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

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- 60 mΩ 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

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

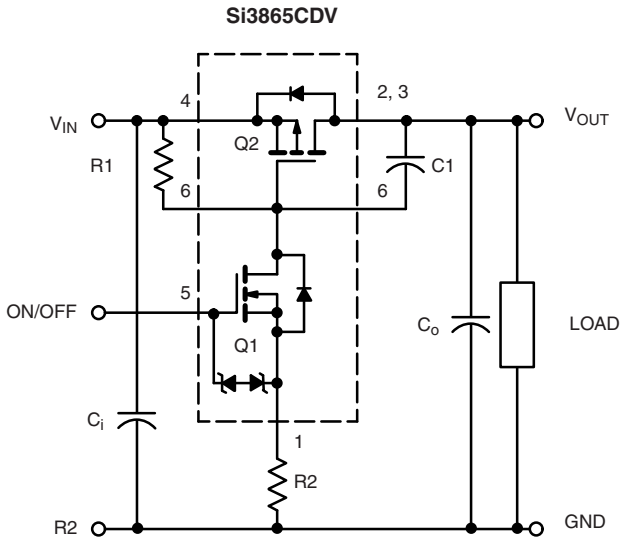
APPLICATIONS

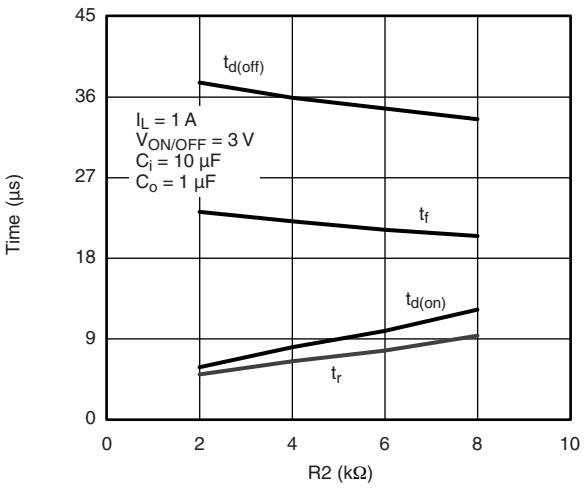
- Load Switching for Portable Devices

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-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.

APPLICATION CIRCUITS





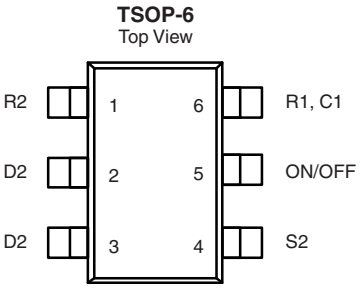
Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 20 kΩ

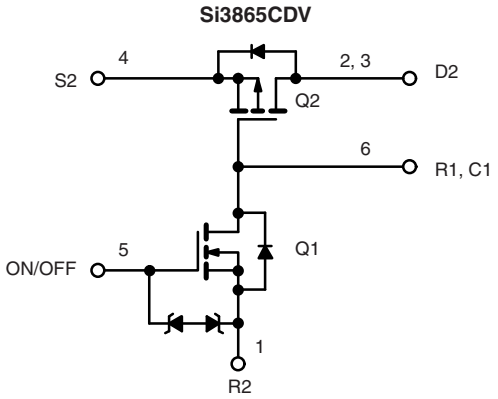
COMPONENTS		
R1	Pull-Up Resistor	Typical 10 kΩ to 1 MΩ*
R2	Optional Slew-Rate Control	Typical 0 to 100 kΩ*
C1	Optional Slew-Rate Control	Typical 1000 pF

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.

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

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 °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]	I_L	± 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	°C
ESD Rating, MIL-STD-883D Human Body Model (100 pF, 1500 Ω)		ESD	3	kV

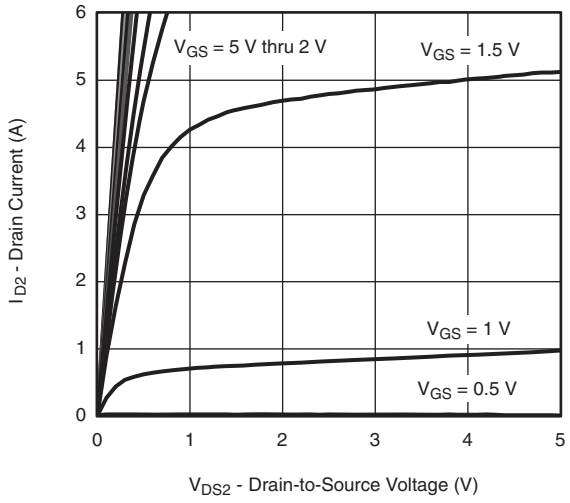
THERMAL RESISTANCE RATINGS				
Parameter	**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient (continuous current)[a]	R_{thJA}	130	150	°C/W
Maximum Junction-to-Foot (Q2)	R_{thJF}	75	90	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.**	**Max.**	**Unit**
OFF Characteristics							
Reverse Leakage Current	I_{FL}	V_{IN} = 12 V, $V_{ON/OFF}$ = 0 V				1	µA
Diode Forward Voltage	V_{SD}	I_S = - 1 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 V, I_D = 1 A	V_{IN} = 4.5 V		0.050	0.060	Ω
			V_{IN} = 2.5 V		0.073	0.095	
			V_{IN} = 1.8 V		0.100	0.130	
On-State (P-Channel) Drain-Current	$I_{D(on)}$	$V_{IN-OUT} \leq$ 0.2 V, V_{IN} = 5 V, $V_{ON/OFF}$ = 1.5 V		1			A
		$V_{IN-OUT} \leq$ 0.3 V, V_{IN} = 3 V, $V_{ON/OFF}$ = 1.5 V		1			

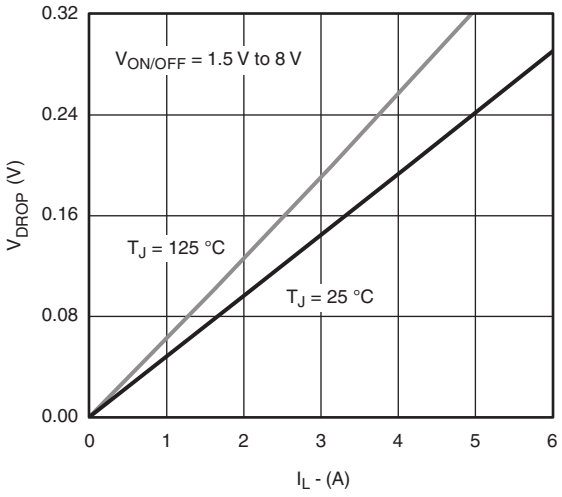
Notes:
a. Surface Mounted on FR4 board.
b. V_{IN} = 8 V, $V_{ON/OFF}$ = 8 V, T_A = 25 °C.
c. Pulse test: pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

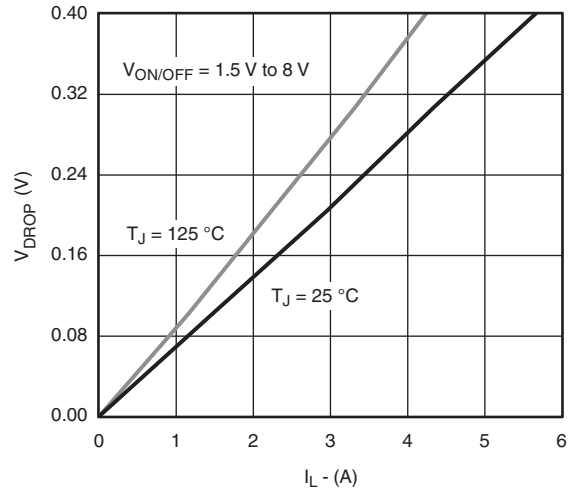
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



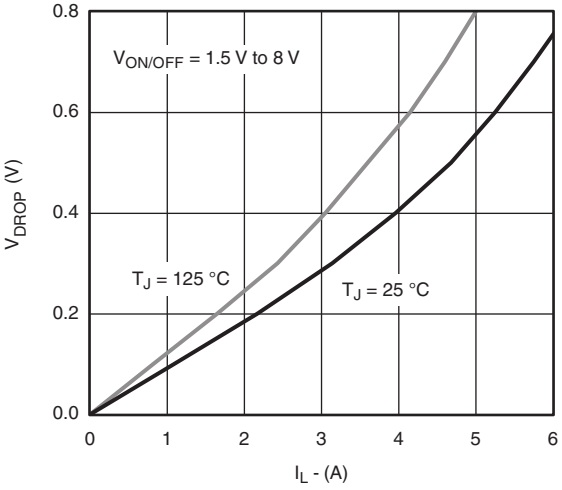
Output Characteristics



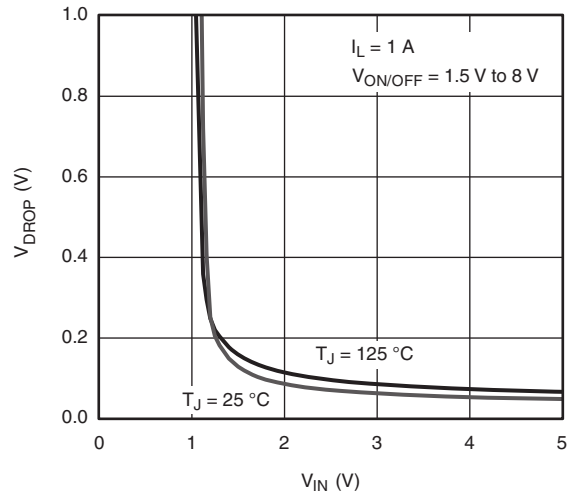
V_{DROP} vs. I_L at V_{IN} = 4.5 V



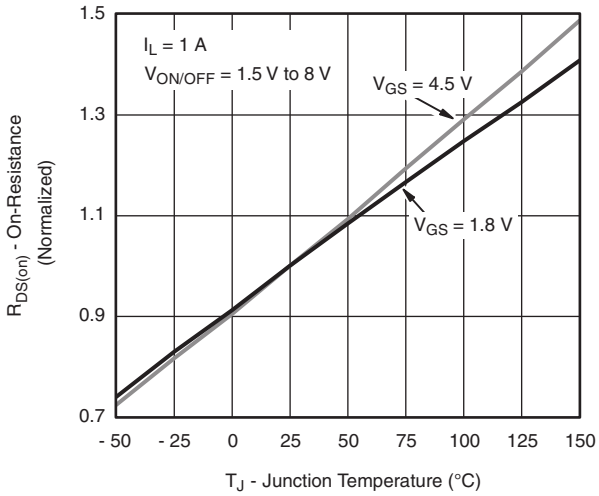
V_{DROP} vs. I_L at V_{IN} = 2.5 V



V_{DROP} vs. I_L at V_{IN} = 1.8 V

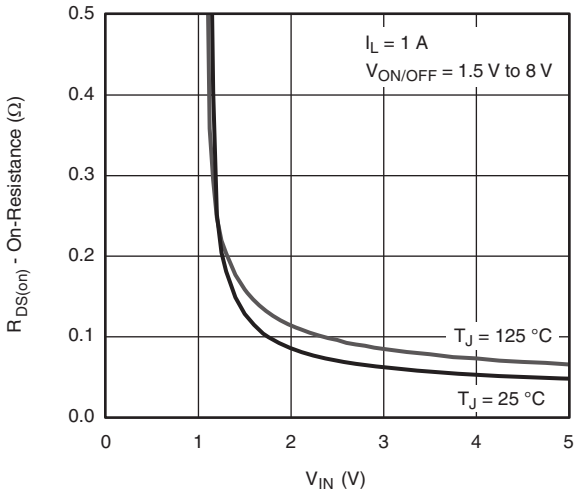


V_{DROP} vs. V_{IN} at I_L = 1 A

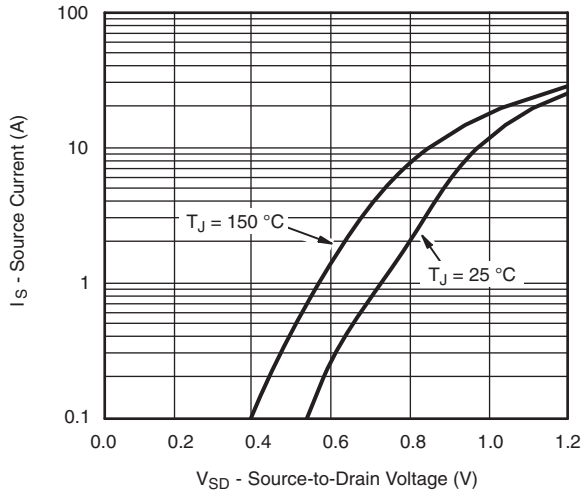


Normalized On-Resistance vs. Junction Temperature

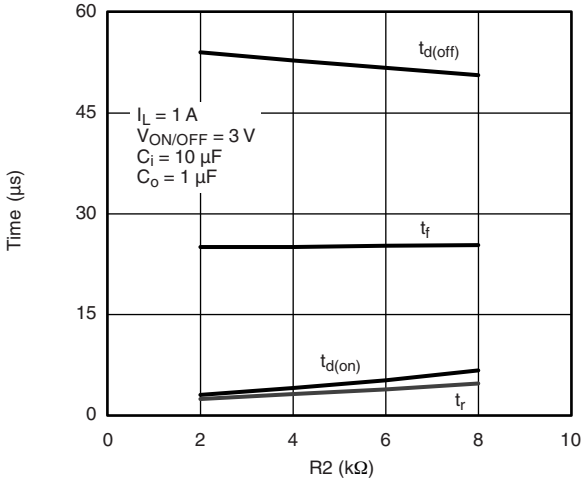
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



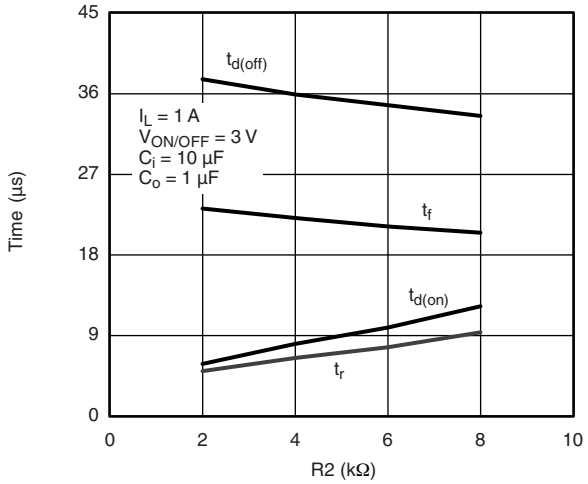
On-Resistance vs. Input Voltage



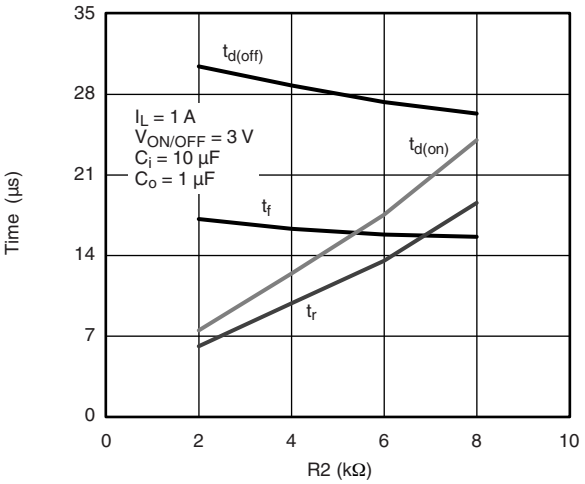
Source-Drain Diode Forward Voltage



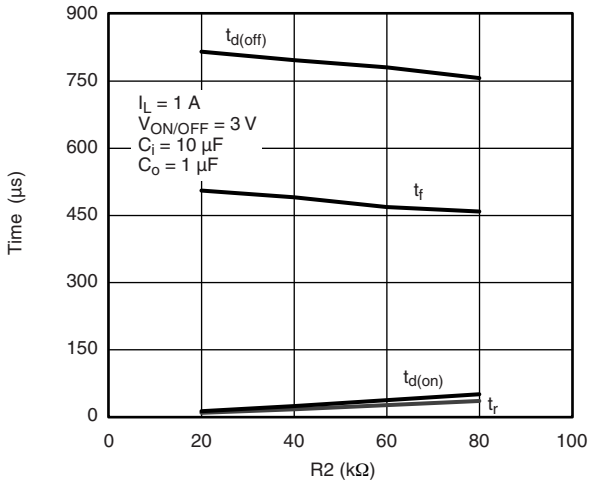
Switching Variation
R2 at V_{IN} = 4.5 V, R1 = 20 kΩ



Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 20 kΩ

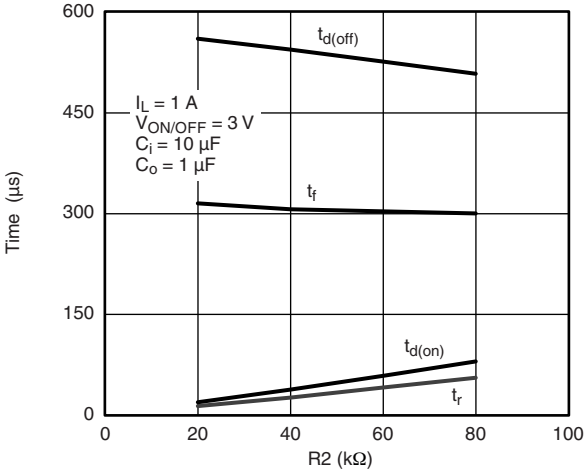


Switching Variation
R2 at V_{IN} = 1.8 V, R1 = 20 kΩ

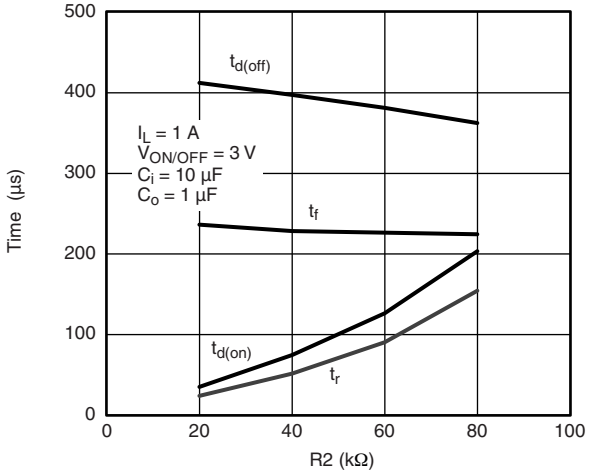


Switching Variation
R2 at V_{IN} = 4.5 V, R1 = 300 kΩ

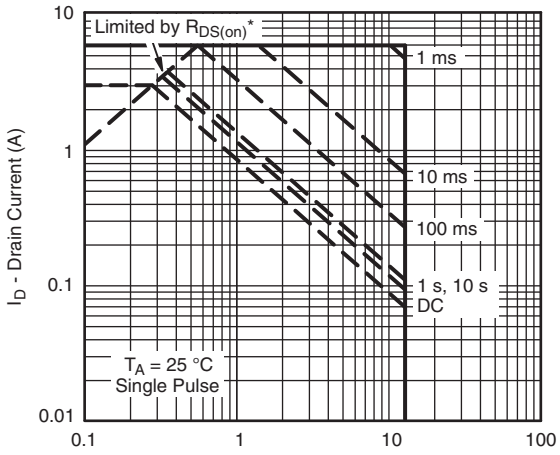
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Switching Variation
R2 at V_{IN} = 2.5 V, R1 = 300 kΩ

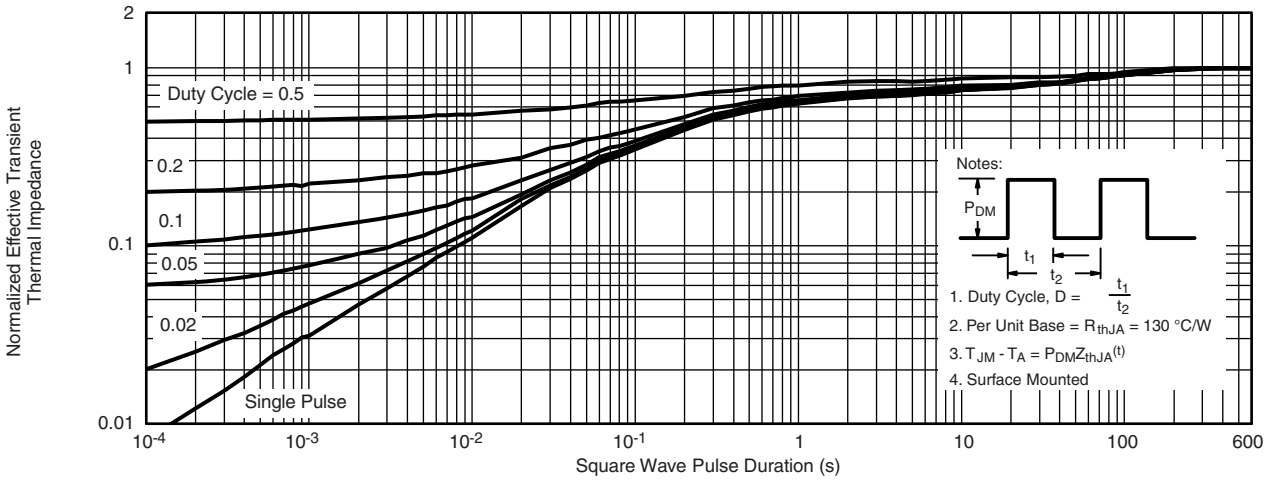


Switching Variation
R2 at V_{IN} = 1.8 V, R1 = 300 kΩ



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

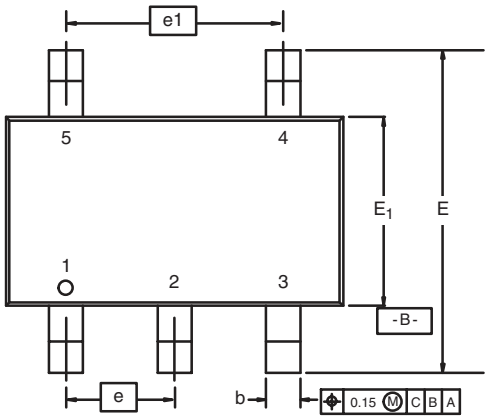
Safe Operating Area, Junction-to-Foot



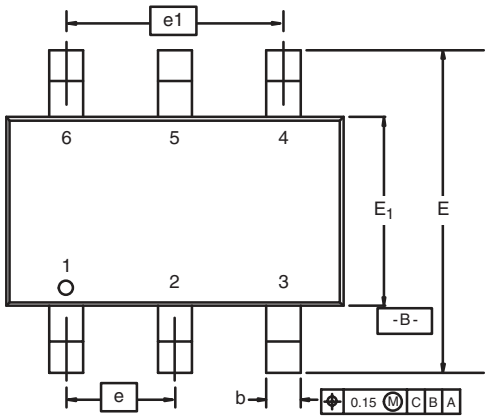
Normalized Thermal Transient Impedance, Junction-to-Ambient

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?69010.

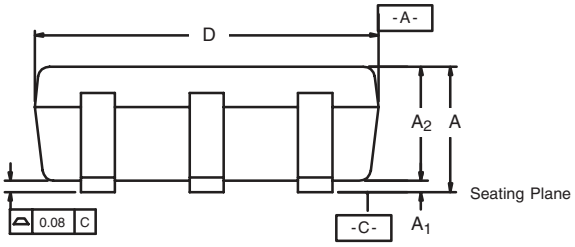
TSOP: 5/6–LEAD
JEDEC Part Number: MO-193C

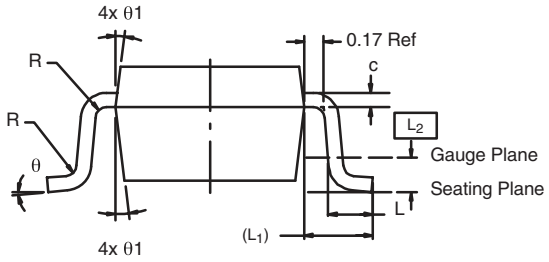


5-LEAD TSOP



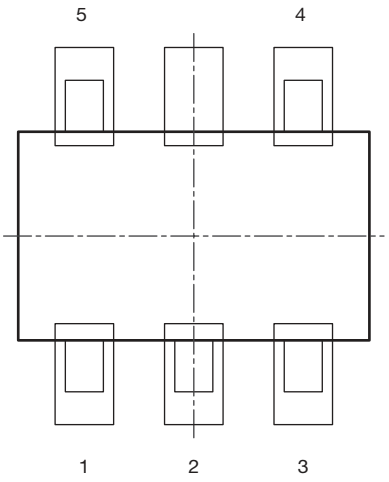
6-LEAD TSOP



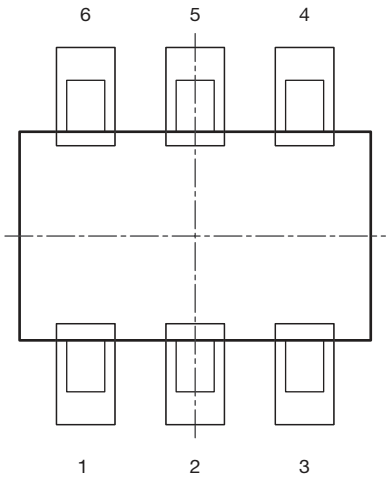


Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.91	-	1.10	0.036	-	0.043
A_1	0.01	-	0.10	0.0004	-	0.004
A_2	0.90	-	1.00	0.035	0.038	0.039
b	0.30	0.32	0.45	0.012	0.013	0.018
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	2.70	2.85	2.98	0.106	0.112	0.117
E_1	1.55	1.65	1.70	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						

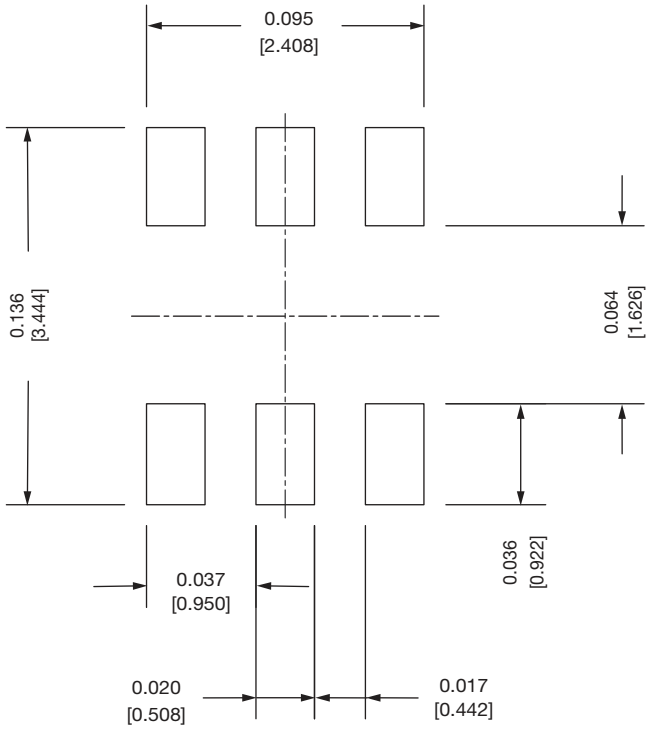
Recommended Land Pattern For TSOP-5L / TSOP-6L



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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