



P-Channel 20 V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|---------------------|-------------------------------------|--------------------|-----------------------|
| V _{DS} (V) | R _{DS(on)} (Ω) | I _D (A) | Q _g (Typ.) |
| - 20 | 0.0205 at V _{GS} = - 4.5 V | - 12 ^a | 24.5 nC |
| | 0.027 at V _{GS} = - 2.5 V | - 12 ^a | |
| | 0.036 at V _{GS} = - 1.8 V | - 12 ^a | |
| | 0.060 at V _{GS} = - 1.5 V | - 4 | |

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- New Thermally Enhanced PowerPAK[®] SC-70 Package
 - Small Footprint Area
 - Ultra-Thin 0.6 mm height
 - Low On-Resistance
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

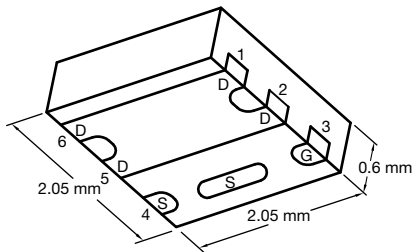


RoHS
COMPLIANT
HALOGEN
FREE

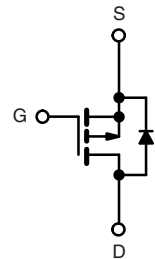
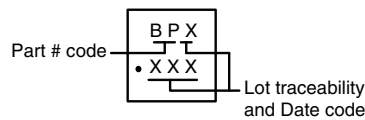
APPLICATIONS

- Load Switch and Charger Switch for Portable Devices
- DC/DC Converter

Thin PowerPAK SC-70-6L-Single



Marking Code



Ordering Information: SiA429DJT-T1-GE3 (Lead (Pb)-free and Halogen-free) 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 | - 12 ^a | A |
| | T _C = 70 °C | - 12 ^a | |
| | T _A = 25 °C | - 10.6 ^{b, c} | |
| | T _A = 70 °C | - 8.5 ^{b, c} | |
| Pulsed Drain Current (t = 300 μs) | I _{DM} | - 30 | |
| Continuous Source-Drain Diode Current | T _C = 25 °C | - 12 ^a | |
| | T _A = 25 °C | - 2.9 ^{b, c} | |
| Maximum Power Dissipation | T _C = 25 °C | 19 | W |
| | T _C = 70 °C | 12 | |
| | T _A = 25 °C | 3.5 ^{b, c} | |
| | T _A = 70 °C | 2.2 ^{b, c} | |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | - 55 to 150 | °C |
| Soldering Recommendations (Peak Temperature) ^{d, e} | | 260 | |

| THERMAL RESISTANCE RATINGS | | | | | |
|---|--------------|-------------------|---------|---------|------|
| Parameter | | Symbol | Typical | Maximum | Unit |
| Maximum Junction-to-Ambient ^{b, f} | t ≤ 5 s | R _{thJA} | 28 | 36 | °C/W |
| Maximum Junction-to-Case (Drain) | Steady State | R _{thJC} | 5.3 | 6.5 | |

Notes:

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- See solder profile (www.vishay.com/ppg?73257). The PowerPAK SC-70 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under steady state conditions is 80 °C/W.

| 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} | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$ | -20 | | | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D = -250\text{ }\mu\text{A}$ | | -12 | | mV/ $^\circ\text{C}$ |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | | 2.7 | | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$ | -0.4 | | -1 | V |
| Gate-Source Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$ | | | -1 | μA |
| | | $V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$ | | | -10 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$ | -20 | | | A |
| Drain-Source On-State Resistance ^a | $R_{DS(on)}$ | $V_{GS} = -4.5\text{ V}, I_D = -6\text{ A}$ | | 0.0170 | 0.0205 | Ω |
| | | $V_{GS} = -2.5\text{ V}, I_D = -2\text{ A}$ | | 0.022 | 0.027 | |
| | | $V_{GS} = -1.8\text{ V}, I_D = -2\text{ A}$ | | 0.029 | 0.036 | |
| | | $V_{GS} = -1.5\text{ V}, I_D = -1\text{ A}$ | | 0.038 | 0.060 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = -10\text{ V}, I_D = -6\text{ A}$ | | 30 | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | | 1750 | | pF |
| Output Capacitance | C_{oss} | | | 270 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 240 | | |
| Total Gate Charge | Q_g | $V_{DS} = -10\text{ V}, V_{GS} = -8\text{ V}, I_D = -10\text{ A}$ | | 41 | 62 | nC |
| | | | | 24.5 | 37 | |
| Gate-Source Charge | Q_{gs} | $V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$ | | 2.4 | | |
| Gate-Drain Charge | Q_{gd} | | | 6.7 | | |
| Gate Resistance | R_g | $f = 1\text{ MHz}$ | 1.3 | 6.3 | 13 | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -10\text{ V}, R_L = 1.2\text{ }\Omega$ $I_D = -8.5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$ | | 22 | 35 | ns |
| Rise Time | t_r | | | 25 | 40 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 70 | 105 | |
| Fall Time | t_f | | | 25 | 40 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -10\text{ V}, R_L = 1.2\text{ }\Omega$ $I_D = -8.5\text{ A}, V_{GEN} = -8\text{ V}, R_g = 1\text{ }\Omega$ | | 10 | 15 | |
| Rise Time | t_r | | | 10 | 15 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 80 | 120 | |
| Fall Time | t_f | | | 25 | 40 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25\text{ }^\circ\text{C}$ | | | -12 | A |
| Pulse Diode Forward Current | I_{SM} | | | | -30 | |
| Body Diode Voltage | V_{SD} | $I_S = -8.5\text{ A}, V_{GS} = 0\text{ V}$ | | -0.8 | -1.2 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $I_F = -8.5\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$ | | 35 | 60 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | 18 | 30 | nC |
| Reverse Recovery Fall Time | t_a | | | 13 | | ns |
| Reverse Recovery Rise Time | t_b | | | 22 | | |

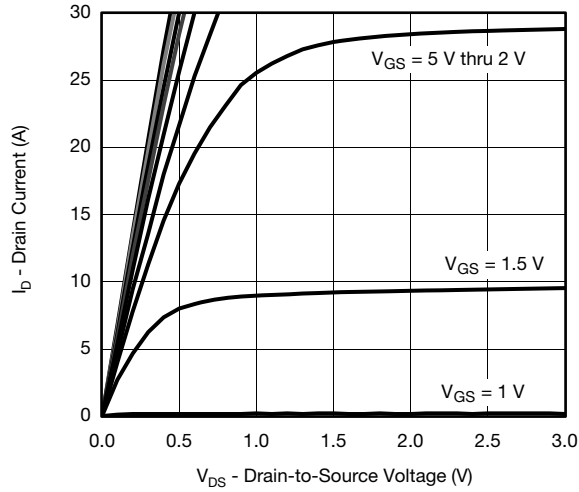
Notes:

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

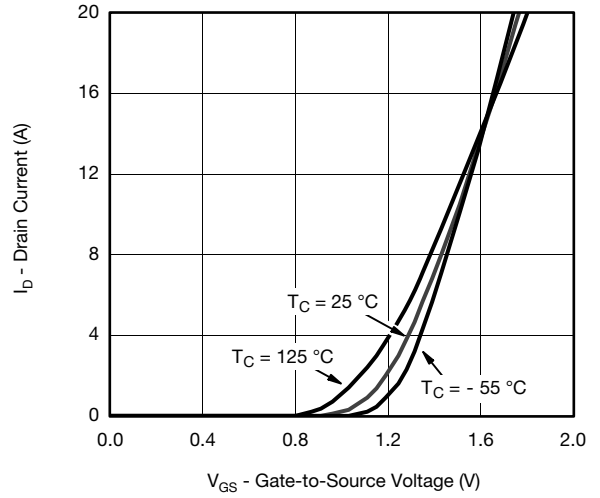
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



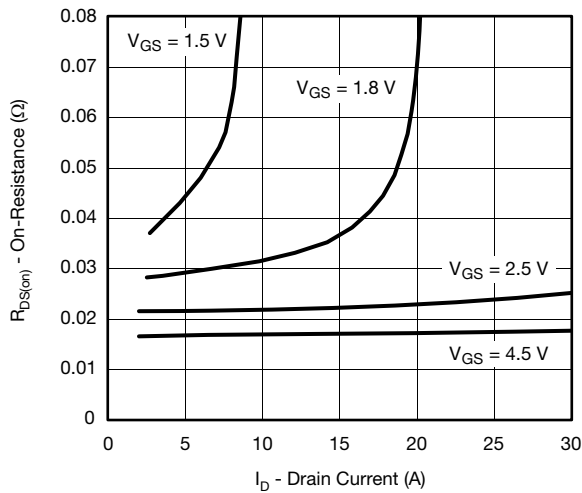
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



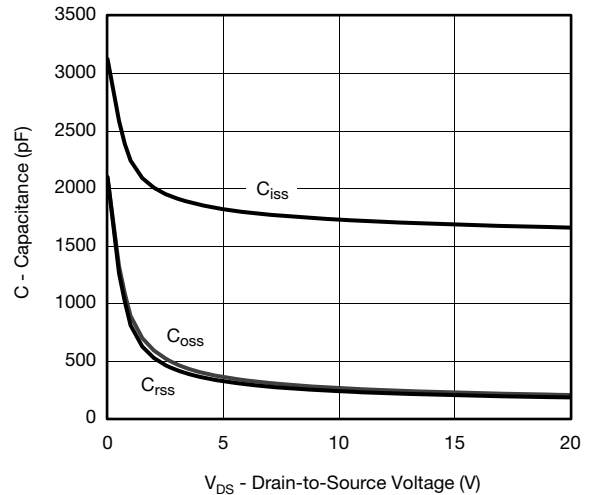
Output Characteristics



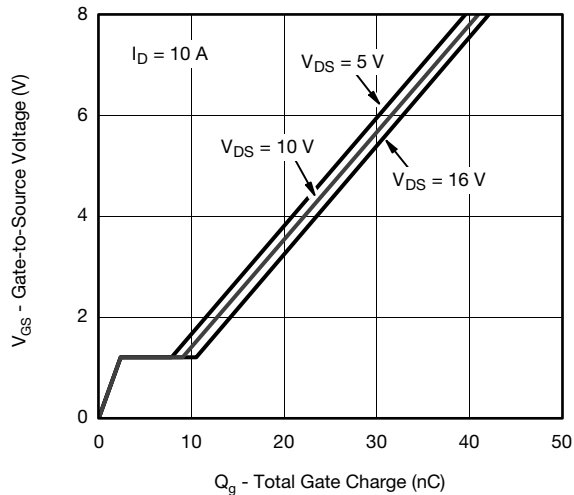
Transfer Characteristics



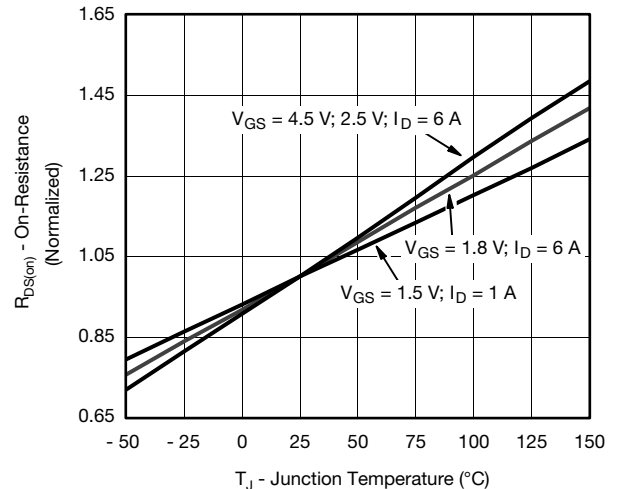
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



Gate Charge



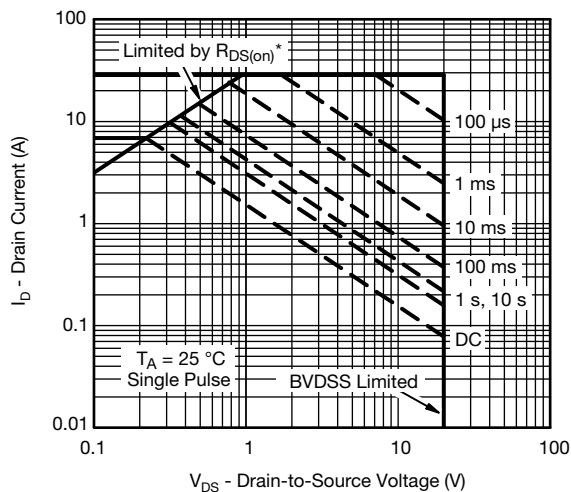
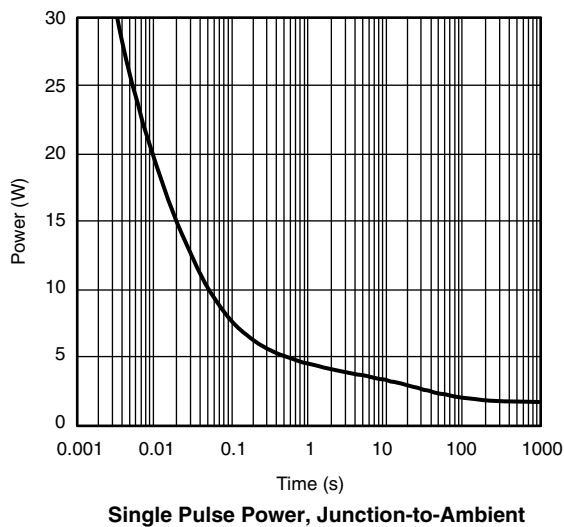
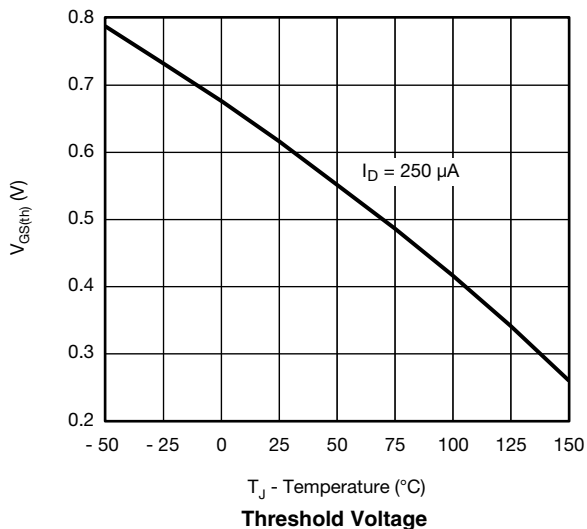
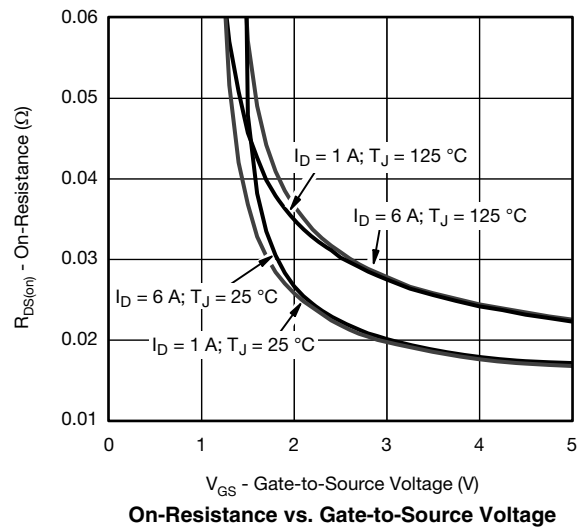
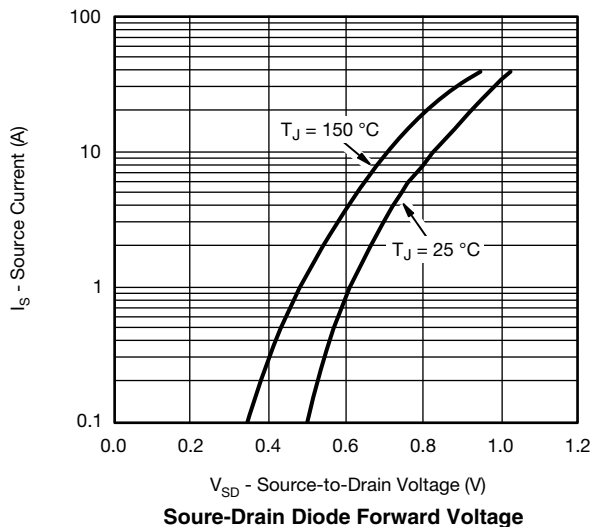
On-Resistance vs. Junction Temperature

SiA429DJT

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

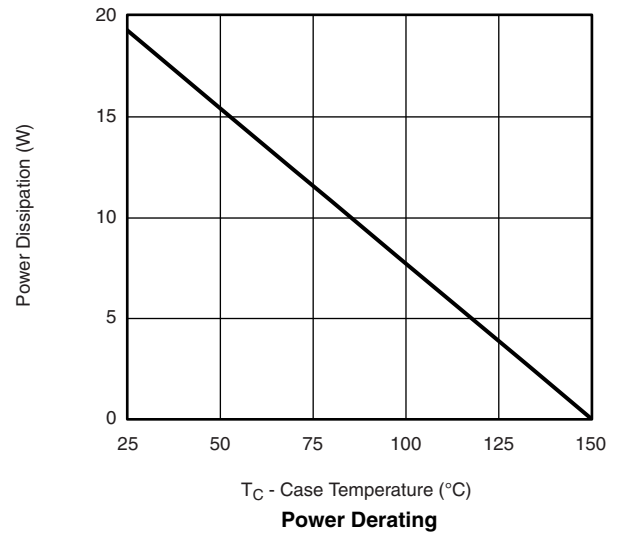
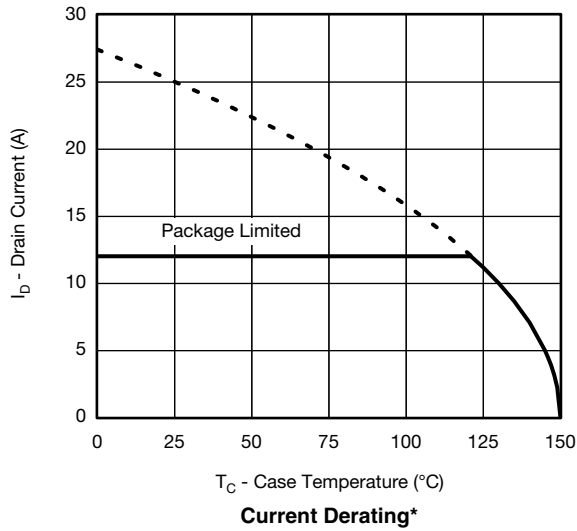


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



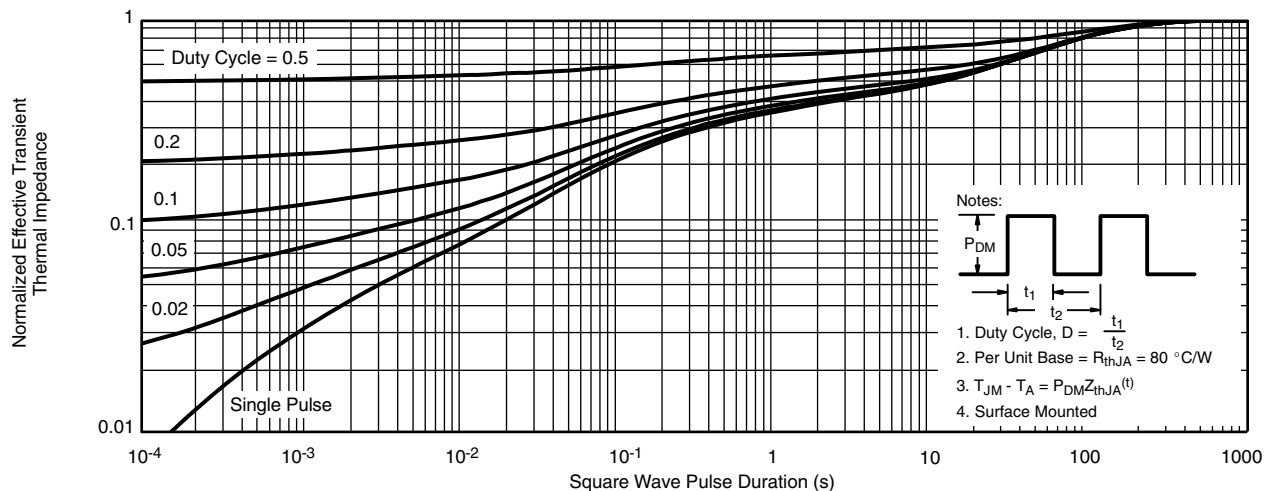
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

SiA429DJT

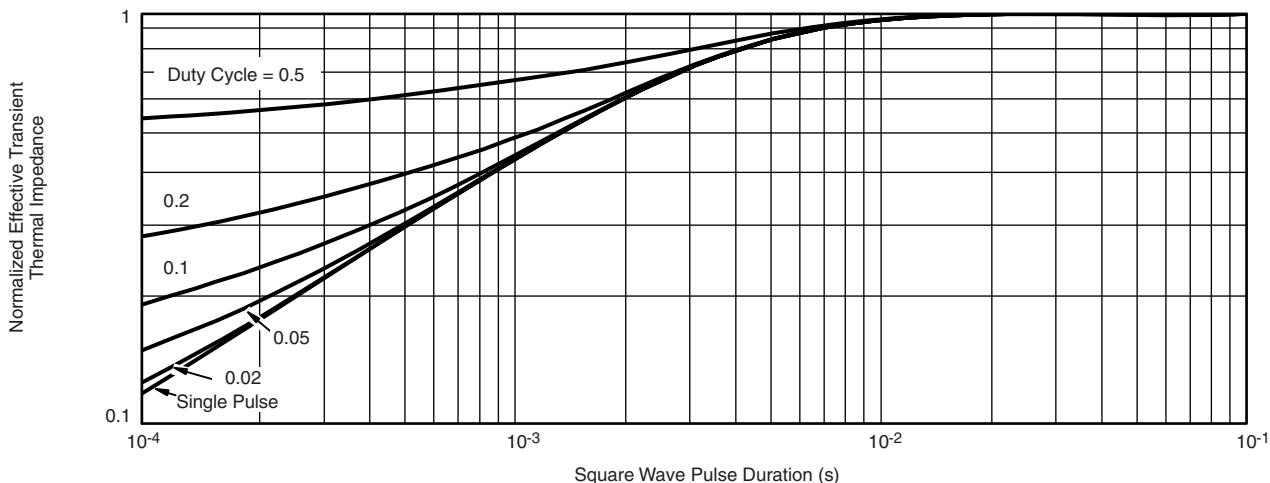
Vishay Siliconix



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

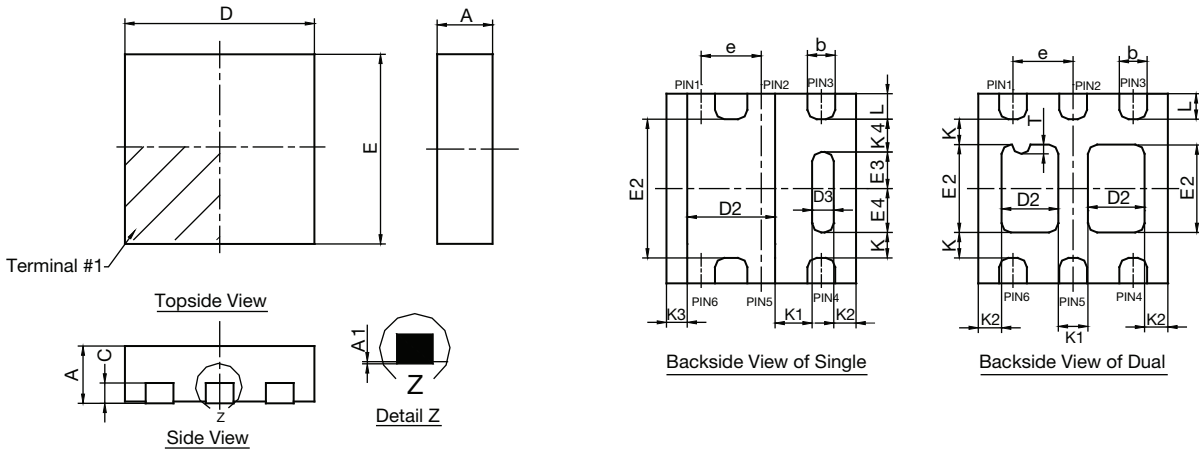


Normalized Thermal Transient Impedance, Junction-to-Case

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?67038.



Case Outline for PowerPAK® SC70T



| DIM. | SINGLE PAD | | | | | | DUAL PAD | | | | | |
|------|-------------|-------|-------|------------|-------|-------|-------------|-------|-------|------------|-------|-------|
| | MILLIMETERS | | | INCHES | | | MILLIMETERS | | | INCHES | | |
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.525 | 0.60 | 0.65 | 0.0206 | 0.024 | 0.026 | 0.525 | 0.60 | 0.65 | 0.0206 | 0.024 | 0.026 |
| A1 | 0 | - | 0.05 | 0 | - | 0.002 | 0 | - | 0.05 | 0 | - | 0.002 |
| b | 0.23 | 0.30 | 0.38 | 0.009 | 0.012 | 0.015 | 0.23 | 0.30 | 0.38 | 0.009 | 0.012 | 0.015 |
| C | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| D | 1.98 | 2.05 | 2.15 | 0.078 | 0.081 | 0.085 | 1.98 | 2.05 | 2.15 | 0.078 | 0.081 | 0.085 |
| D2 | 0.85 | 0.95 | 1.05 | 0.033 | 0.037 | 0.041 | 0.513 | 0.613 | 0.713 | 0.020 | 0.024 | 0.028 |
| D3 | 0.135 | 0.235 | 0.335 | 0.005 | 0.009 | 0.013 | | | | | | |
| E | 1.98 | 2.05 | 2.15 | 0.078 | 0.081 | 0.085 | 1.98 | 2.05 | 2.15 | 0.078 | 0.081 | 0.085 |
| E2 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 | 0.85 | 0.95 | 1.05 | 0.033 | 0.037 | 0.041 |
| E3 | 0.345 | 0.395 | 0.445 | 0.014 | 0.016 | 0.018 | | | | | | |
| E4 | 0.425 | 0.475 | 0.525 | 0.017 | 0.019 | 0.021 | | | | | | |
| e | 0.65 BSC | | | 0.026 BSC | | | 0.65 BSC | | | 0.026 BSC | | |
| K | 0.275 TYP. | | | 0.011 TYP. | | | 0.275 TYP. | | | 0.011 TYP. | | |
| K1 | 0.400 TYP. | | | 0.016 TYP. | | | 0.320 TYP. | | | 0.013 TYP. | | |
| K2 | 0.240 TYP. | | | 0.009 TYP. | | | 0.252 TYP. | | | 0.010 TYP. | | |
| K3 | 0.225 TYP. | | | 0.009 TYP. | | | | | | | | |
| K4 | 0.355 TYP. | | | 0.014 TYP. | | | | | | | | |
| L | 0.175 | 0.275 | 0.375 | 0.007 | 0.011 | 0.015 | 0.175 | 0.275 | 0.375 | 0.007 | 0.011 | 0.015 |
| T | | | | | | | 0.05 | 0.10 | 0.15 | 0.002 | 0.004 | 0.006 |

ECN: C12-0160-Rev. B, 05-Mar-12
DWG: 5994

Notes

1. All dimensions are in millimeter. Millimeters will govern.
2. Package outline exclusive of mold flash and metal burr.
3. Package outline inclusive of plating



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