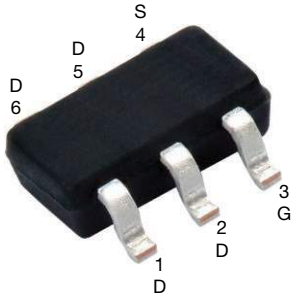
# P-Channel 20 V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) MAX. | $I_D$ (A) [a, e] | $Q_g$ (TYP.) |
| -20 | 0.0210 at $V_{GS}$ = -4.5 V | -8 | 43.2 nC |
| | 0.0240 at $V_{GS}$ = -2.5 V | -8 | |
| | 0.0380 at $V_{GS}$ = -1.8 V | -8 | |

**TSOP-6 Single**




Top View

**Marking Code**: BM

**Ordering Information**:
Si3429EDV-T1-GE3 (lead (Pb)-free and halogen-free)

## FEATURES

- TrenchFET® power MOSFET
- 100 % $R_g$ tested
- Built-in ESD protection
  - Typical ESD performance 3000 V
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

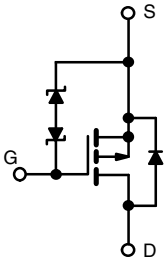
Pb-free

RoHS COMPLIANT

HALOGEN FREE

## APPLICATIONS

- Power management for portable and consumer
  - Load switches
  - DC/DC converters




P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C, unless otherwise noted) | | | | |
|---|---|---|---|---|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | | $V_{DS}$ | -20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 8 | |
| Continuous Drain Current ($T_J$ = 150 °C) | $T_C$ = 25 °C | $I_D$ | -8 [e] | A |
| | $T_C$ = 70 °C | | -8 [e] | |
| | $T_A$ = 25 °C | | -8 [b, c, e] | |
| | $T_A$ = 70 °C | | -6.4 [b, c] | |
| Pulsed Drain Current (t = 300 µs) | | $I_{DM}$ | -40 | |
| Continuous Source-Drain Diode Current | $T_C$ = 25 °C | $I_S$ | -3.5 | |
| | $T_A$ = 25 °C | | -1.7 [b, c] | |
| Maximum Power Dissipation | $T_C$ = 25 °C | $P_D$ | 4.2 | W |
| | $T_C$ = 70 °C | | 2.7 | |
| | $T_A$ = 25 °C | | 2 [b, c] | |
| | $T_A$ = 70 °C | | 1.3 [b, c] | |
| 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 [b, d] | t ≤ 5 s | $R_{thJA}$ | 45 | 62.5 | °C/W |
| Maximum Junction-to-Foot (Drain) | Steady State | $R_{thJF}$ | 25 | 30 | |

**Notes**

a. $T_C$ = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. Maximum under steady state conditions is 110 °C/W.
e. Package limited.

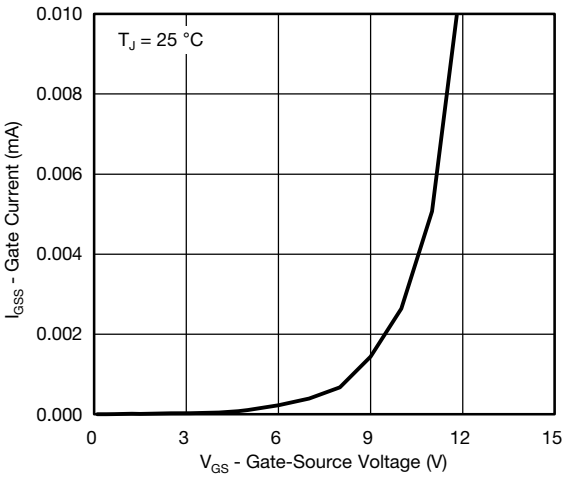
| **SPECIFICATIONS** ($T_J$ = 25 °C, unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{DS}$ | $V_{GS}$ = 0 V, $I_D$ = -250 µA | -20 | - | - | V |
| $V_{DS}$ Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D$ = -250 µA | - | -12 | - | mV/°C |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | - | 2.4 | - | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = -250 µA | -0.4 | - | -1 | V |
| Gate-Source Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 8 V | - | - | ± 10 | µA |
| | | $V_{DS}$ = 0 V, $V_{GS}$ = ± 4.5 V | - | - | ± 1 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -20 V, $V_{GS}$ = 0 V | - | - | -1 | |
| | | $V_{DS}$ = -20 V, $V_{GS}$ = 0 V, $T_J$ = 55 °C | - | - | -10 | |
| On-State Drain Current [a] | $I_{D(on)}$ | $V_{DS}$ ≤ -5 V, $V_{GS}$ = -4.5 V | -15 | - | - | A |
| Drain-Source On-State Resistance [a] | $R_{DS(on)}$ | $V_{GS}$ = -4.5 V, $I_D$ = -4 A | - | 0.0175 | 0.0210 | Ω |
| | | $V_{GS}$ = -2.5 V, $I_D$ = -4 A | - | 0.0200 | 0.0240 | |
| | | $V_{GS}$ = -1.8 V, $I_D$ = -2 A | - | 0.0250 | 0.0380 | |
| **Dynamic** [b] | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = -10 V, $V_{GS}$ = 0 V, f = 1 MHz | - | 4083 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 395 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 365 | - | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = -10 V, $V_{GS}$ = -8 V, $I_D$ = -8 A | - | 78.2 | 118 | nC |
| | | $V_{DS}$ = -10 V, $V_{GS}$ = -4.5 V, $I_D$ = -8 A | - | 43.2 | 65 | |
| Gate-Source Charge | $Q_{gs}$ | | - | 6.3 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 4.3 | - | |
| Gate Resistance | $R_g$ | f = 1 MHz | 1.8 | 9.4 | 18.8 | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = -10 V, $R_L$ = 1.56 Ω<br>$I_D$ ≅ -6.4 A, $V_{GEN}$ = -4.5 V, $R_g$ = 1 Ω | - | 35 | 53 | ns |
| Rise Time | $t_r$ | | - | 30 | 45 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 174 | 261 | |
| Fall Time | $t_f$ | | - | 58 | 87 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = -10 V, $R_L$ = 1.56 Ω<br>$I_D$ ≅ -6.4 A, $V_{GEN}$ = -8 V, $R_g$ = 1 Ω | - | 10 | 20 | |
| Rise Time | $t_r$ | | - | 17 | 26 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 210 | 315 | |
| Fall Time | $t_f$ | | - | 64 | 96 | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Source-Drain Diode Current | $I_S$ | $T_C$ = 25 °C | - | - | -3.5 | A |
| Pulse Diode Forward Current | $I_{SM}$ | | - | - | -40 | |
| Body Diode Voltage | $V_{SD}$ | $I_S$ = -6.4 A, $V_{GS}$ = 0 V | - | -0.8 | -1.2 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = -6.4 A, dI/dt = 100 A/µs, $T_J$ = 25 °C | - | 28 | 42 | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 16 | 24 | nC |
| Reverse Recovery Fall Time | $t_a$ | | - | 13 | - | ns |
| Reverse Recovery Rise Time | $t_b$ | | - | 15 | - | |

**Notes**

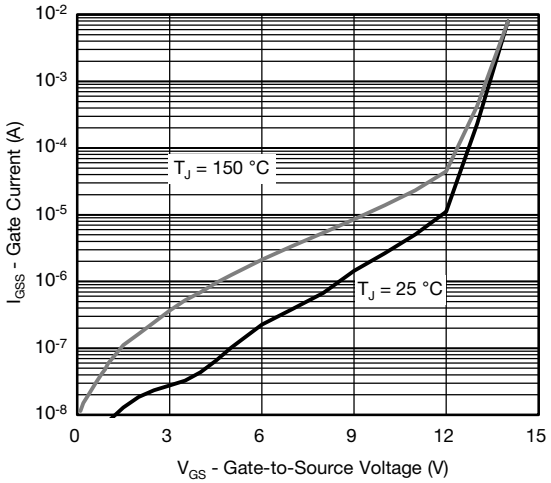
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

*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.*

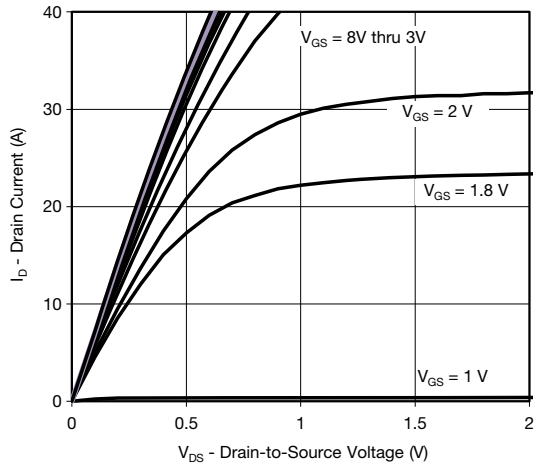
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



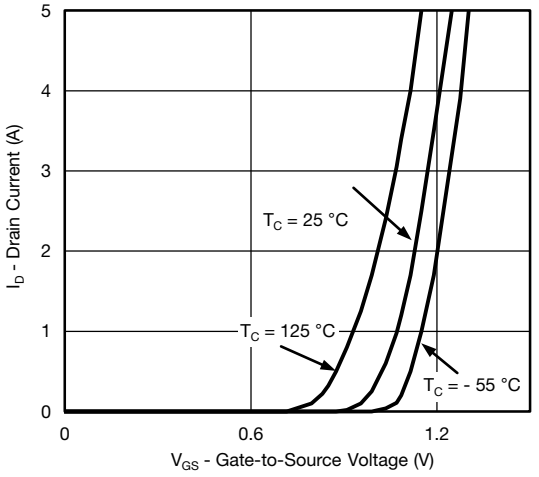

**Gate Current vs. Gate-Source Voltage**



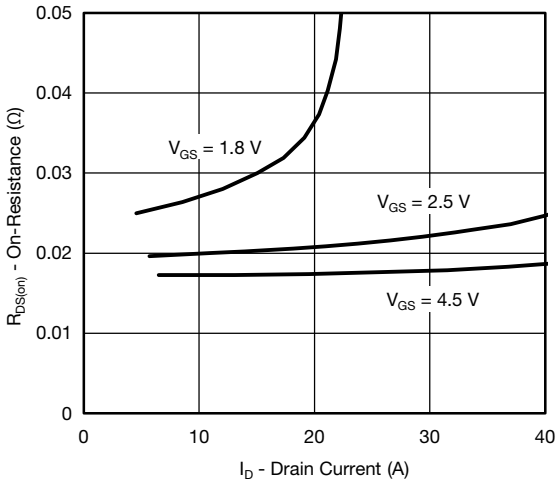

**Gate Current vs. Gate-Source Voltage**



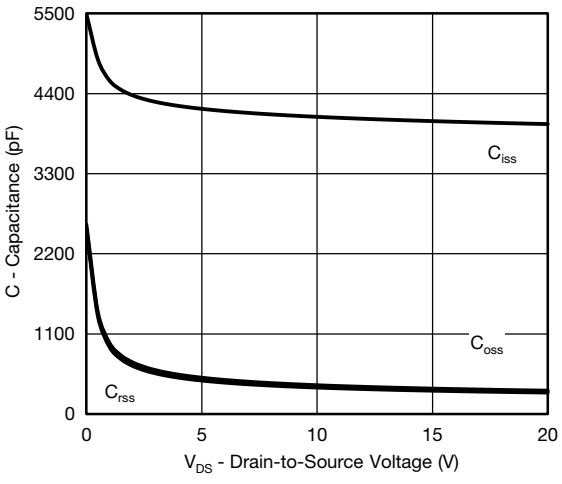

**Output Characteristics**




**Transfer Characteristics**

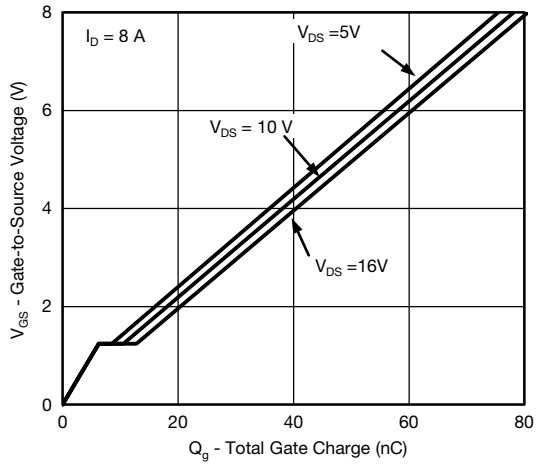



**On-Resistance vs. Drain Current**

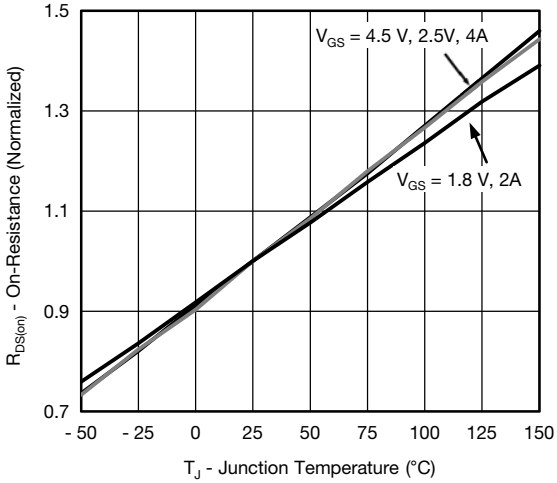



**Capacitance**

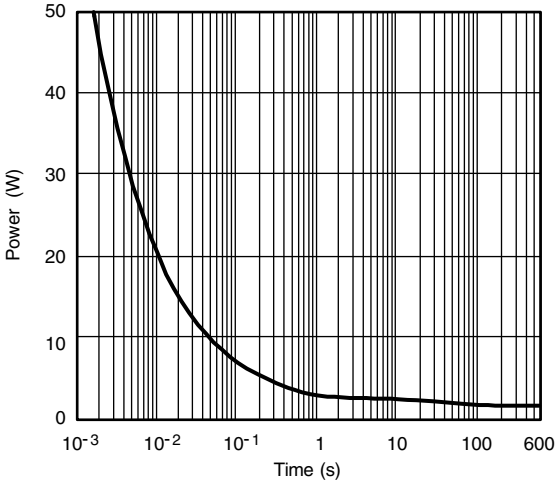
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



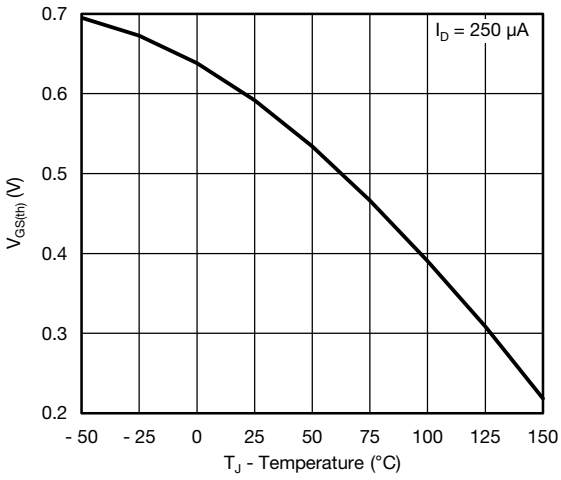

**Gate Charge**



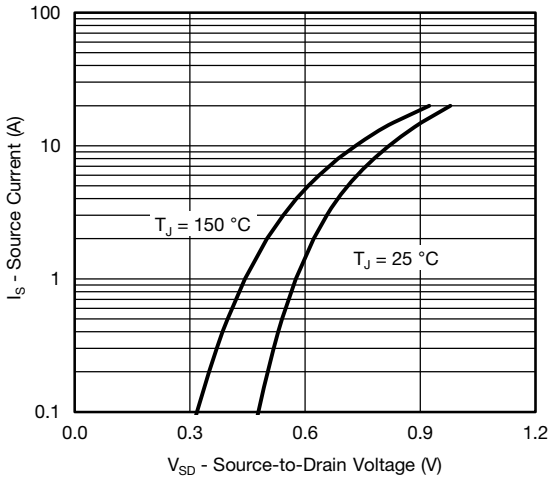

**On-Resistance vs. Junction Temperature**



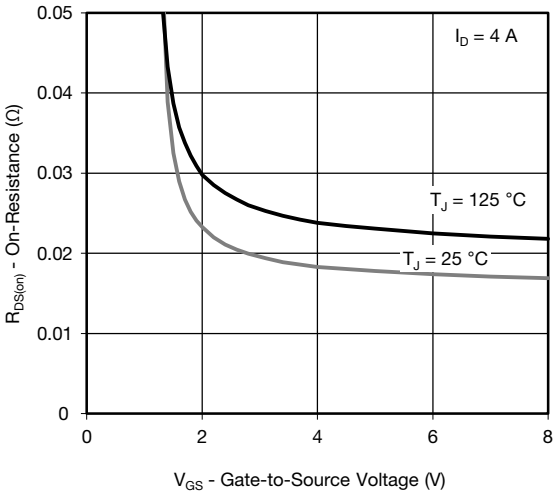

**Single Pulse Power, Junction-to-Ambient**




**Threshold Voltage**

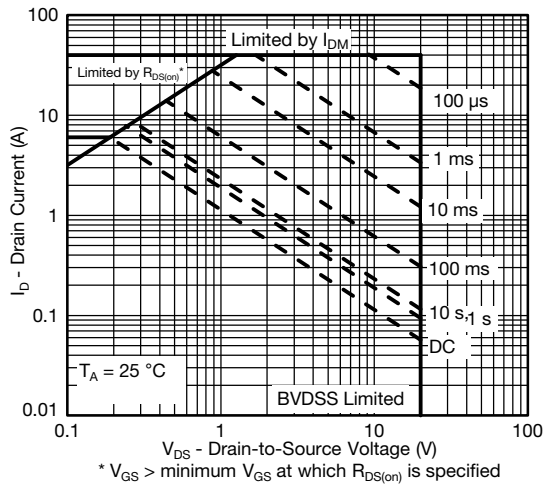



**Source-Drain Diode Forward Voltage**

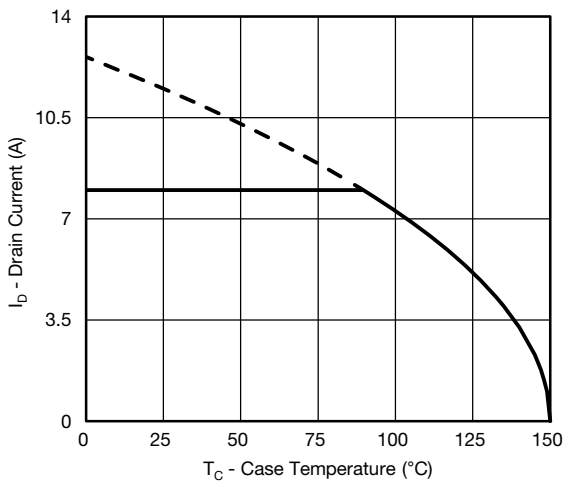



**On-Resistance vs. Gate-to-Source Voltage**

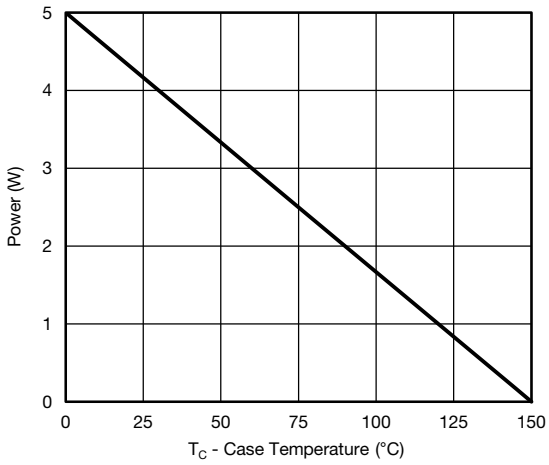
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



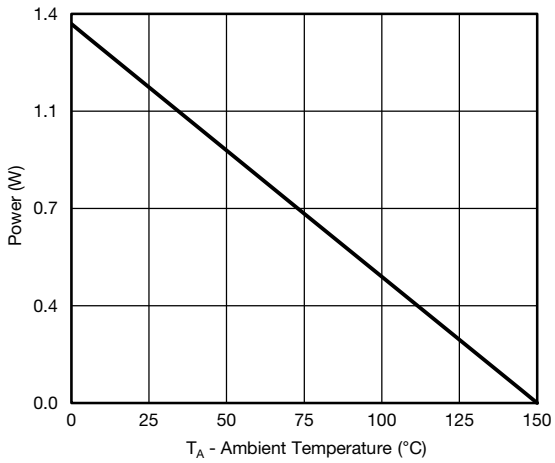

**Safe Operating Area, Junction-to-Ambient**




**Current Derating***



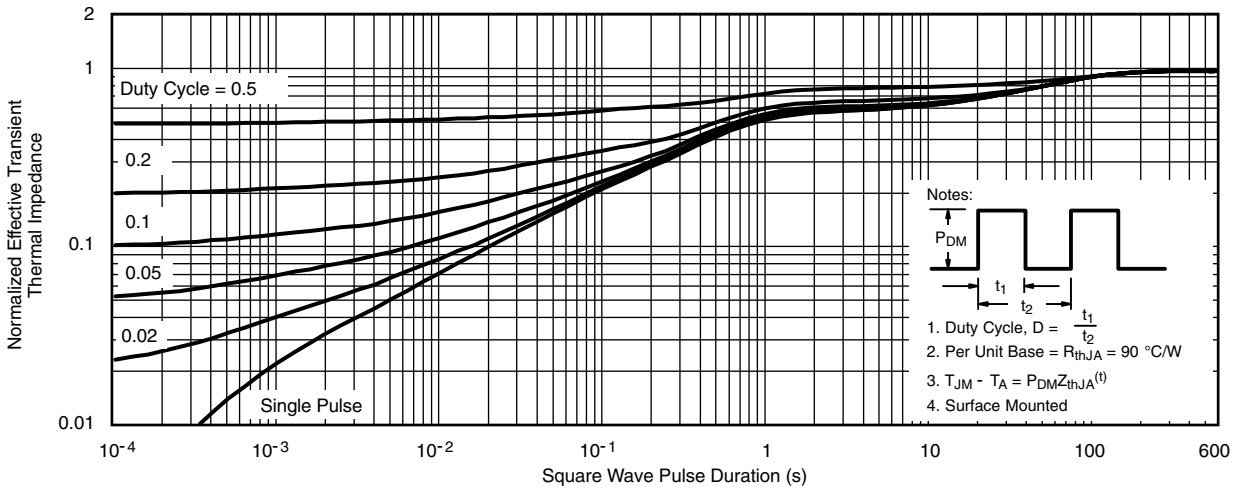

**Power Junction-to-Foot**



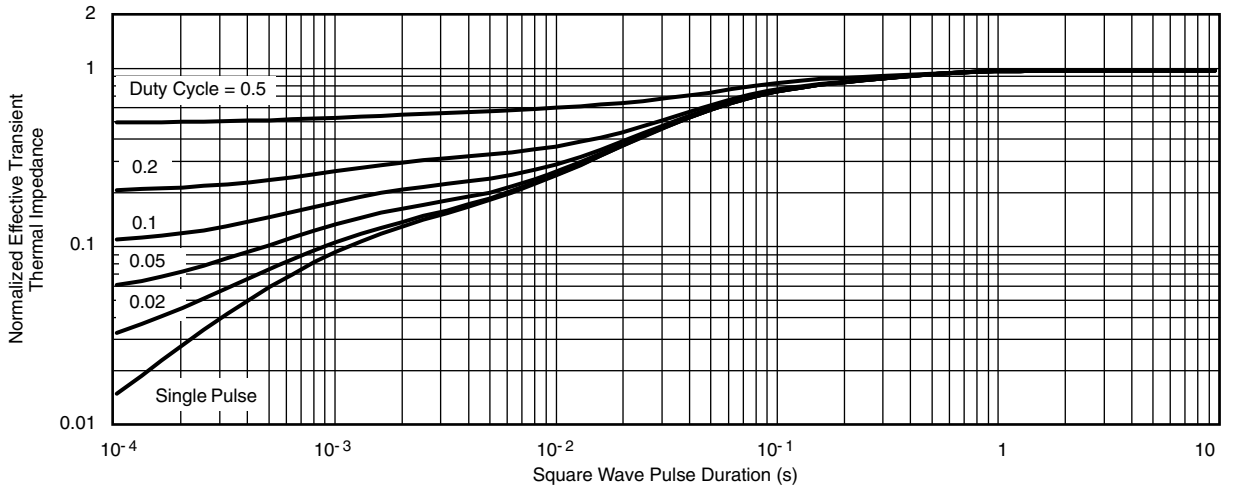

**Power Junction-to-Ambient**

* 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.

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



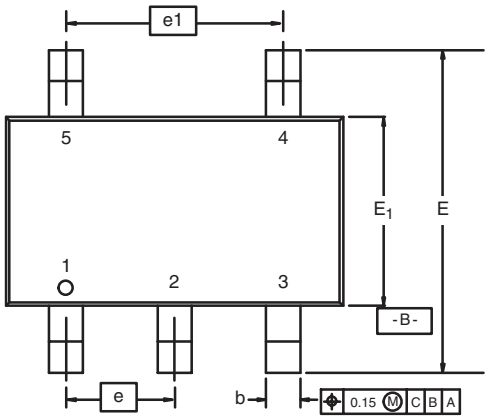

**Normalized Thermal Transient Impedance, Junction-to-Ambient**



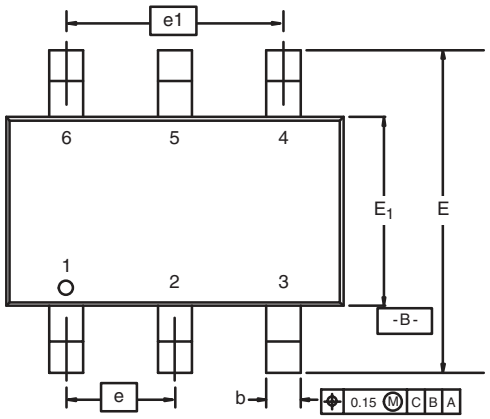

**Normalized Thermal Transient Impedance, Junction-to-Foot**

*Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?62946.*

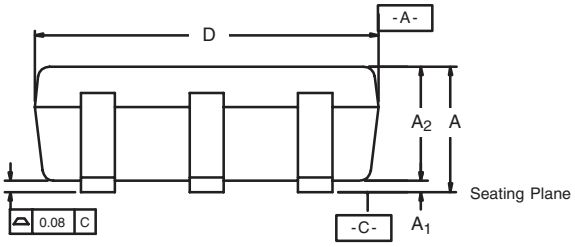
**TSOP: 5/6–LEAD**
**JEDEC Part Number: MO-193C**

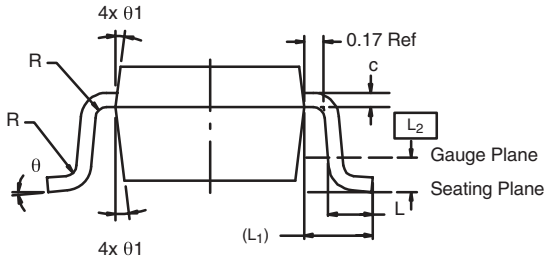



**5-LEAD TSOP**



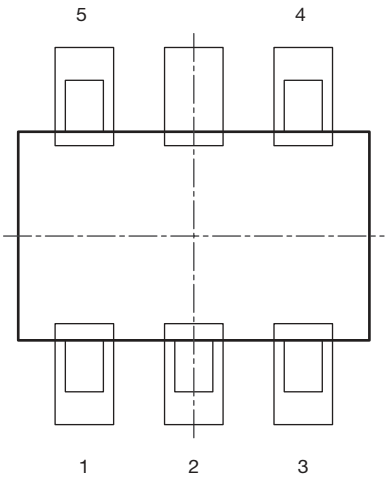

**6-LEAD TSOP**



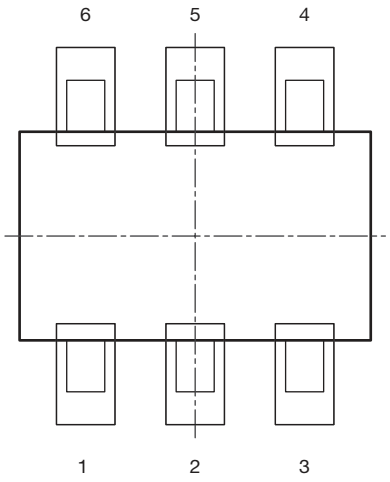




| Dim | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| **A** | 0.91 | - | 1.10 | 0.036 | - | 0.043 |
| **$A_1$** | 0.01 | - | 0.10 | 0.0004 | - | 0.004 |
| **$A_2$** | 0.90 | - | 1.00 | 0.035 | 0.038 | 0.039 |
| **b** | 0.30 | 0.32 | 0.45 | 0.012 | 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° |
| $\theta_1$ | 7° Nom | | | 7° Nom | | |
| ECN: C-06593-Rev. I, 18-Dec-06<br>DWG: 5540 | | | | | | |

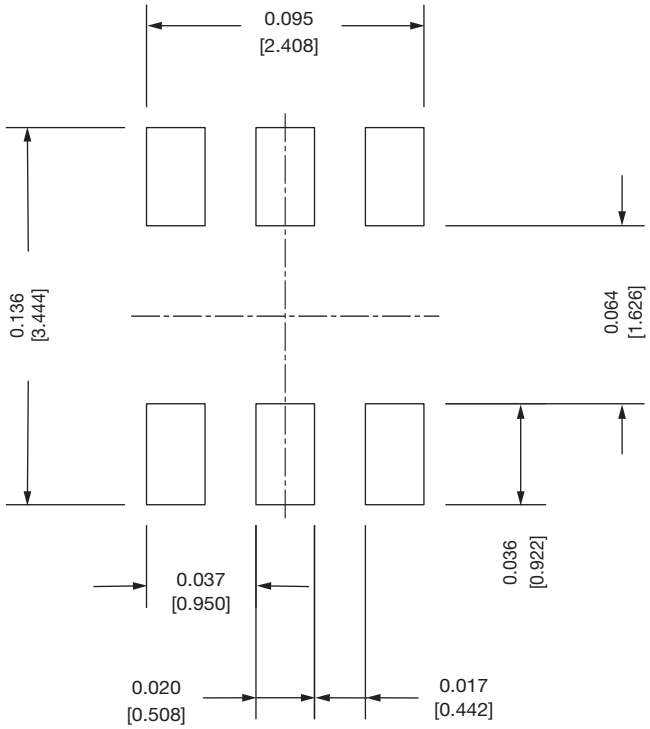
# Recommended Land Pattern For TSOP-5L / TSOP-6L




TSOP 5L




TSOP 6L




**Note**

- All dimensions are in inches (millimeter)

| |
|---|
| ECN: C22-0860-Rev. B, 24-Oct-2022<br>DWG: 3010 |

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