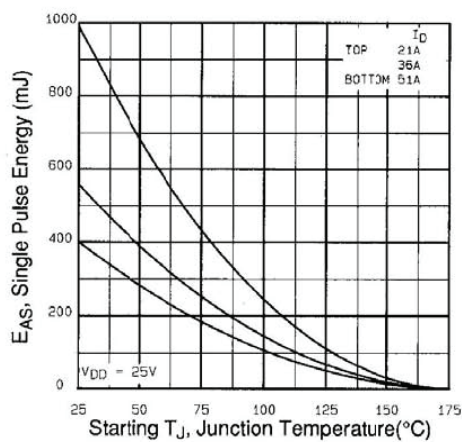
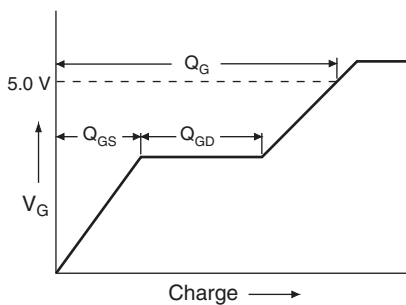
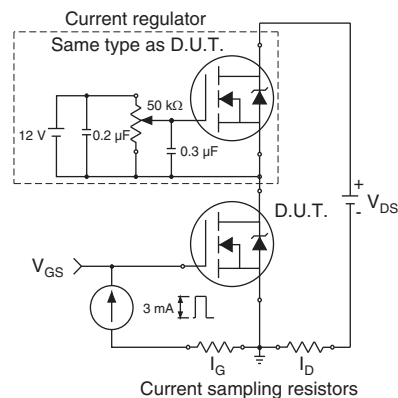
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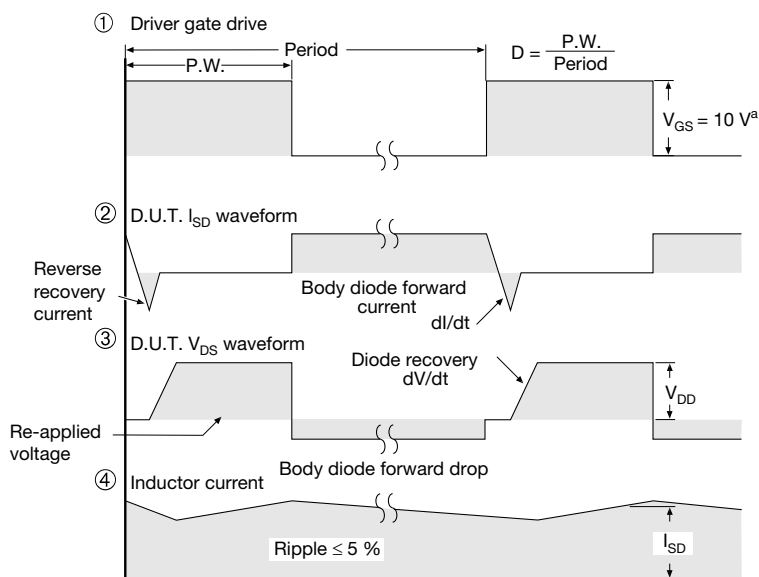
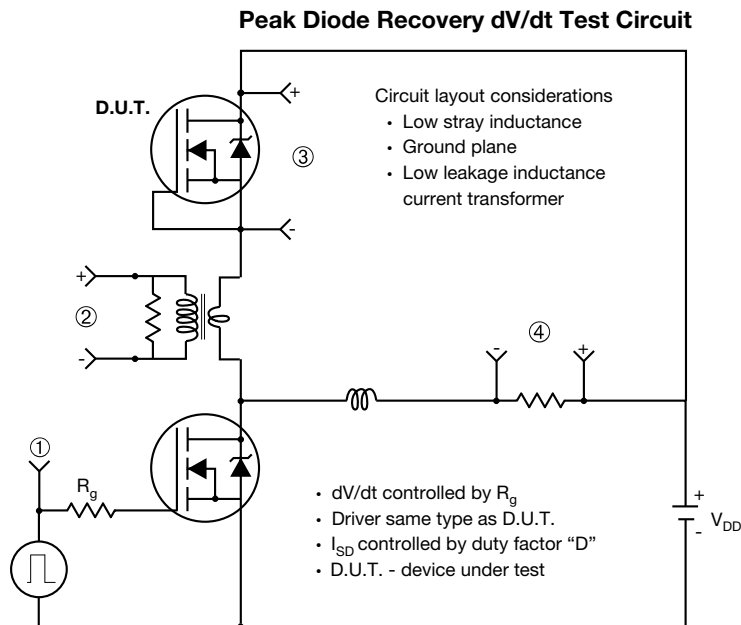
- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$
- Current limited by the package, (die current = 51 A)

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

Fig. 3 - Typical Transfer Characteristics

Fig. 2 - Typical Output Characteristics, $T_C = 175^\circ\text{C}$

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


Note

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

Fig. 11 - For N-Channel

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