# P-Channel 100 V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) Max. | $I_D$ (A)[c] | $Q_g$ (Typ.) |
| - 100 | 0.138 at $V_{GS}$ = - 10 V | - 16.3 | 24 nC |
| | 0.141 at $V_{GS}$ = - 7.5 V | - 16.1 | |
| | 0.142 at $V_{GS}$ = - 6 V | - 16.1 | |

## FEATURES

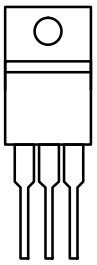
- TrenchFET® Power MOSFET
- 100 % $R_g$ and UIS Tested
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

## APPLICATIONS

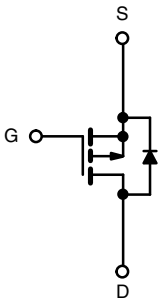
- DC/DC Converters
- Motor Control

**TO-220AB**




Drain connected to Tab

Top View




P-Channel MOSFET

**Ordering Information:**
SUP25P10-138-GE3 (Lead (Pb)-free and Halogen-free)

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

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | - 100 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | |
| Continuous Drain Current ($T_J$ = 150 °C) | $T_C$ = 25 °C | $I_D$ | - 16.3 | A |
| | $T_C$ = 125 °C | | - 7.3 | |
| Pulsed Drain Current (t = 100 µs) | | $I_{DM}$ | - 40 | |
| Avalanche Current | L = 0.1 mH | $I_{AS}$ | - 25 | |
| Single Pulse Avalanche Energy[a] | | $E_{AS}$ | 31.25 | mJ |
| Power Dissipation | $T_C$ = 25 °C | $P_D$ | 73.5[b] | W |
| | $T_A$ = 25 °C | | 3.1 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | - 55 to 150 | °C |

## THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Junction-to-Ambient Free Air | $R_{thJA}$ | 40 | °C/W |
| Junction-to-Case | $R_{thJC}$ | 1.7 | |

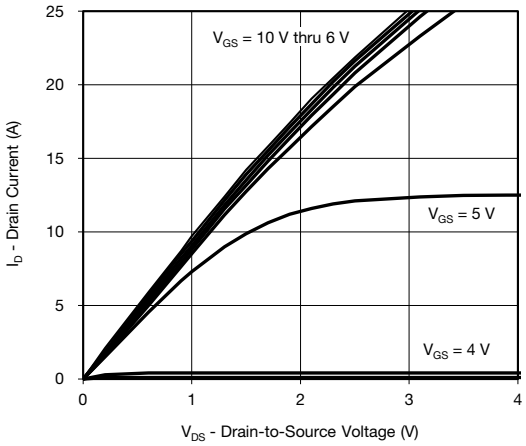
Notes:
a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. $T_C$ = 25 °C

| **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 | - 100 | | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = - 250 µA | - 2 | | - 4 | |
| $V_{DS}$ Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D$ = - 250 µA | | - 105 | | mV/°C |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | $I_D$ = - 250 µA | | 6.6 | | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = - 100 V, $V_{GS}$ = 0 V | | | - 1 | µA |
| | | $V_{DS}$ = - 100 V, $V_{GS}$ = 0 V, $T_J$ = 125 °C | | | - 50 | |
| | | $V_{DS}$ = - 100 V, $V_{GS}$ = 0 V, $T_J$ = 150 °C | | | - 200 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS}$ = - 5 V, $V_{GS}$ = - 10 V | - 20 | | | A |
| Drain-Source On-State Resistance[a] | $R_{DS(on)}$ | $V_{GS}$ = - 10 V, $I_D$ = - 6 A | | 0.115 | 0.138 | Ω |
| | | $V_{GS}$ = - 7.5 V, $I_D$ = - 6 A | | 0.117 | 0.141 | |
| | | $V_{GS}$ = - 6 V, $I_D$ = - 6 A | | 0.118 | 0.142 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = - 15 V, $I_D$ = - 6 A | | 18 | | S |
| **Dynamic[b]** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = - 50 V, f = 1 MHz | | 2110 | | pF |
| Output Capacitance | $C_{oss}$ | | | 105 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 58 | | |
| Total Gate Charge[c] | $Q_g$ | $V_{DS}$ = - 50 V, $V_{GS}$ = - 10 V, $I_D$ = - 6.7 A | | 40 | 60 | nC |
| | | $V_{DS}$ = - 50 V, $V_{GS}$ = - 6 V, $I_D$ = - 6.7 A | | 24 | 36 | |
| Gate-Source Charge[c] | $Q_{gs}$ | | | 12.5 | | |
| Gate-Drain Charge[c] | $Q_{gd}$ | | | 6.7 | | |
| Gate Resistance | $R_g$ | f = 1 MHz | 2 | 8 | 16 | Ω |
| Turn-On Delay Time[c] | $t_{d(on)}$ | $V_{DD}$ = - 50 V, $R_L$ = 10 Ω<br>$I_D \cong$ - 5 A, $V_{GEN}$ = - 10 V, $R_g$ = 1 Ω | | 7 | 14 | ns |
| Rise Time[c] | $t_r$ | | | 12 | 20 | |
| Turn-Off Delay Time[c] | $t_{d(off)}$ | | | 46 | 70 | |
| Fall Time[c] | $t_f$ | | | 40 | 60 | |
| Turn-On Delay Time[c] | $t_{d(on)}$ | $V_{DD}$ = - 50 V, $R_L$ = 10 Ω<br>$I_D \cong$ - 5 A, $V_{GEN}$ = - 4.5 V, $R_g$ = 1 Ω | | 12 | 20 | |
| Rise Time[c] | $t_r$ | | | 105 | 160 | |
| Turn-Off Delay Time[c] | $t_{d(off)}$ | | | 36 | 54 | |
| Fall Time[c] | $t_f$ | | | 34 | 51 | |
| **Source-Drain Diode Ratings and Characteristics** $T_C$ = 25 °C[b] | | | | | | |
| Continuous Current | $I_S$ | | | | - 16.3 | A |
| Pulsed Current (t = 100 µs) | $I_{SM}$ | | | | - 40 | |
| Forward Voltage[a] | $V_{SD}$ | $I_F$ = - 5 A, $V_{GS}$ = 0 V | | - 0.85 | - 1.5 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = - 5 A, dI/dt = 100 A/µs | | 70 | 105 | ns |
| Peak Reverse Recovery Current | $I_{RM(REC)}$ | | | - 7 | - 14 | A |
| Reverse Recovery Charge | $Q_{rr}$ | | | 220 | 330 | nC |

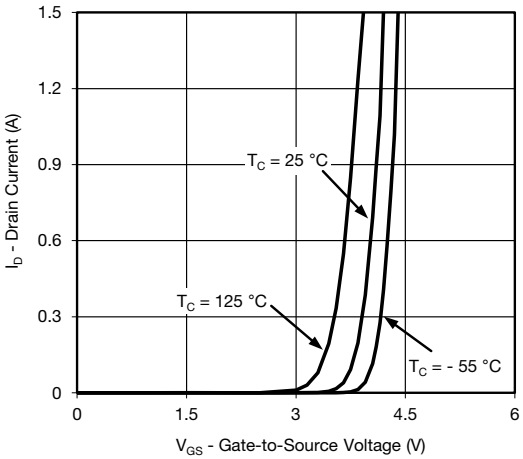
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

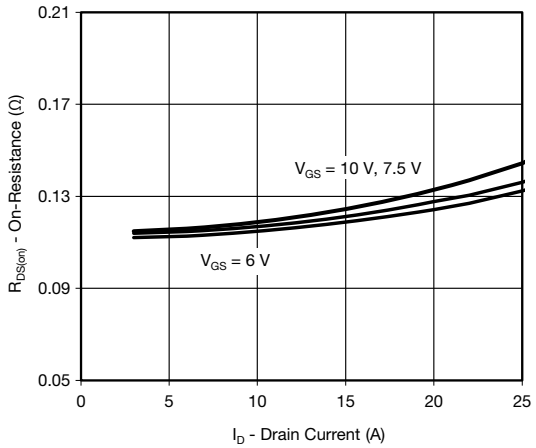
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



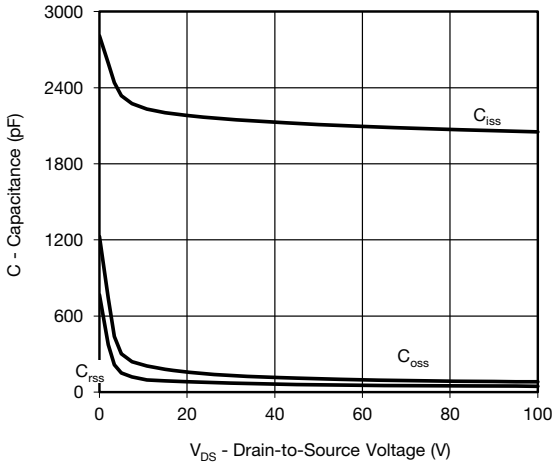

**Output Characteristics**



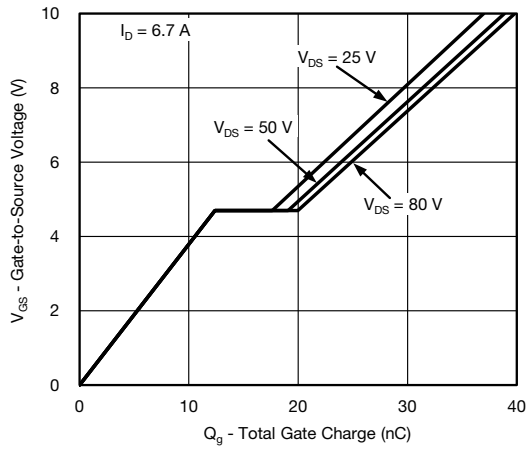

**Transfer Characteristics**



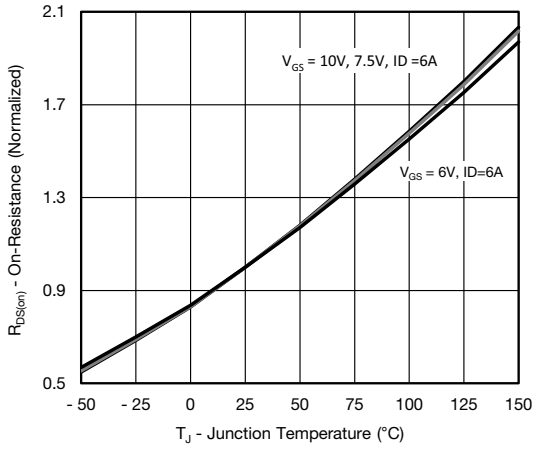

**On-Resistance vs. Drain Current and Gate Voltage**




**Capacitance**

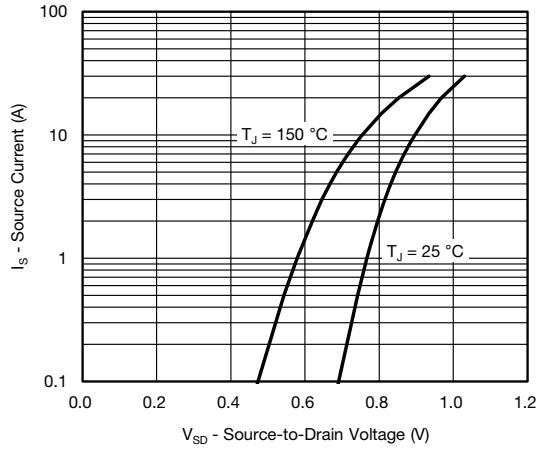



**Gate Charge**

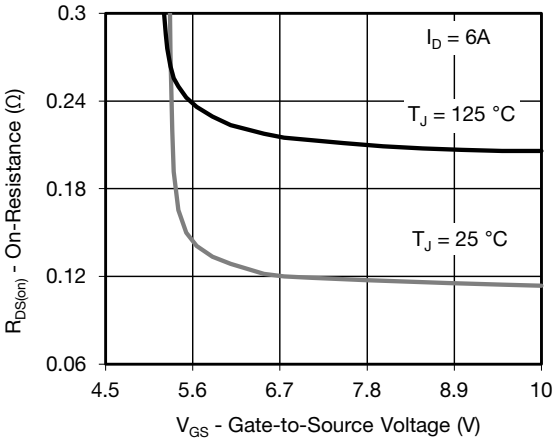



**On-Resistance vs. Junction Temperature**

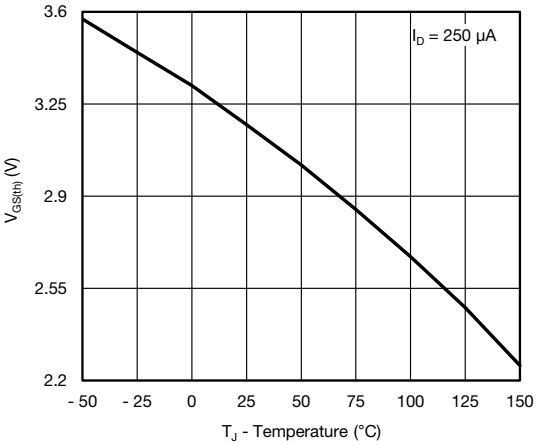
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



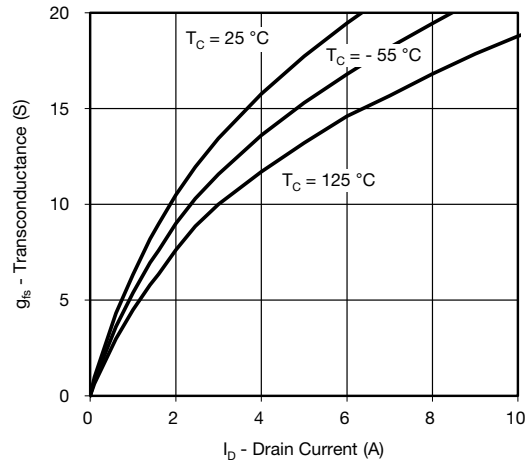

**Source-Drain Diode Forward Voltage**



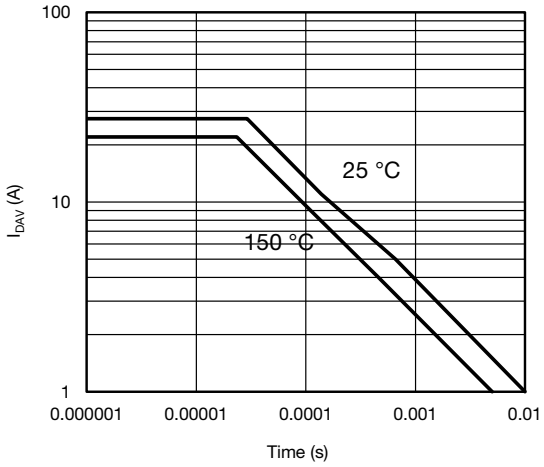

**On-Resistance vs. Gate-to-Source Voltage**



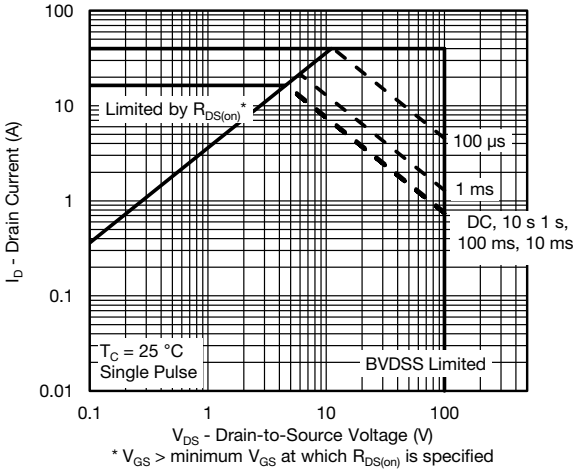

**Threshold Voltage**




**Transconductance**

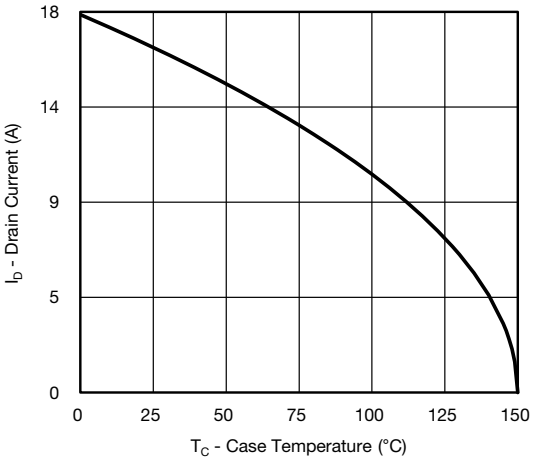



**Single Pulse Avalanche Capability**

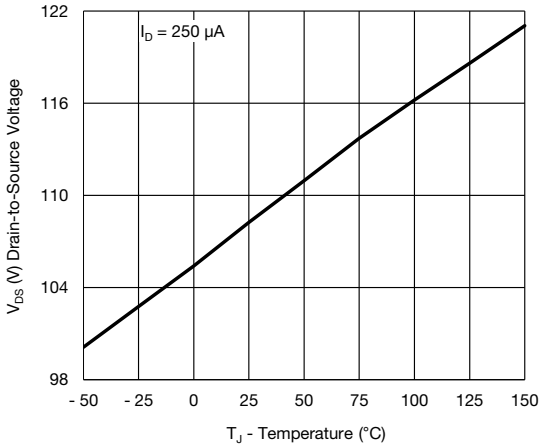



**Safe Operating Area, Junction-to-Case**

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

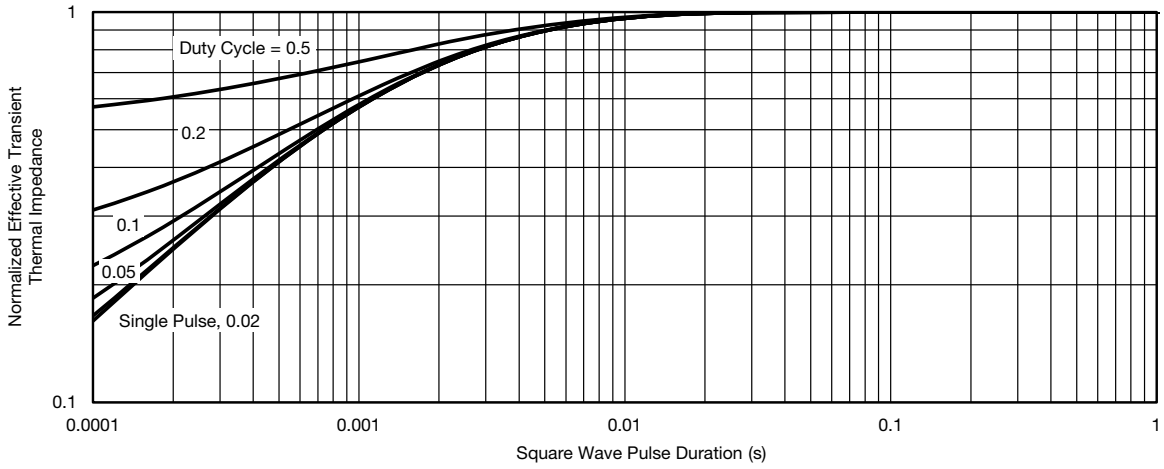



**Current Derating***




**Drain Source Breakdown vs. Junction Temperature**

* The power dissipation $P_D$ is based on $T_{J(max.)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.




**Normalized Thermal Transient Impedance, Junction-to-Case**

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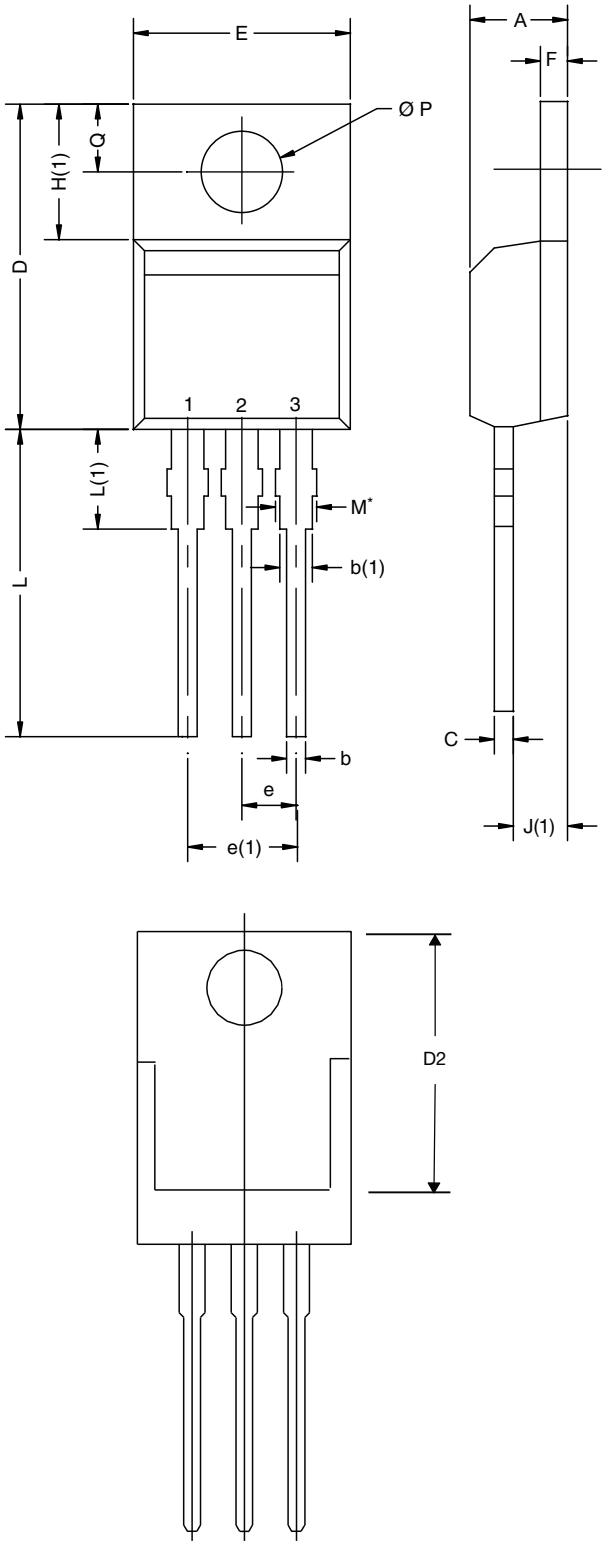
# TO-220AB




| DIM. | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.25 | 4.65 | 0.167 | 0.183 |
| b | 0.69 | 1.01 | 0.027 | 0.040 |
| b(1) | 1.20 | 1.73 | 0.047 | 0.068 |
| c | 0.36 | 0.61 | 0.014 | 0.024 |
| D | 14.85 | 15.49 | 0.585 | 0.610 |
| D2 | 12.19 | 12.70 | 0.480 | 0.500 |
| E | 10.04 | 10.51 | 0.395 | 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) | 6.09 | 6.48 | 0.240 | 0.255 |
| J(1) | 2.41 | 2.92 | 0.095 | 0.115 |
| L | 13.35 | 14.02 | 0.526 | 0.552 |
| L(1) | 3.32 | 3.82 | 0.131 | 0.150 |
| Ø P | 3.54 | 3.94 | 0.139 | 0.155 |
| Q | 2.60 | 3.00 | 0.102 | 0.118 |
| ECN: T14-0413-Rev. P, 16-Jun-14<br>DWG: 5471 | | | | |

**Note**

* M = 1.32 mm to 1.62 mm (dimension including protrusion) Heatsink hole for HVM

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