

QM6020P-VB Datasheet

N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY

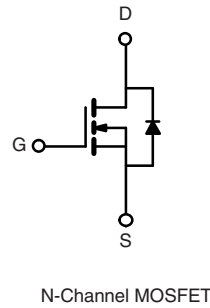
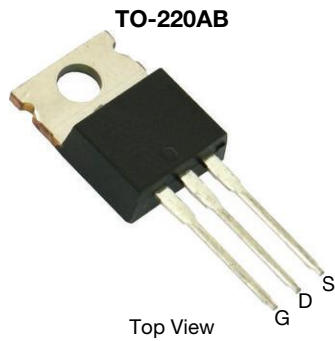
| | |
|---|--------|
| V_{DS} (V) | 60 |
| $R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V | 0.0016 |
| $R_{DS(on)}$ (Ω) at $V_{GS} = 4.5$ V | 0.0020 |
| I_D (A) | 270 |
| Configuration | Single |

FEATURES

- Trench power MOSFET
- Package with low thermal resistance
- 100 % R_g and UIS tested



RoHS
COMPLIANT
HALOGEN
FREE



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

| PARAMETER | SYMBOL | LIMIT | UNIT |
|--|----------------|------------------|------------------|
| Drain-Source Voltage | V_{DS} | 60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | |
| Continuous Drain Current | I_D | 270 | A |
| | | 120 ^a | |
| Continuous Source Current (Diode Conduction) | I_S | 120 ^a | |
| Pulsed Drain Current ^b | I_{DM} | 600 | |
| Single Pulse Avalanche Current | I_{AS} | 75 | mJ |
| Single Pulse Avalanche Energy | E_{AS} | 281 | |
| Maximum Power Dissipation ^b | P_D | 375 | W |
| | | 125 | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ |

THERMAL RESISTANCE RATINGS

| PARAMETER | SYMBOL | LIMIT | UNIT |
|--------------------------|------------|-------|--------------------|
| Junction-to-Ambient | R_{thJA} | 40 | $^\circ\text{C/W}$ |
| Junction-to-Case (Drain) | R_{thJC} | 0.4 | |

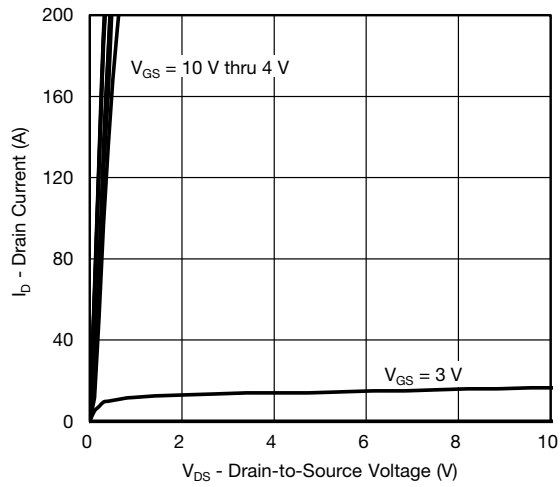
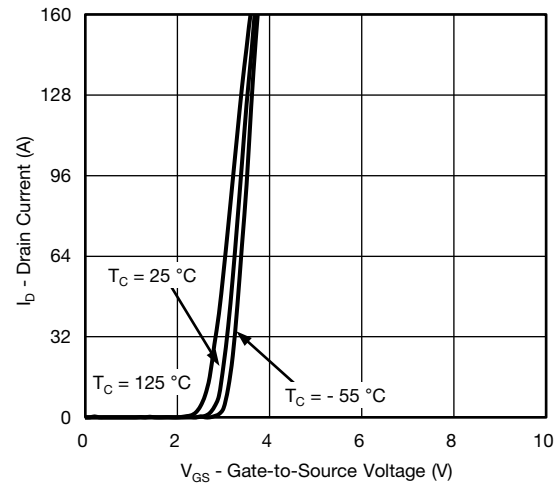
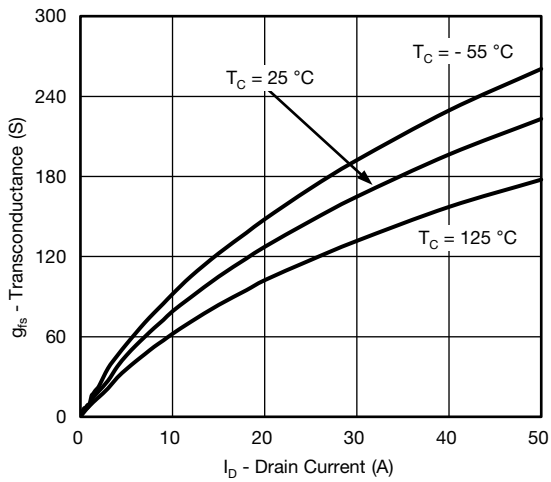
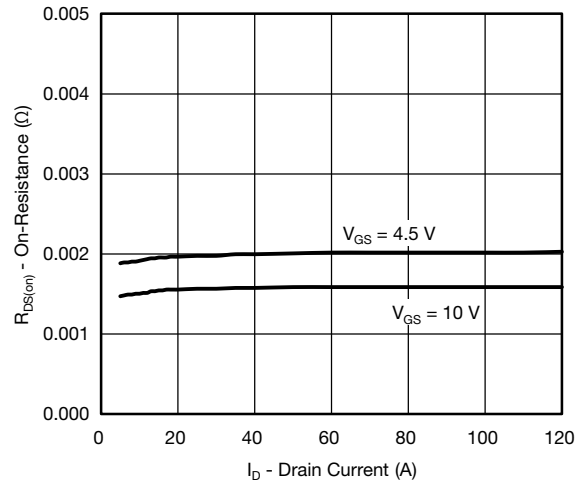
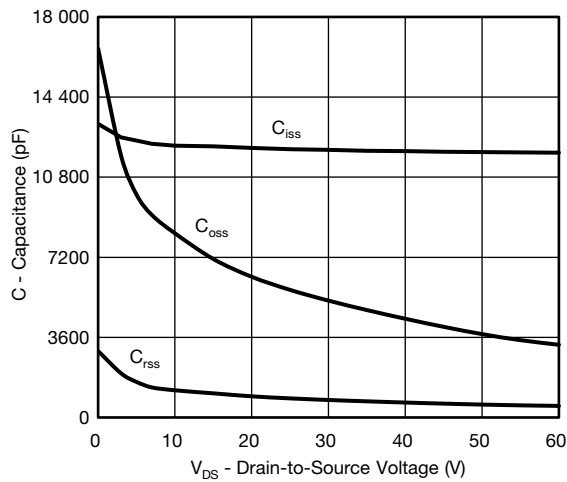
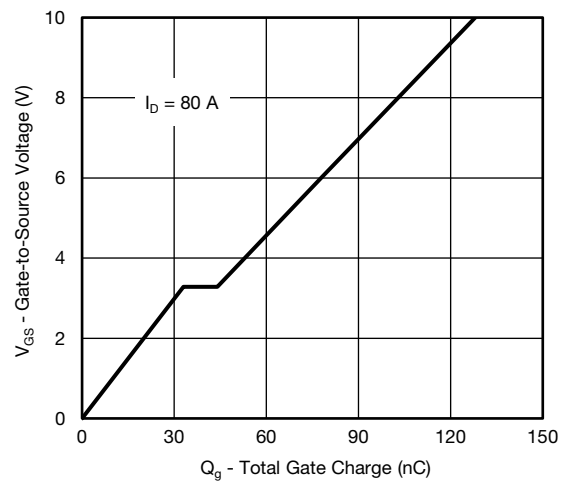
Notes

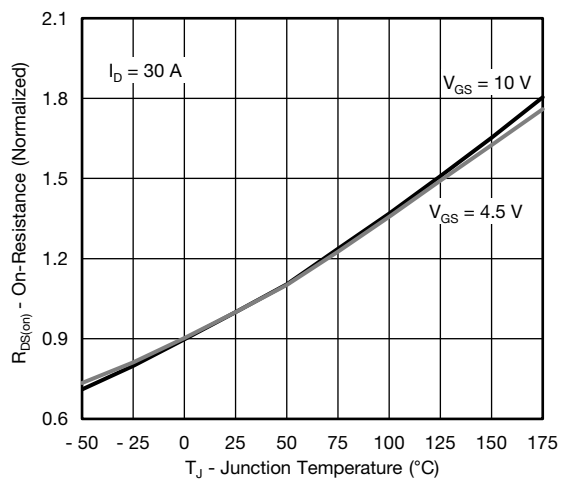
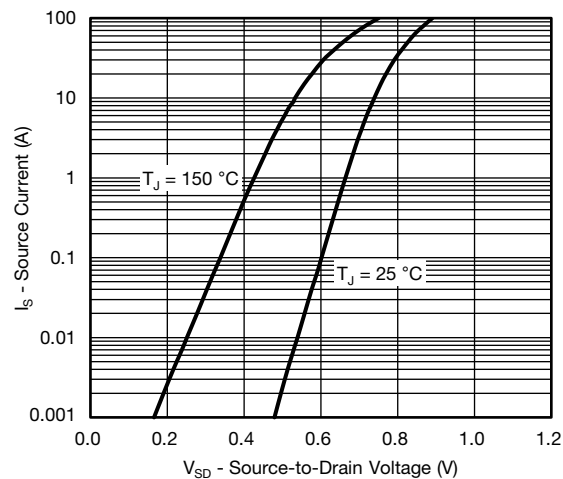
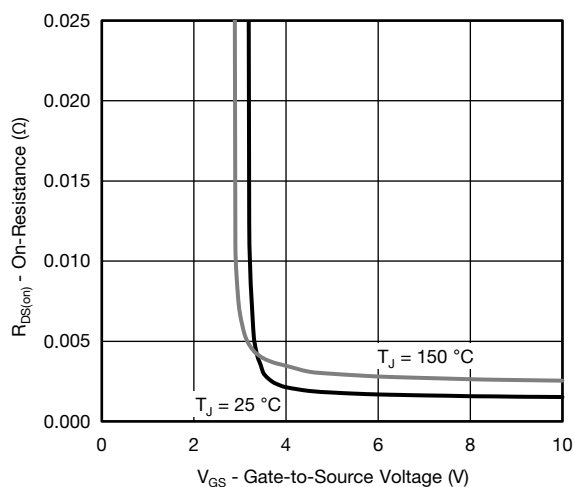
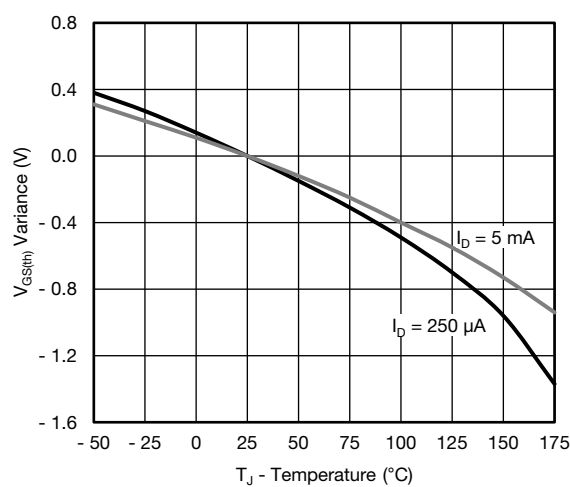
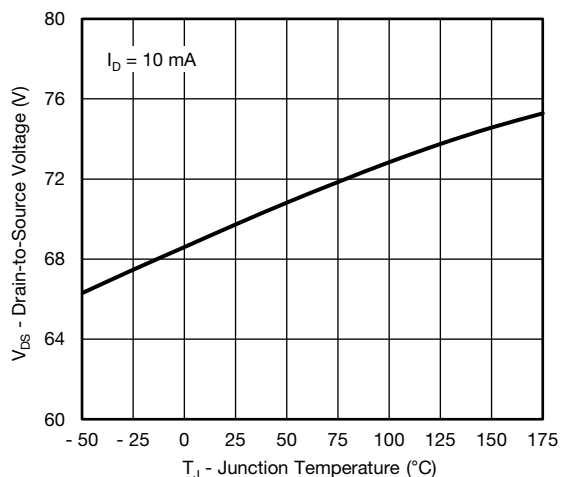
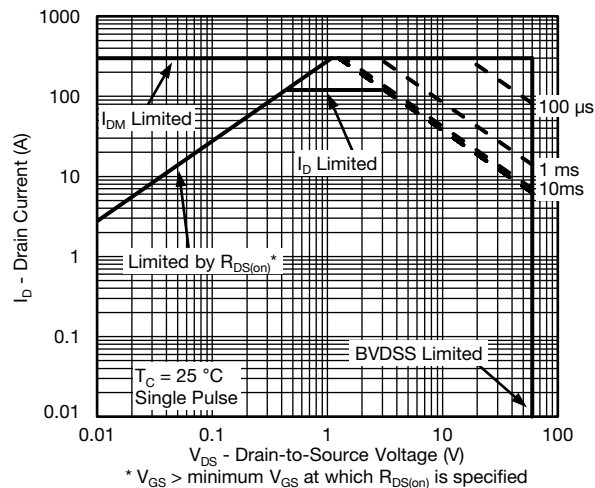
- Package limited.
- Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
- When mounted on 1" square PCB (FR4 material).

| SPECIFICATIONS (T _C = 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 |
| Gate-Source Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | | 1.5 | 2.0 | 2.5 | |
| Gate-Source Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V | V _{DS} = 60 V | - | - | 1 | μA |
| | | V _{GS} = 0 V | V _{DS} = 60 V, T _J = 125 °C | - | - | 50 | |
| | | V _{GS} = 0 V | V _{DS} = 60 V, T _J = 175 °C | - | - | 1.5 | mA |
| On-State Drain Current ^a | I _{D(on)} | V _{GS} = 10 V | V _{DS} ≥ 5 V | 120 | - | - | A |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | V _{GS} = 10 V | I _D = 30 A | - | 0.0016 | - | Ω |
| | | V _{GS} = 10 V | I _D = 30 A, T _J = 125 °C | - | 0.0031 | - | |
| | | V _{GS} = 10 V | I _D = 30 A, T _J = 175 °C | - | 0.0037 | - | |
| | | V _{GS} = 4.5 V | I _D = 20 A | - | 0.0020 | - | |
| Forward Transconductance ^b | g _{fs} | V _{DS} = 15 V, I _D = 30 A | | - | 164 | - | S |
| Dynamic ^b | | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} = 0 V | V _{DS} = 25 V, f = 1 MHz | - | 12 060 | 15 100 | pF |
| Output Capacitance | C _{oss} | | | - | 5750 | 7200 | |
| Reverse Transfer Capacitance | C _{rss} | | | - | 860 | 1100 | |
| Total Gate Charge ^c | Q _g | V _{GS} = 10 V | V _{DS} = 30 V, I _D = 80 A | - | 128 | 200 | nC |
| Gate-Source Charge ^c | Q _{gs} | | | - | 33 | - | |
| Gate-Drain Charge ^c | Q _{gd} | | | - | 11 | - | |
| Gate Resistance | R _g | f = 1 MHz | | 0.8 | 1.68 | 2.6 | Ω |
| Turn-On Delay Time ^c | t _{d(on)} | V _{DD} = 30 V, R _L = 0.375 Ω I _D ≅ 80 A, V _{GEN} = 10 V, R _g = 1 Ω | | - | 20 | 25 | ns |
| Rise Time ^c | t _r | | | - | 15 | 40 | |
| Turn-Off Delay Time ^c | t _{d(off)} | | | - | 65 | 100 | |
| Fall Time ^c | t _f | | | - | 12 | 20 | |
| Source-Drain Diode Ratings and Characteristics ^b | | | | | | | |
| Pulsed Current ^a | I _{SM} | | | - | - | 300 | A |
| Forward Voltage | V _{SD} | I _F = 80 A, V _{GS} = 0 V | | - | 0.88 | 1.5 | V |

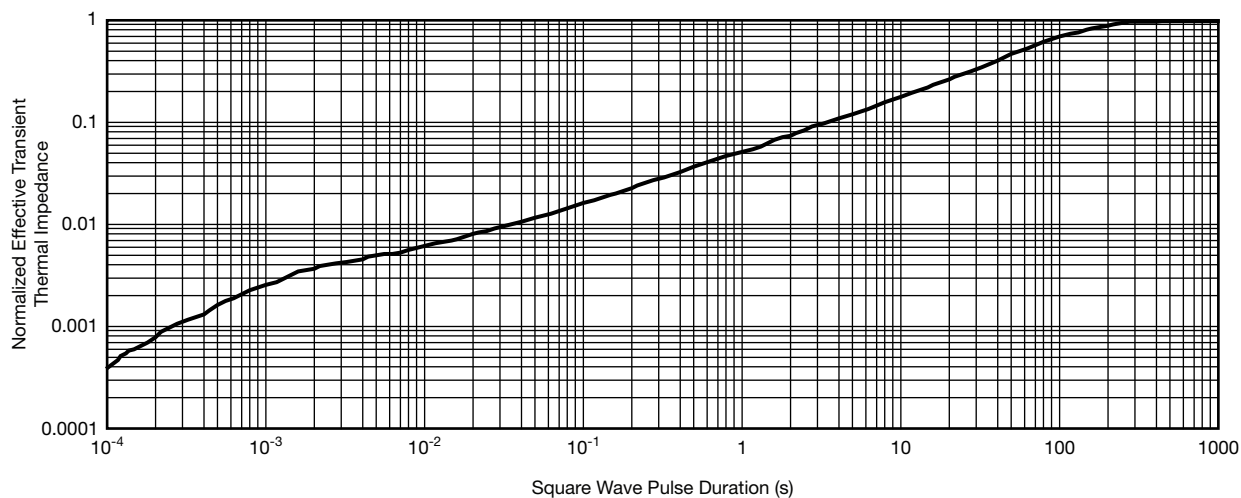
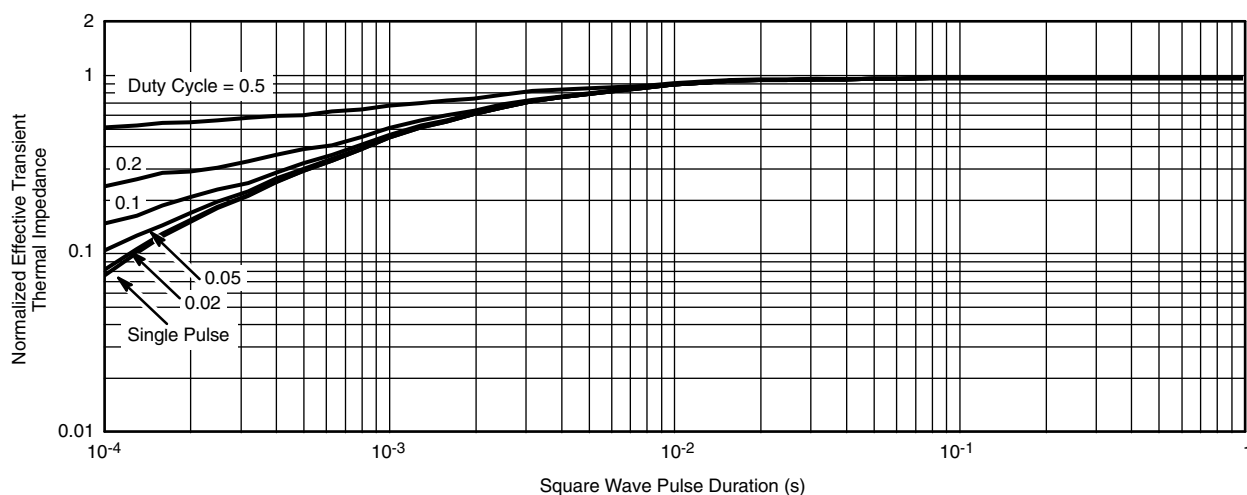
Notes

- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.
 c. Independent of operating temperature.

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance

Gate Charge

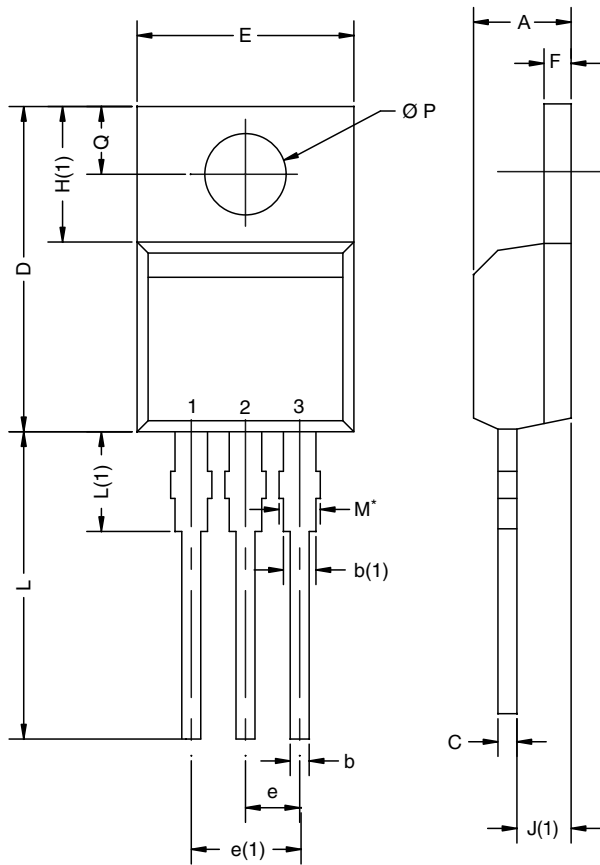
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

On-Resistance vs. Junction Temperature

Source Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Threshold Voltage

Drain Source Breakdown vs. Junction Temperature

Safe Operating Area

* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

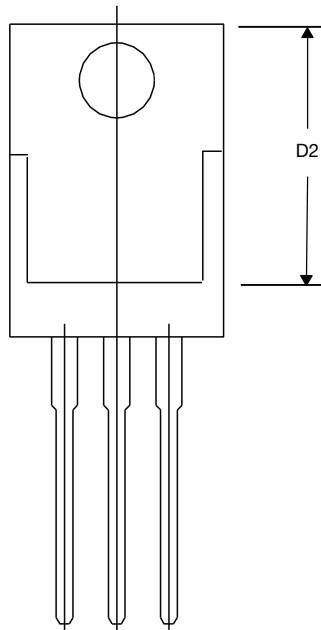
THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case
Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Case ($25\text{ }^{\circ}\text{C}$)
- are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.


TO-220AB



| DIM. | | INCHES | | MILLIMETERS | |
|---------------------------------|------------|-----------|-------|-------------|--------|
| | | MIN. | MAX. | MIN. | MAX. |
| A | | 0.160 | 0.190 | 4.064 | 4.826 |
| b | | 0.020 | 0.039 | 0.508 | 0.990 |
| b1 | | 0.020 | 0.035 | 0.508 | 0.889 |
| b2 | | 0.045 | 0.055 | 1.143 | 1.397 |
| c* | Thin lead | 0.013 | 0.018 | 0.330 | 0.457 |
| | Thick lead | 0.023 | 0.028 | 0.584 | 0.711 |
| c1 | Thin lead | 0.013 | 0.017 | 0.330 | 0.431 |
| | Thick lead | 0.023 | 0.027 | 0.584 | 0.685 |
| c2 | | 0.045 | 0.055 | 1.143 | 1.397 |
| D | | 0.340 | 0.380 | 8.636 | 9.652 |
| D1 | | 0.220 | 0.240 | 5.588 | 6.096 |
| D2 | | 0.038 | 0.042 | 0.965 | 1.067 |
| D3 | | 0.045 | 0.055 | 1.143 | 1.397 |
| D4 | | 0.044 | 0.052 | 1.118 | 1.321 |
| E | | 0.380 | 0.410 | 9.652 | 10.414 |
| E1 | | 0.245 | - | 6.223 | - |
| E2 | | 0.355 | 0.375 | 9.017 | 9.525 |
| E3 | | 0.072 | 0.078 | 1.829 | 1.981 |
| e | | 0.100 BSC | | 2.54 BSC | |
| K | | 0.045 | 0.055 | 1.143 | 1.397 |
| L | | 0.575 | 0.625 | 14.605 | 15.875 |
| L1 | | 0.090 | 0.110 | 2.286 | 2.794 |
| L2 | | 0.040 | 0.055 | 1.016 | 1.397 |
| L3 | | 0.050 | 0.070 | 1.270 | 1.778 |
| L4 | | 0.010 BSC | | 0.254 BSC | |
| M | | - | 0.002 | - | 0.050 |
| ECN: T13-0707-Rev. K, 30-Sep-13 | | | | | |
| DWG: 5843 | | | | | |



Notes

- Plane B includes maximum features of heat sink tab and plastic.
- No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- Pin-to-pin coplanarity max. 4 mils.
- *: Thin lead is for SUB, SYB.
Thick lead is for SUM, SYM, SQM.
- Use inches as the primary measurement.
-  This feature is for thick lead.

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