

APM2701AC-VB Datasheet

N- and P-Channel 20V (D-S) MOSFET

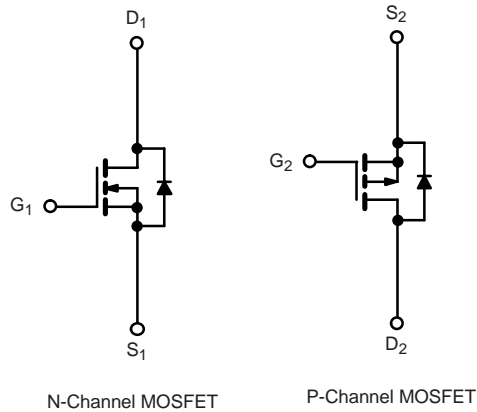
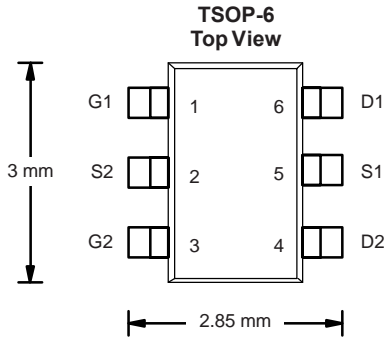
| PRODUCT SUMMARY | | | |
|-----------------|---------------------|------------------------------------|--------------------|
| | V _{DS} (V) | R _{DS(on)} (Ω) | I _D (A) |
| N-Channel | 20 | 0.022 at V _{GS} = 10 V | 5.5 |
| | | 0.036 at V _{GS} = 4.5 V | 4.2 |
| P-Channel | - 20 | 0.030 at V _{GS} = - 10 V | - 3.4 |
| | | 0.079 at V _{GS} = - 4.5 V | - 2.5 |

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available



| ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted | | | | | |
|---|-----------------------------------|------------------------|-----------|-------|---|
| Parameter | Symbol | N-Channel | P-Channel | Unit | |
| Drain-Source Voltage | V _{DS} | 20 | - 20 | V | |
| Gate-Source Voltage | V _{GS} | ± 20 | ± 20 | | |
| Continuous Drain Current (T _J = 150 °C) ^{a, b} | I _D | T _A = 25 °C | 5.5 | - 3.4 | A |
| | | T _A = 70 °C | 4.0 | - 2.3 | |
| Pulsed Drain Current | I _{DM} | 15 | 10 | | |
| Continuous Source Current (Diode Conduction) ^{a, b} | I _S | 1.05 | - 1.05 | | |
| Maximum Power Dissipation ^{a, b} | P _D | T _A = 25 °C | 1.15 | | W |
| | | T _A = 70 °C | 0.73 | | |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | - 55 to 150 | | °C | |

| THERMAL RESISTANCE RATINGS | | | | | |
|--|--------------|-------------------|---------|---------|------|
| Parameter | | Symbol | Typical | Maximum | Unit |
| Maximum Junction-to-Ambient ^a | t ≤ 5 s | R _{thJA} | 93 | 110 | °C/W |
| | Steady State | | 130 | 150 | |
| Maximum Junction-to-Lead | Steady State | R _{thJL} | 75 | 90 | |

Notes:

a. Surface Mounted on FR4 board.

b. t ≤ 5 s.

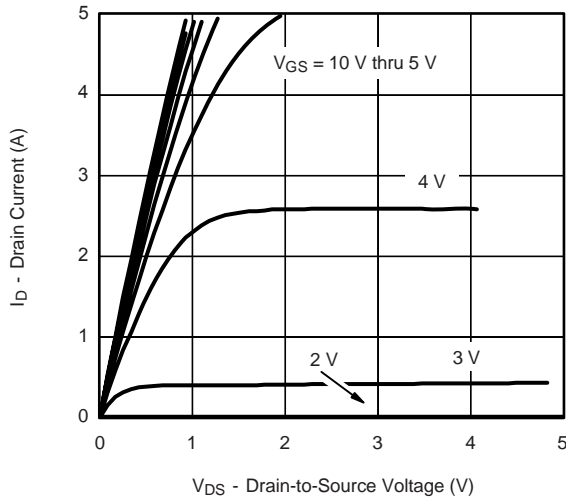
| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | | |
|--|--------------|---|--------------|----------|----------|------------------------|---------------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit | |
| Static | | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | N-Ch | 0.6 | | | V |
| | | $V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$ | P-Ch | -0.7 | | | |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\ \text{V}, V_{GS} = \pm 20\ \text{V}$ | N-Ch P-Ch | | | ± 100 ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 24\ \text{V}, V_{GS} = 0\ \text{V}$ | N-Ch | | | 1 | μA |
| | | $V_{DS} = -24\ \text{V}, V_{GS} = 0\ \text{V}$ | P-Ch | | | -1 | |
| | | $V_{DS} = 24\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$ | N-Ch | | | 5 | |
| | | $V_{DS} = -24\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$ | P-Ch | | | -5 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} = 5\ \text{V}, V_{GS} = 10\ \text{V}$ | N-Ch | 3.7 | | | A |
| | | $V_{DS} = -5\ \text{V}, V_{GS} = -10\ \text{V}$ | P-Ch | -3 | | | |
| Drain-Source On-State Resistance ^a | $R_{DS(on)}$ | $V_{GS} = 10\ \text{V}, I_D = 2.5\ \text{A}$ | N-Ch | | 0.022 | | Ω |
| | | $V_{GS} = -10\ \text{V}, I_D = -1.8\ \text{A}$ | P-Ch | | 0.055 | | |
| | | $V_{GS} = 4.5\ \text{V}, I_D = 2.0\ \text{A}$ | N-Ch | | 0.030 | | |
| | | $V_{GS} = -4.5\ \text{V}, I_D = -1.2\ \text{A}$ | P-Ch | | 0.079 | | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = 10\ \text{V}, I_D = 2.5\ \text{A}$ | N-Ch | | 4.3 | | S |
| | | $V_{DS} = -15\ \text{V}, I_D = -1.8\ \text{A}$ | P-Ch | | 2.4 | | |
| Diode Forward Voltage ^a | V_{SD} | $I_S = 1.05\ \text{A}, V_{GS} = 0\ \text{V}$ | N-Ch | | 0.81 | 1.10 | V |
| | | $I_S = -1.05\ \text{A}, V_{GS} = 0\ \text{V}$ | P-Ch | | -0.83 | -1.10 | |
| Dynamic^b | | | | | | | |
| Total Gate Charge | Q_g | N-Channel $V_{DS} = 15\ \text{V}, V_{GS} = 5\ \text{V}, I_D = 1.8\ \text{A}$ | N-Ch | | 2.1 | 3.2 | nC |
| Gate-Source Charge | Q_{gs} | | P-Ch | | 2.4 | 3.6 | |
| Gate-Drain Charge | Q_{gd} | P-Channel $V_{DS} = -15\ \text{V}, V_{GS} = -5\ \text{V}, I_D = -1.8\ \text{A}$ | N-Ch | | 0.7 | | |
| | | | P-Ch | | 0.9 | | |
| Gate Resistance | R_g | | N-Ch P-Ch | 0.5 3 | | 2.4 11 | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | N-Channel $V_{DD} = 15\ \text{V}, R_L = 15\ \Omega$ $I_D \cong 1\ \text{A}, V_{GEN} = 10\ \text{V}, R_g = 6\ \Omega$ | N-Ch P-Ch | | 7 8 | 11 12 | ns |
| Rise Time | t_r | | N-Ch P-Ch | | 9 12 | 14 18 | |
| Turn-Off Delay Time | $t_{d(off)}$ | P-Channel $V_{DD} = -15\ \text{V}, R_L = 15\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -10\ \text{V}, R_g = 6\ \Omega$ | N-Ch P-Ch | | 13 12 | 20 18 | |
| Fall Time | t_f | | N-Ch P-Ch | | 5 7 | 8 11 | |
| Source-Drain Reverse Recovery Time | t_{rr} | $I_F = 1.05\ \text{A}, dI/dt = 100\ \text{A}/\mu\text{s}$ | N-Ch | | 35 | 60 | |
| | | $I_F = -1.05\ \text{A}, dI/dt = 100\ \text{A}/\mu\text{s}$ | P-Ch | | 30 | 60 | |

Notes:

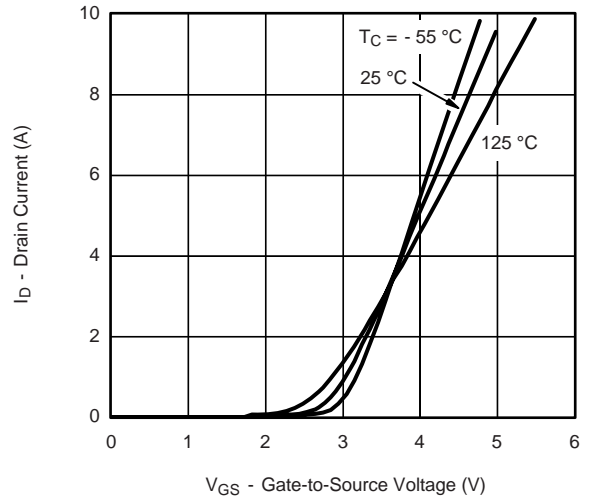
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

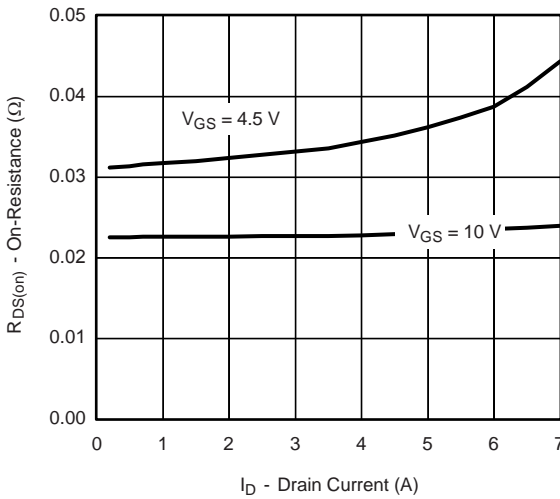
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



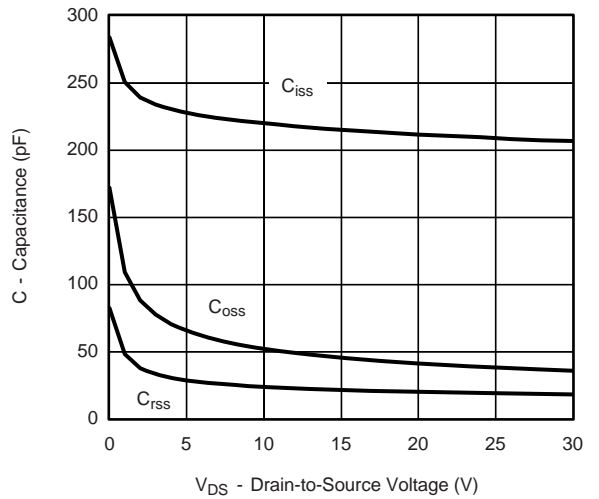
Output Characteristics



Transfer Characteristics



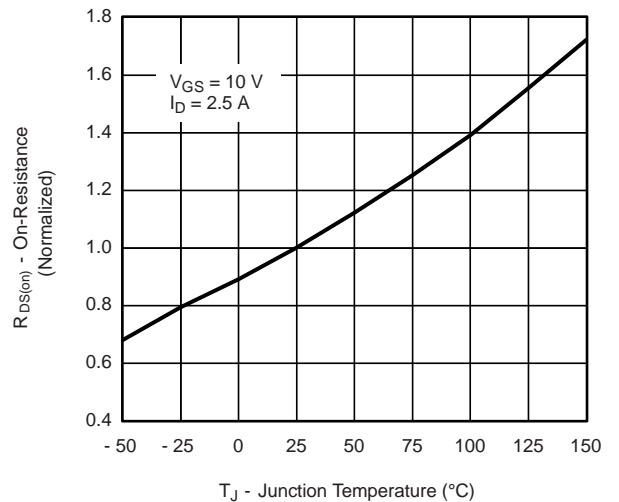
On-Resistance vs. Drain Current



Capacitance

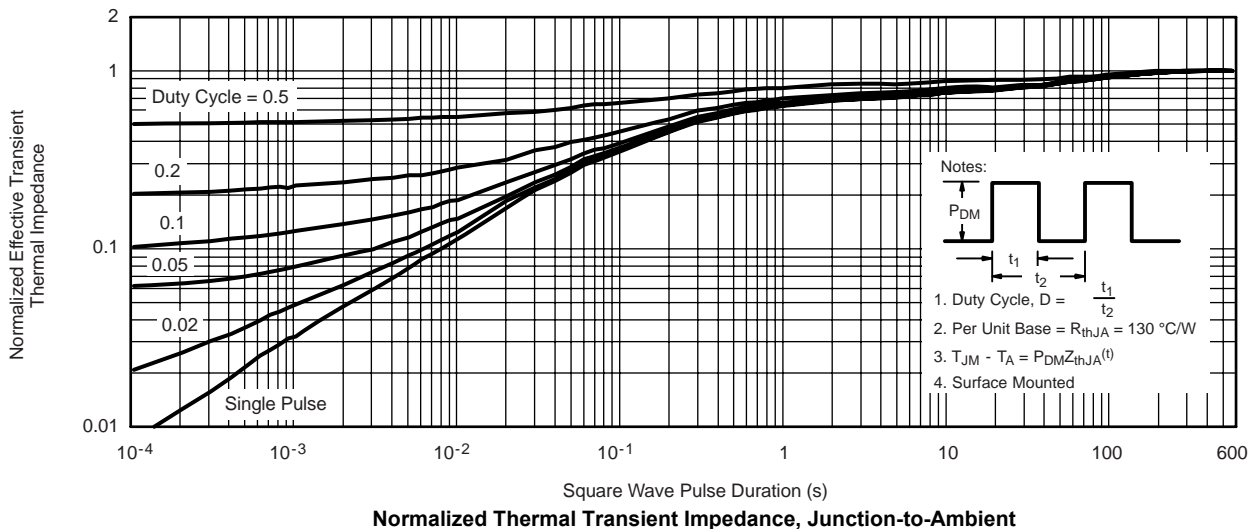
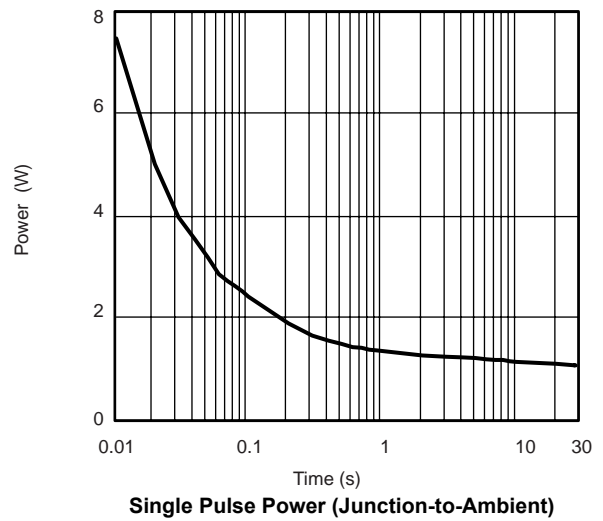


Gate Charge

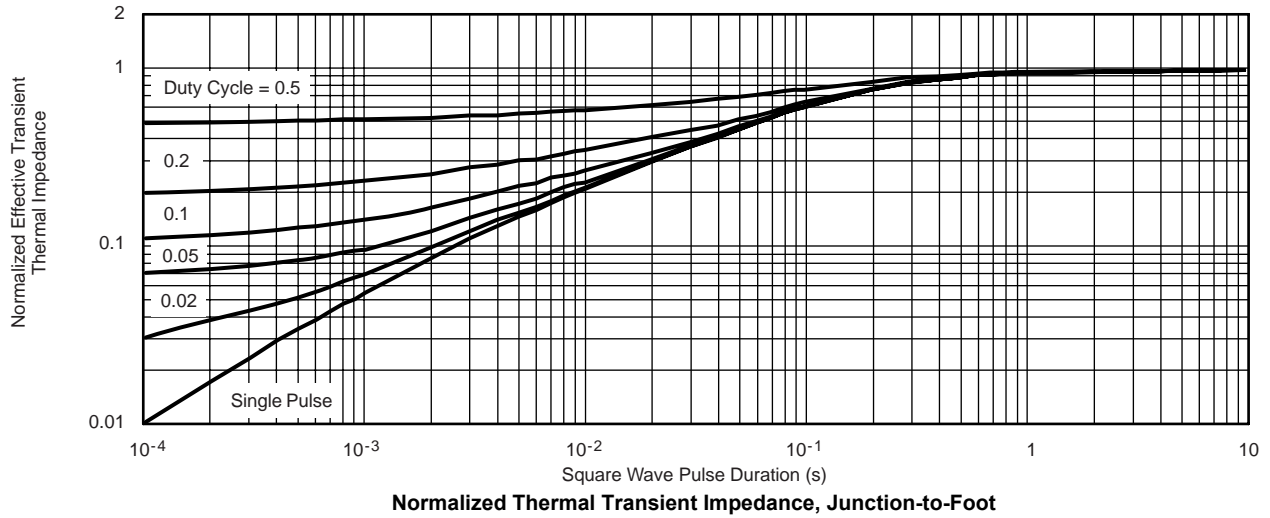


On-Resistance vs. Junction Temperature

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



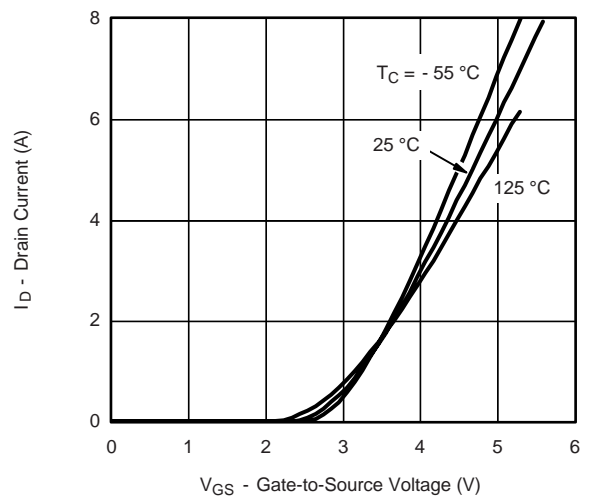
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



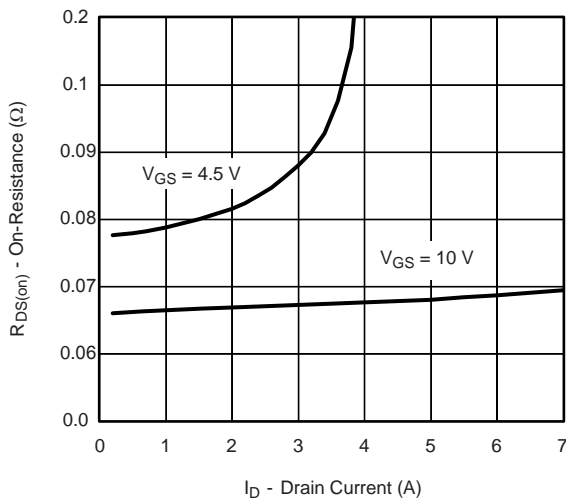
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



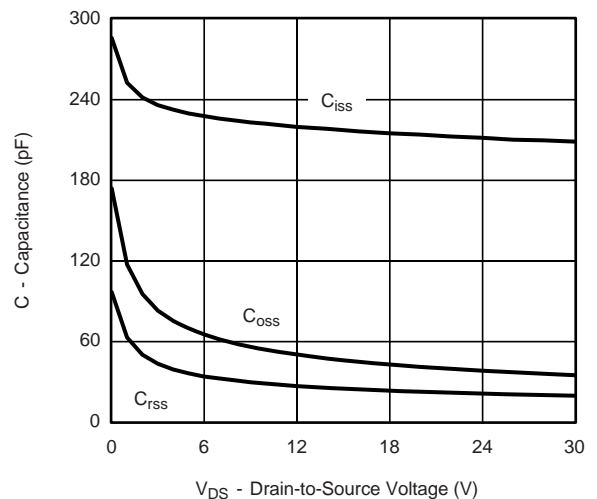
Output Characteristics



Transfer Characteristics

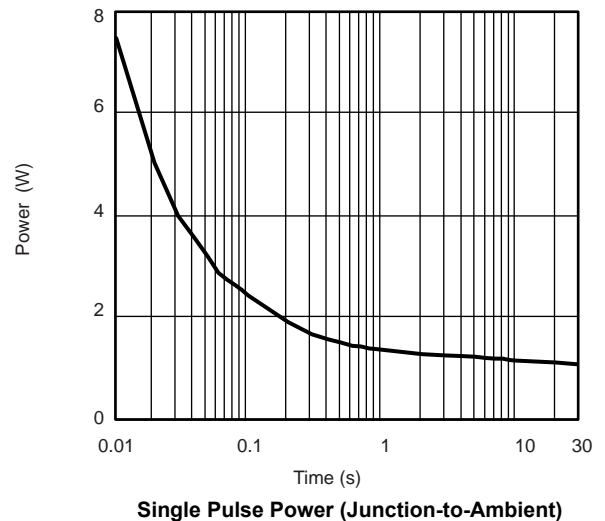
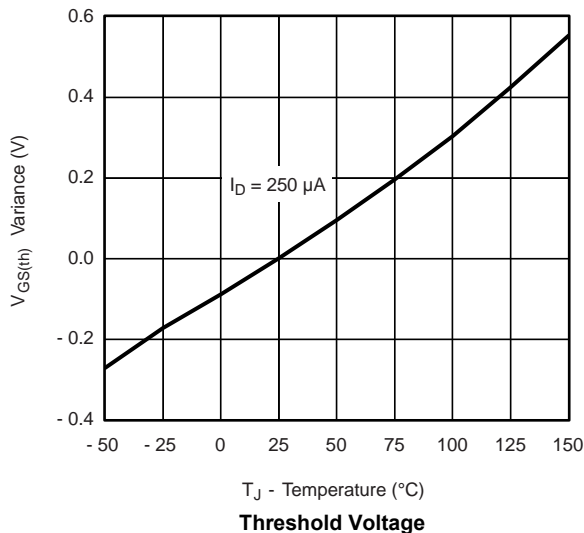
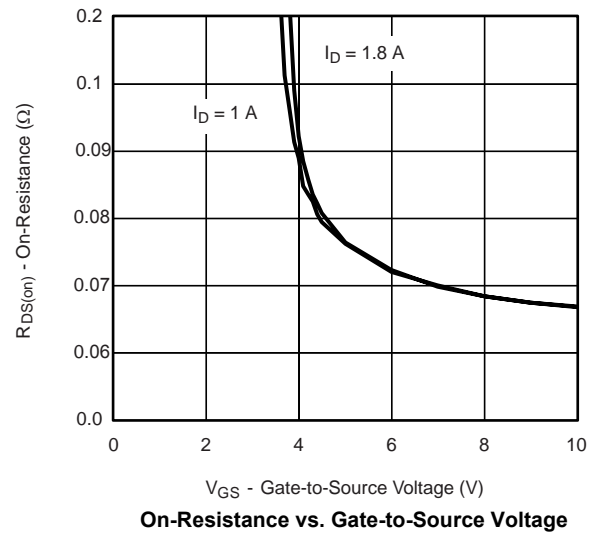
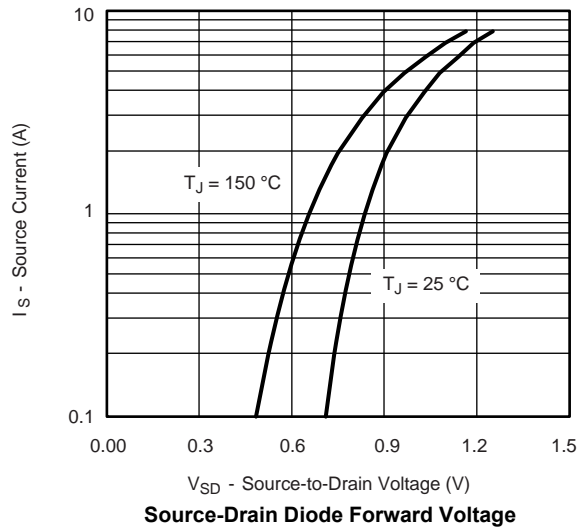


On-Resistance vs. Drain Current



Capacitance

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

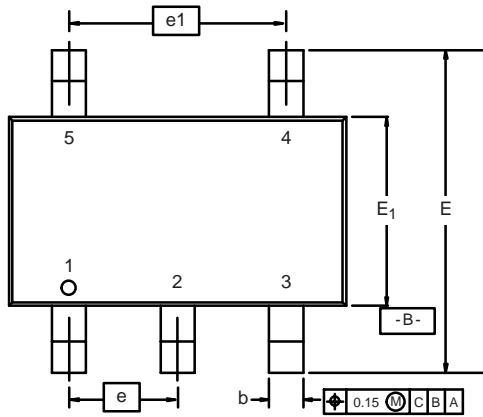


Normalized Thermal Transient Impedance, Junction-to-Ambient

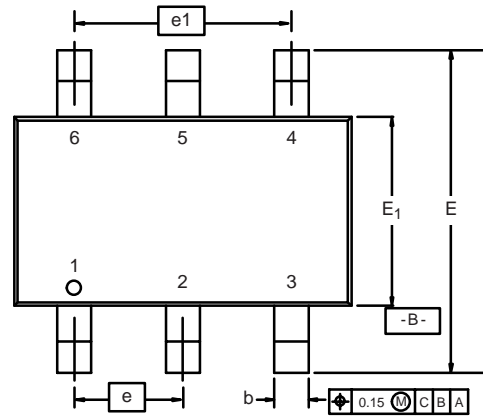


Normalized Thermal Transient Impedance, Junction-to-Foot

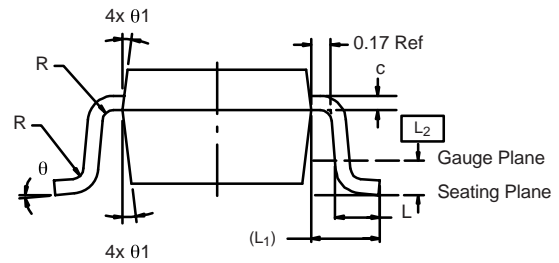
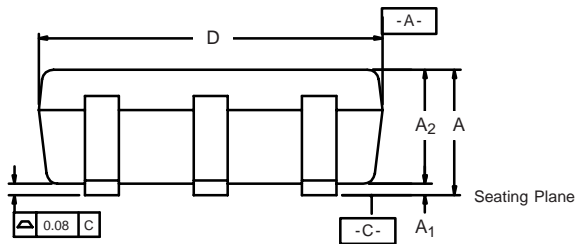
TSOP: 5/6-LEAD
JEDEC Part Number: MO-193C



5-LEAD TSOP



6-LEAD TSOP



| Dim | MILLIMETERS | | | INCHES | | |
|--------------------------------|-------------|------|------|------------|-------|-------|
| | Min | Nom | Max | Min | Nom | Max |
| A | 0.91 | - | 1.10 | 0.036 | - | 0.043 |
| A ₁ | 0.01 | - | 0.10 | 0.0004 | - | 0.004 |
| A ₂ | 0.90 | - | 1.00 | 0.035 | 0.038 | 0.039 |
| b | 0.30 | 0.32 | 0.45 | 0.012 | 0.013 | 0.018 |
| c | 0.10 | 0.15 | 0.20 | 0.004 | 0.006 | 0.008 |
| D | 2.95 | 3.05 | 3.10 | 0.116 | 0.120 | 0.122 |
| E | 2.70 | 2.85 | 2.98 | 0.106 | 0.112 | 0.117 |
| E ₁ | 1.55 | 1.65 | 1.70 | 0.061 | 0.065 | 0.067 |
| e | 0.95 BSC | | | 0.0374 BSC | | |
| e ₁ | 1.80 | 1.90 | 2.00 | 0.071 | 0.075 | 0.079 |
| L | 0.32 | - | 0.50 | 0.012 | - | 0.020 |
| L ₁ | 0.60 Ref | | | 0.024 Ref | | |
| L ₂ | 0.25 BSC | | | 0.010 BSC | | |
| R | 0.10 | - | - | 0.004 | - | - |
| θ | 0° | 4° | 8° | 0° | 4° | 8° |
| θ ₁ | 7° Nom | | | 7° Nom | | |
| ECN: C-06593-Rev. I, 18-Dec-06 | | | | | | |
| DWG: 5540 | | | | | | |

RECOMMENDED MINIMUM PADS FOR TSOP-6



Recommended Minimum Pads
Dimensions in Inches/(mm)

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