

Load Switch with Level-Shift

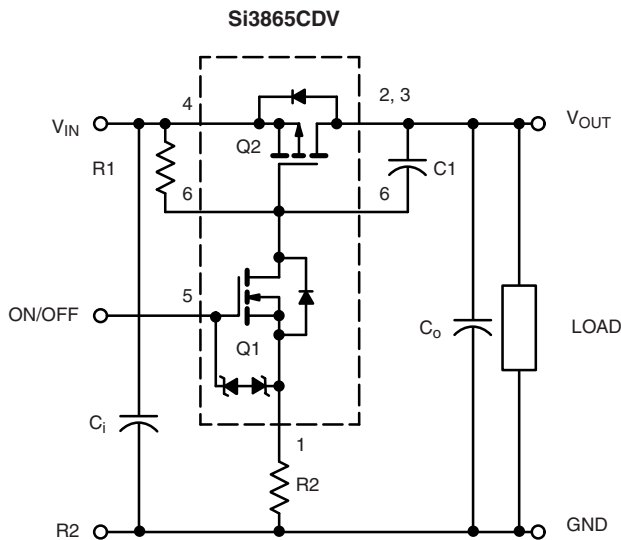
PRODUCT SUMMARY

| V_{DS2} (V) (V_{IN}) | $R_{DS(on)}$ (Ω) | I_D (A) |
|----------------------------|---------------------------|-----------|
| 1.8 to 12 | 0.060 at $V_{IN} = 4.5$ V | 2.8 |
| | 0.095 at $V_{IN} = 2.5$ V | 2.2 |
| | 0.130 at $V_{IN} = 1.8$ V | 1.9 |

DESCRIPTION

The Si3865CDV includes a P- and N-Channel MOSFET in a single TSOP-6 package. The low on-resistance P-Channel TrenchFET is tailored for use as a load switch. The N-Channel, with an external resistor, can be used as a level-

APPLICATION CIRCUITS



COMPONENTS

| | | |
|----|----------------------------|---|
| R1 | Pull-Up Resistor | Typical 10 k Ω to 1 M Ω * |
| R2 | Optional Slew-Rate Control | Typical 0 to 100 k Ω * |
| C1 | Optional Slew-Rate Control | Typical 1000 pF |

Note:

* Minimum R1 value should be at least 10 x R2 to ensure Q1 turn-on at 1.8 V input.

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- 60 m Ω Low $R_{DS(on)}$ TrenchFET®
- 1.8 V to 12 V Input
- 1.5 V to 8 V Logic Level Control
- Low Profile, Small Footprint TSOP-6 Package
- 3000 V ESD Protection On Input Switch, $V_{ON/OFF}$
- Adjustable Slew-Rate
- Compliant to RoHS Directive 2002/95/EC

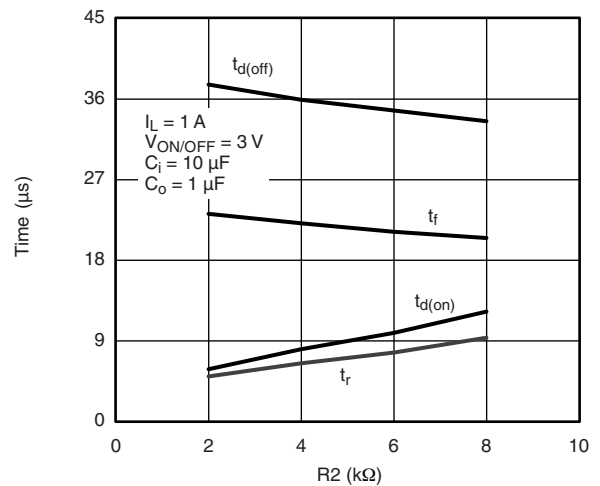


RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load Switching for Portable Devices

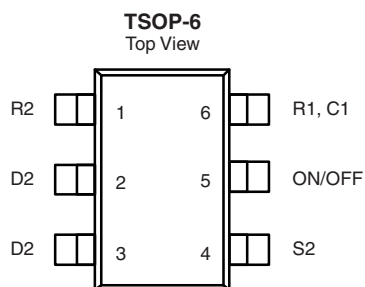
shift to drive the P-Channel load-switch. The N-Channel MOSFET has internal ESD protection and can be driven by logic signals as low as 1.5 V. The Si3865CDV operates on supply lines from 1.8 to 12 V, and can drive loads up to 2.8 A.



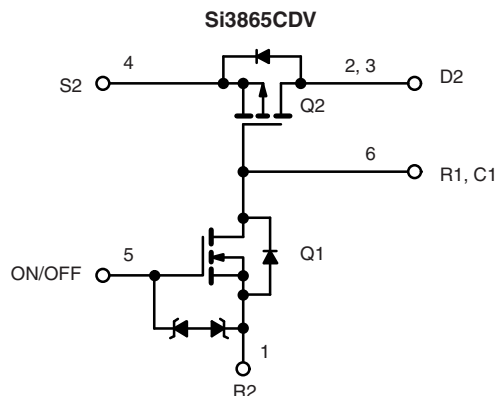
Switching Variation
R2 at $V_{IN} = 2.5$ V, $R1 = 20$ k Ω

The Si3865CDV is ideally suited for high-side load switching in portable applications. The integrated N-Channel level-shift device saves space by reducing external components. The slew rate is set externally so that rise-times can be tailored to different load types.

FUNCTIONAL BLOCK DIAGRAM



Ordering Information: Si3865CDV-T1-E3 (Lead (Pb)-free)
Si3865CDV-T1-GE3 (Lead (Pb)-free and Halogen-free)

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

| Parameter | Symbol | Limit | Unit |
|--|----------------------------|-------------|--------------------|
| Input Voltage | V_{IN} (V_{DS2}) | 12 | V |
| Gate-Source Voltage | V_{GS2} | 8 | |
| ON/OFF Voltage | $V_{ON/OFF}$ (V_{GS1}) | 8 | |
| Load Current | Continuous ^{a, b} | ± 2.8 | A |
| | Pulsed ^{b, c} | ± 6 | |
| Continuous Intrinsic Diode Conduction ^a | I_S | - 1 | |
| Maximum Power Dissipation ^a | P_D | 0.83 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | - 55 to 150 | $^{\circ}\text{C}$ |
| ESD Rating, MIL-STD-883D Human Body Model (100 pF, 1500 Ω) | ESD | 3 | kV |

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Typical | Maximum | Unit |
|---|------------|---------|---------|-----------------------------|
| Maximum Junction-to-Ambient (continuous current) ^a | R_{thJA} | 130 | 150 | $^{\circ}\text{C}/\text{W}$ |
| Maximum Junction-to-Foot (Q2) | R_{thJF} | 75 | 90 | |

SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

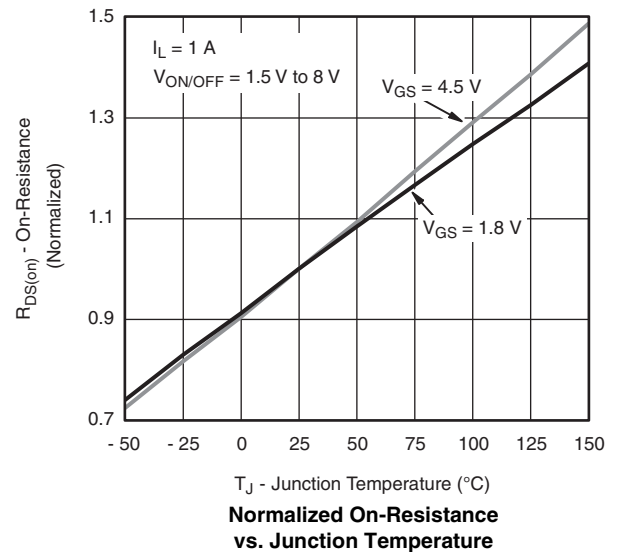
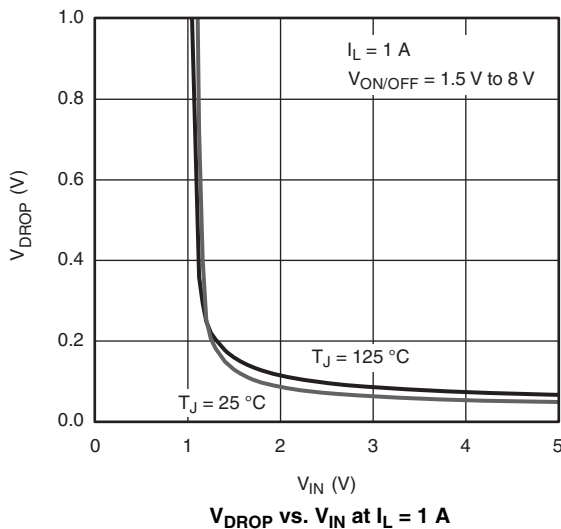
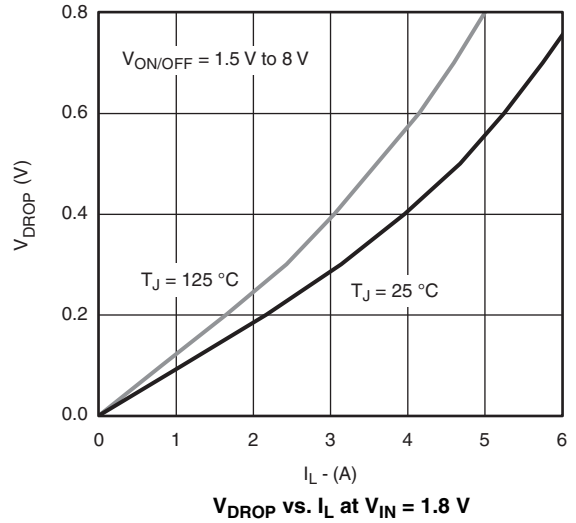
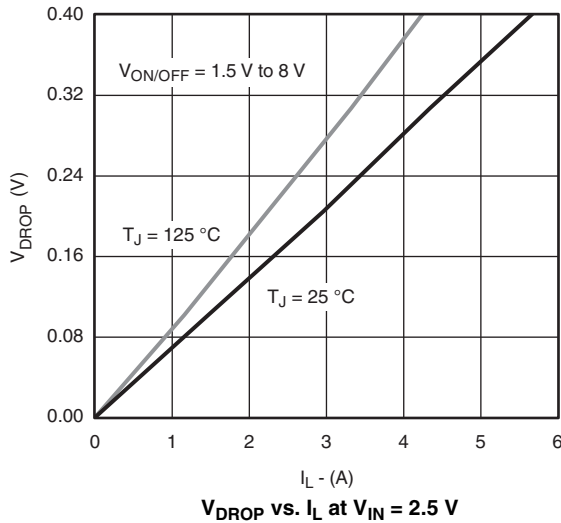
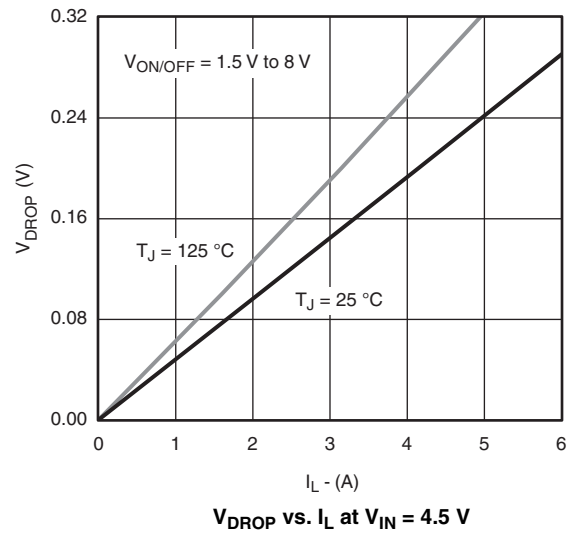
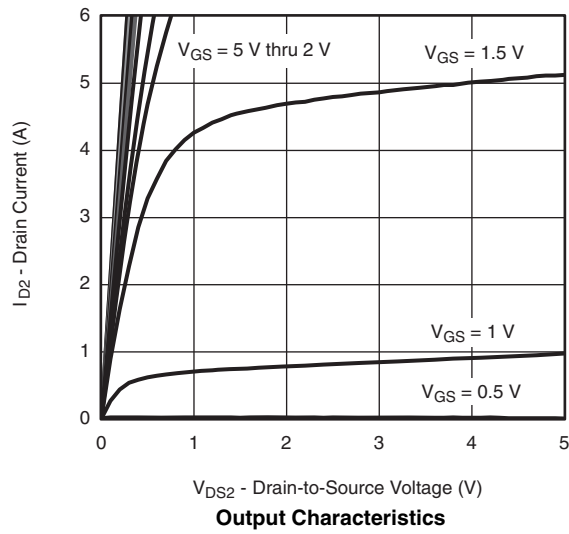
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|------------------------------------|------------------------|--|-------------------------|--------|-------|---------------|
| OFF Characteristics | | | | | | |
| Reverse Leakage Current | I_{FL} | $V_{IN} = 12\text{ V}, V_{ON/OFF} = 0\text{ V}$ | | | 1 | μA |
| Diode Forward Voltage | V_{SD} | $I_S = -1\text{ A}$ | | - 0.77 | - 1 | V |
| ON Characteristics | | | | | | |
| Input Voltage Range | V_{IN} (V_{DS2}) | | 1.8 | | 12 | V |
| On-Resistance (P-Channel) at 1 A | $R_{DS(on)}$ | $V_{ON/OFF} = 1.5\text{ V}, I_D = 1\text{ A}$ | $V_{IN} = 4.5\text{ V}$ | 0.050 | 0.060 | Ω |
| | | | $V_{IN} = 2.5\text{ V}$ | 0.073 | 0.095 | |
| | | | $V_{IN} = 1.8\text{ V}$ | 0.100 | 0.130 | |
| On-State (P-Channel) Drain-Current | $I_{D(on)}$ | $V_{IN-OUT} \leq 0.2\text{ V}, V_{IN} = 5\text{ V}, V_{ON/OFF} = 1.5\text{ V}$ | 1 | | | A |
| | | $V_{IN-OUT} \leq 0.3\text{ V}, V_{IN} = 3\text{ V}, V_{ON/OFF} = 1.5\text{ V}$ | 1 | | | |

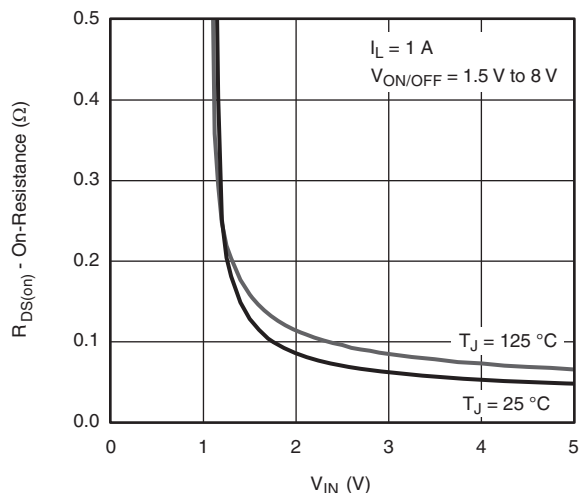
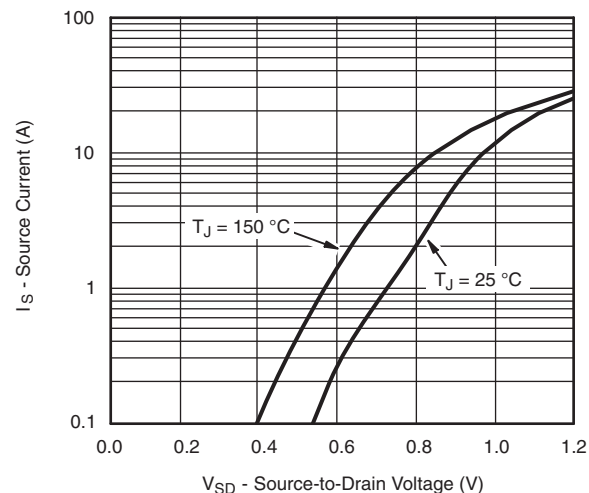
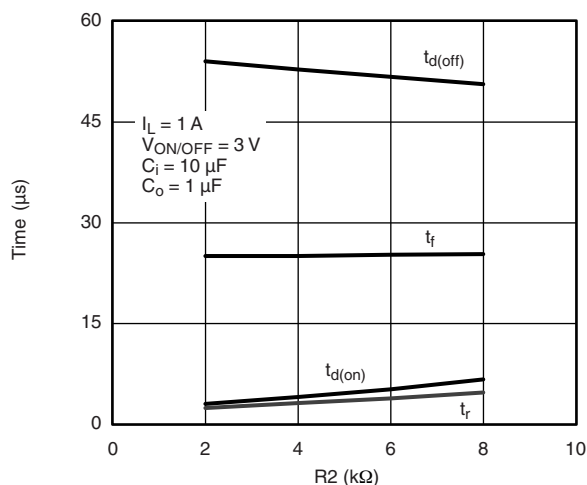
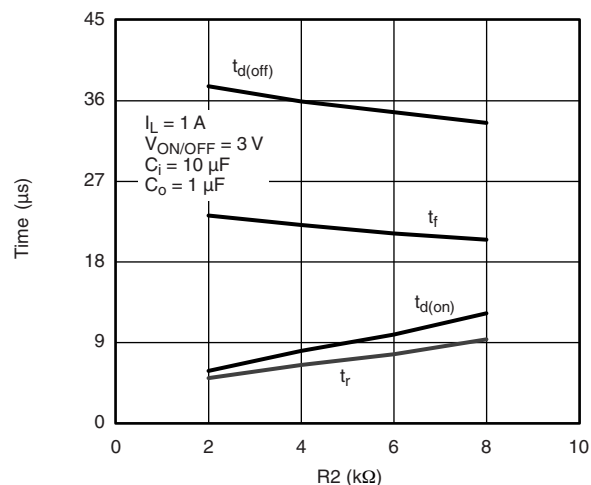
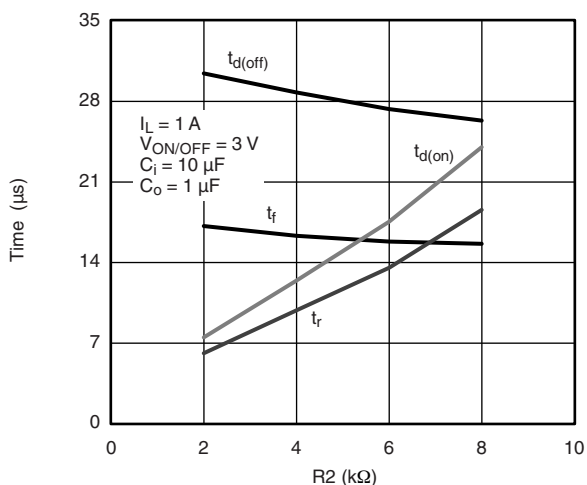
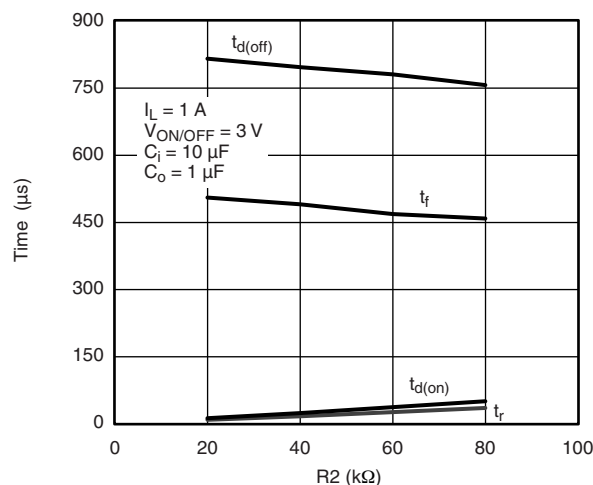
Notes:

- a. Surface Mounted on FR4 board.
b. $V_{IN} = 8\text{ V}, V_{ON/OFF} = 8\text{ V}, T_A = 25\text{ }^{\circ}\text{C}$.
c. Pulse test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

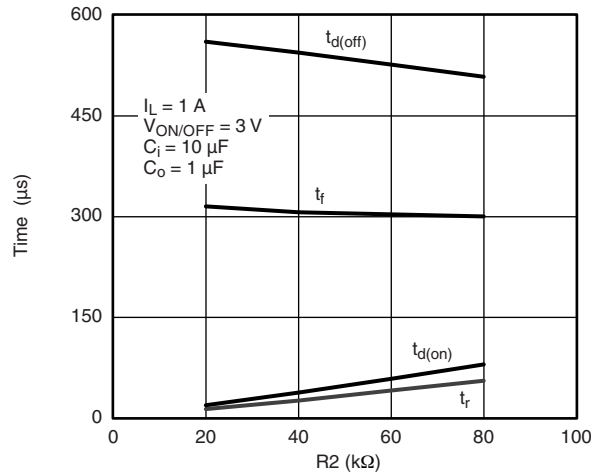
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

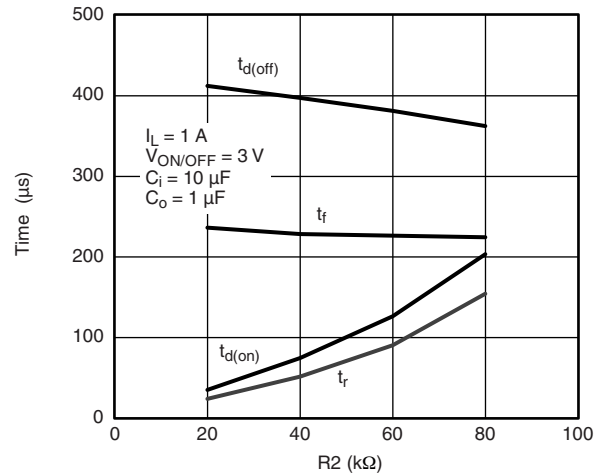


TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)**On-Resistance vs. Input Voltage****Source-Drain Diode Forward Voltage****Switching Variation**
 R_L at $V_{IN} = 4.5\text{ V}$, $R_1 = 20\text{ k}\Omega$ **Switching Variation**
 R_L at $V_{IN} = 2.5\text{ V}$, $R_1 = 20\text{ k}\Omega$ **Switching Variation**
 R_L at $V_{IN} = 1.8\text{ V}$, $R_1 = 20\text{ k}\Omega$ **Switching Variation**
 R_L at $V_{IN} = 4.5\text{ V}$, $R_1 = 300\text{ k}\Omega$

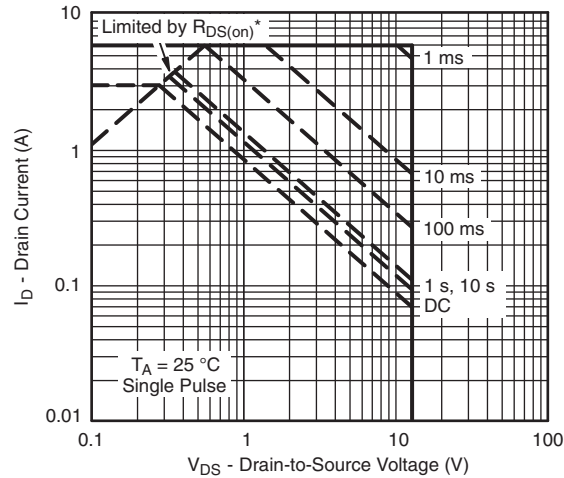
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



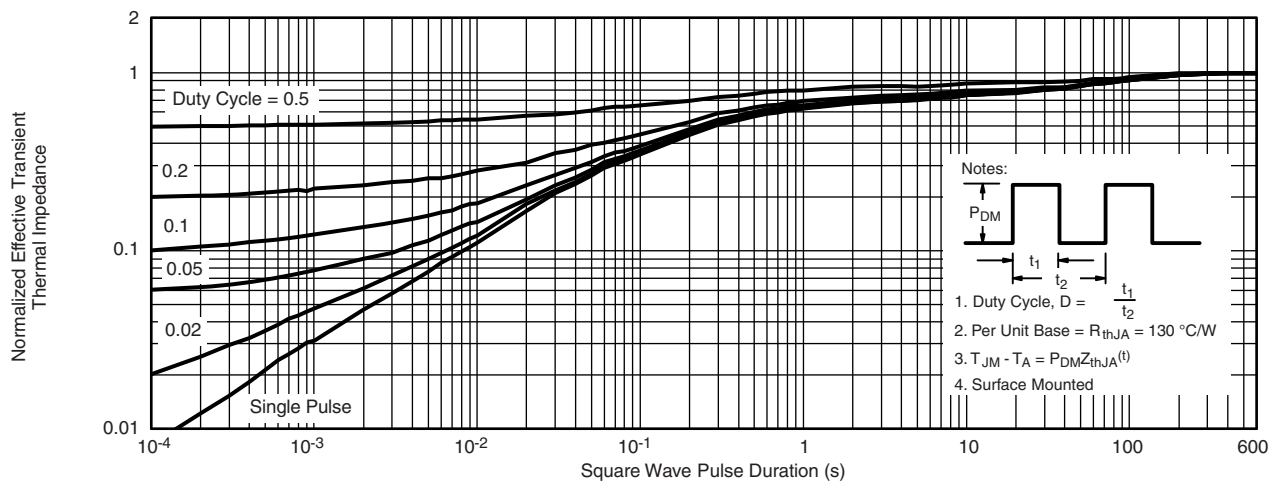
Switching Variation
R2 at $V_{IN} = 2.5 \text{ V}$, $R1 = 300 \text{ k}\Omega$



Switching Variation
R2 at $V_{IN} = 1.8 \text{ V}$, $R1 = 300 \text{ k}\Omega$



* $V_{GS} > \text{minimum } V_{GS} \text{ at which } R_{DS(on)} \text{ is specified}$
Safe Operating Area, Junction-to-Foot



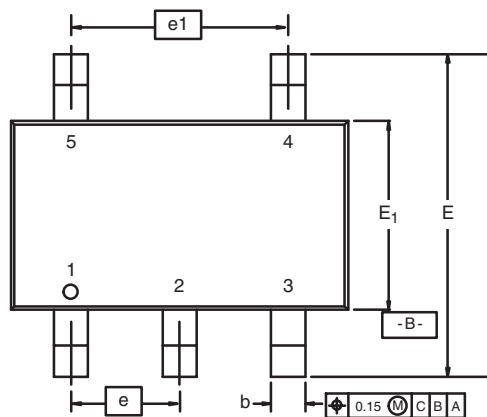
Normalized Thermal Transient Impedance, Junction-to-Ambient

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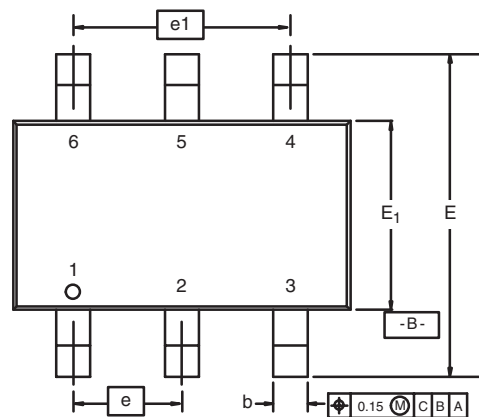


TSOP: 5/6-LEAD

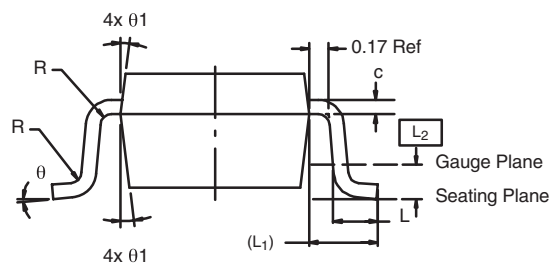
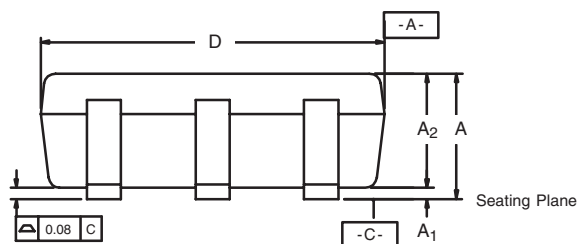
JEDEC Part Number: MO-193C



5-LEAD TSOP

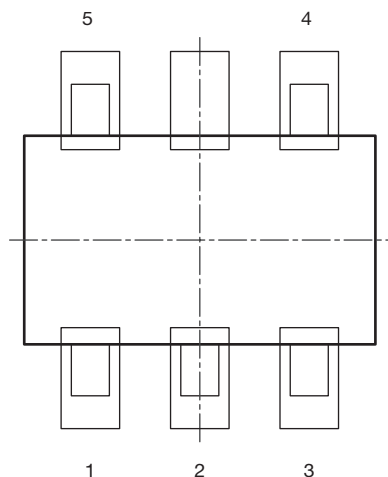


6-LEAD TSOP

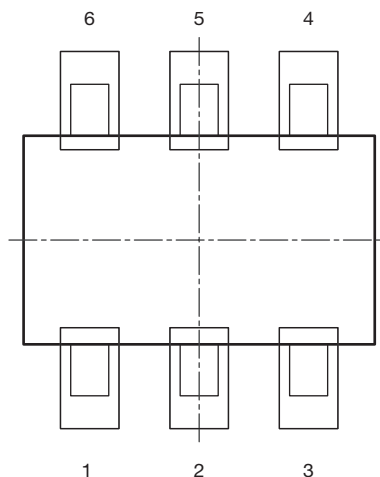


| | MILLIMETERS | | | INCHES | | |
|--------------------------------|-------------|------|------|------------|-------|-------|
| Dim | Min | Nom | Max | Min | Nom | Max |
| A | 0.91 | - | 1.10 | 0.036 | - | 0.043 |
| A ₁ | 0.01 | - | 0.10 | 0.0004 | - | 0.004 |
| A ₂ | 0.90 | - | 1.00 | 0.035 | 0.038 | 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 | | | | | | |

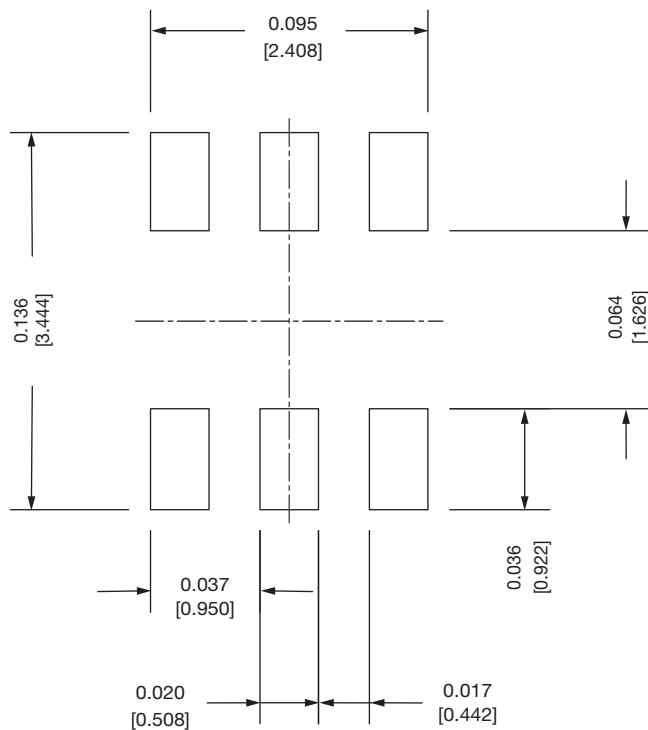
Recommended Land Pattern For TSOP-5L / TSOP-6L



TSOP 5L



TSOP 6L


Note

- All dimensions are in inches (millimeter)

ECN: C22-0860-Rev. B, 24-Oct-2022
DWG: 3010



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