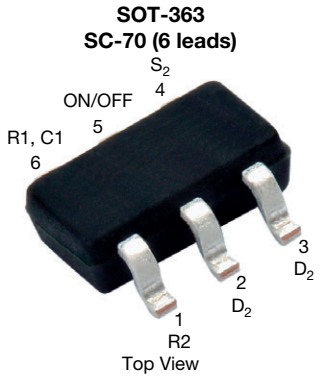
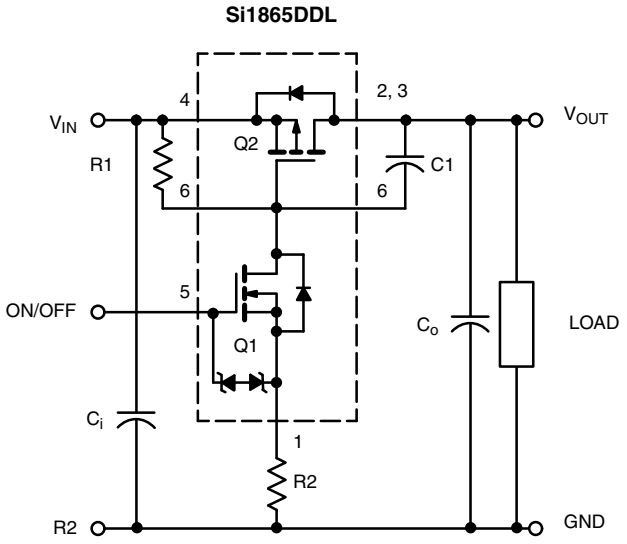
Load Switch with Level-Shift



Marking Code: VD

PRODUCT SUMMARY	
V_{DS} (V)	12
$R_{DS(on)}$ (Ω) at V_{IN} = 4.5 V	0.200
$R_{DS(on)}$ (Ω) at V_{IN} = 2.5 V	0.300
$R_{DS(on)}$ (Ω) at V_{IN} = 1.8 V	0.508
I_D (A)	± 1.1
Configuration	Level-shift

APPLICATION CIRCUITS



COMPONENTS		
R1	Pull-up resistor	Typical 10 kΩ to 1 MΩ [a]
R2	Optional slew-rate control	Typical 0 to 100 kΩ [a]
C1	Optional slew-rate control	Typical 1000 pF

Note

a. Minimum R1 value should be at least 10 x R2 to ensure Q1 turn-on

FEATURES

- 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 SC-70-6 package
- 2000 V ESD protection on input switch, $V_{ON/OFF}$
- Adjustable slew-rate
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

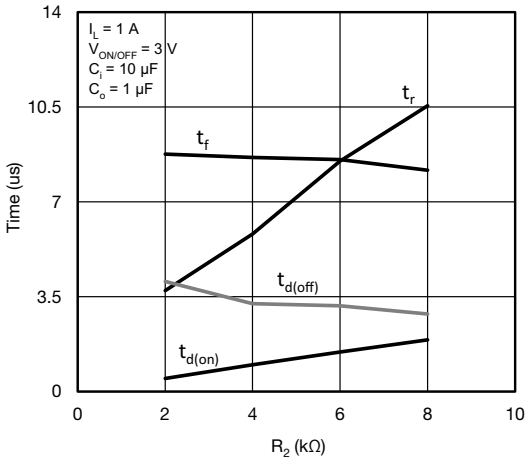
Pb-free
RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Load switch with level-shift
- Slew-rate control
- Portable / consumer devices

DESCRIPTION

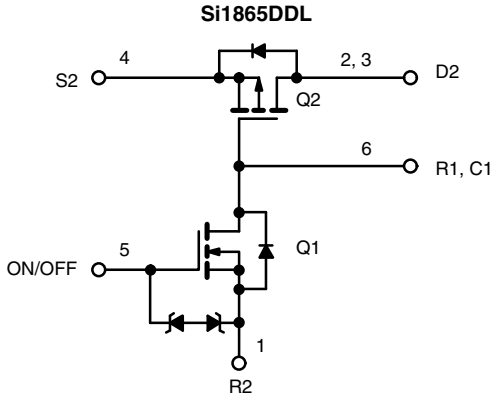
The Si1865DDL includes a p- and n-channel MOSFET in a single SC-70-6 package. The low on-resistance p-channel TrenchFET is tailored for use as a load switch. The n-channel, with an external resistor, can be used as a level-shift to drive the p-channel load-switch. The n-channel MOSFET has internal ESD protection and can be driven by logic signals as low as 1.5 V. The Si1865DDL operates on supply lines from 1.8 V to 12 V, and can drive loads up to 1.1 A.



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

The Si1865DDL 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	
Package	SC-70
Lead (Pb)-free and halogen-free	Si1865DDL-T1-GE3

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Input voltage		$V_{IN}(V_{DS2})$	12	V
On/off voltage		$V_{ON/OFF}$	8	
Load current	Continuous [a, b]	I_L	± 1.1	A
	Pulsed [b, c]		± 5	
Continuous intrinsic diode conduction [a]		I_S	-0.3	
Maximum power dissipation [a]		P_D	0.357	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	2	kV

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient (continuous current) [a]	R_{thJA}	290	350	°C/W
Maximum junction-to-foot (Q2)	R_{thJF}	250	300	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

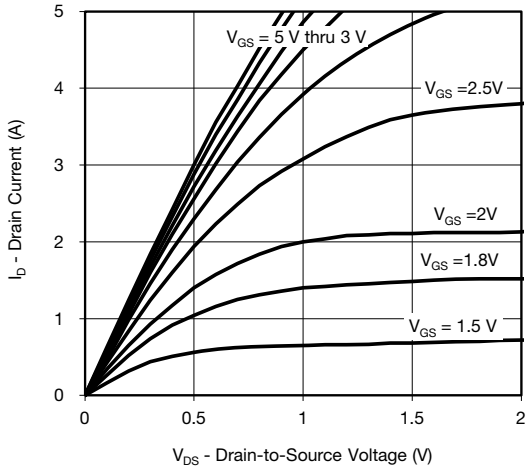
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Off Characteristics						
Reverse leakage current	I_{FL}	V_{IN} = 12 V, $V_{ON/OFF}$ = 0 V	-	-	1	µA
Diode forward voltage	V_{SD}	I_S = -0.8 A	-	-0.84	-1.2	V
On Characteristics						
Input voltage range	V_{IN}		1.8	-	12	V
On-resistance (p-channel)	$R_{DS(on)}$	$V_{ON/OFF}$ = 1.5 V, V_{IN} = 4.5 V, I_D = 1.1 A	-	0.165	0.200	Ω
		$V_{ON/OFF}$ = 1.5 V, V_{IN} = 2.5 V, I_D = 0.9 A	-	0.250	0.300	
		$V_{ON/OFF}$ = 1.5 V, V_{IN} = 1.8 V, I_D = 0.2 A	-	0.376	0.508	
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

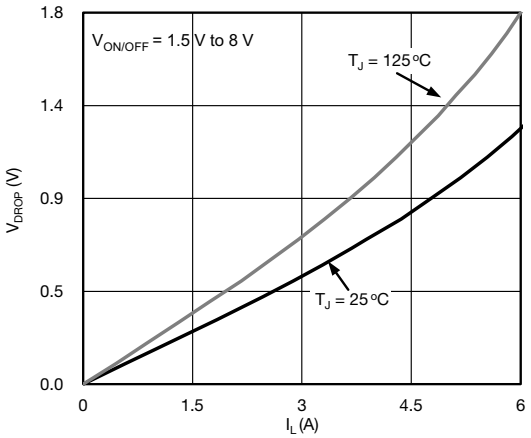
a. Surface mounted on FR4 board
b. V_{IN} = 12 V, $V_{ON/OFF}$ = 8 V, T_A = 25 °C
c. Pulse test: pulse width ≤ 300 µs, duty cycle ≤ 2 %

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.

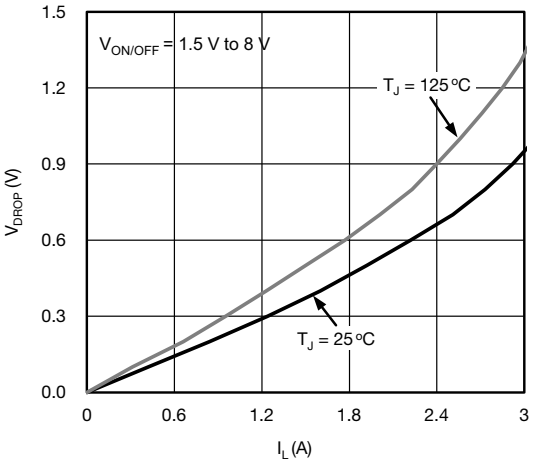
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



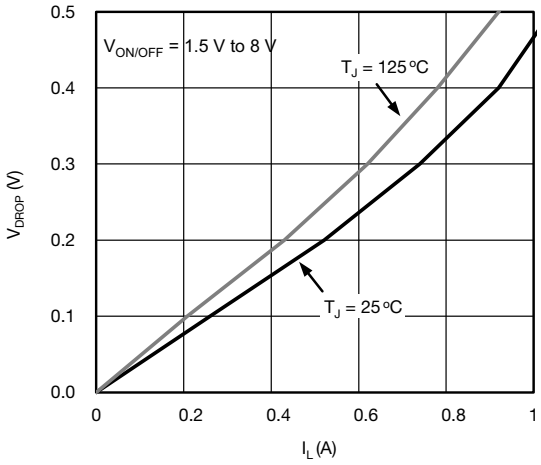
Output Characteristics



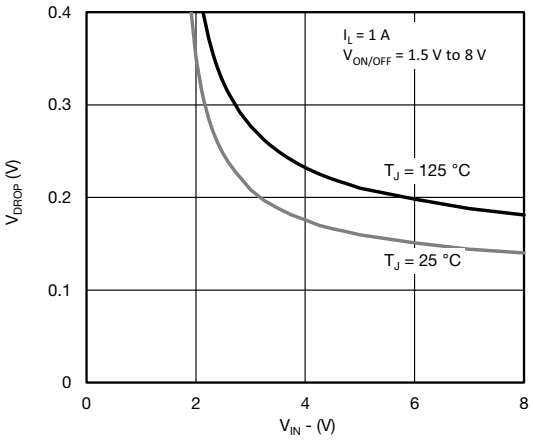
V_{DROP} vs. I_L at V_{IN} = 4.5 V



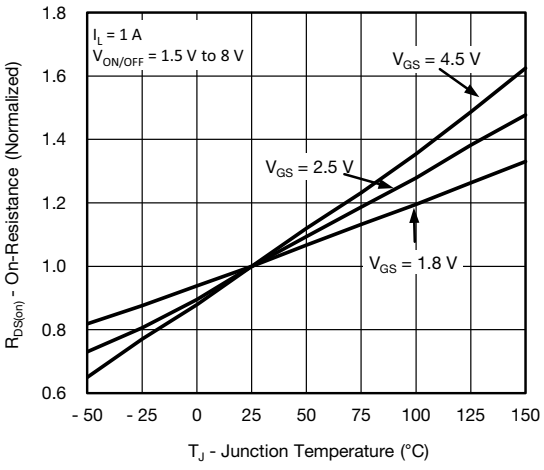
V_{DROP} vs. I_L at V_{IN} = 2.5 V



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

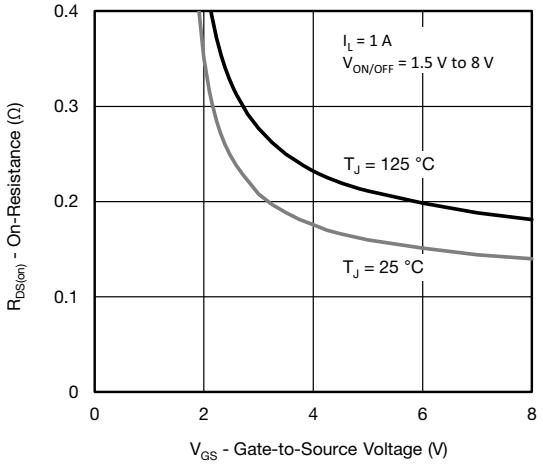


V_{DROP} vs. V_{IN} at I_L = 1 A

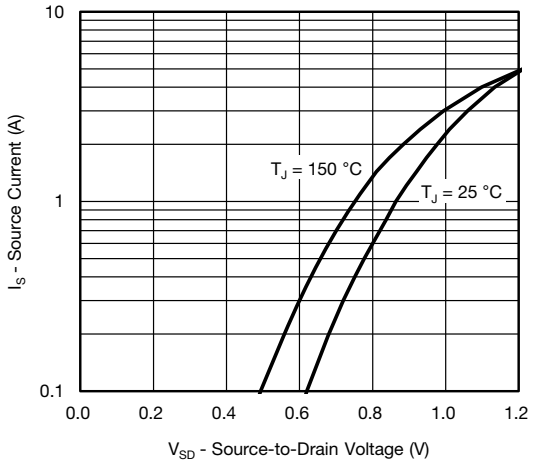


Normalized On-Resistance vs. Junction Temperature

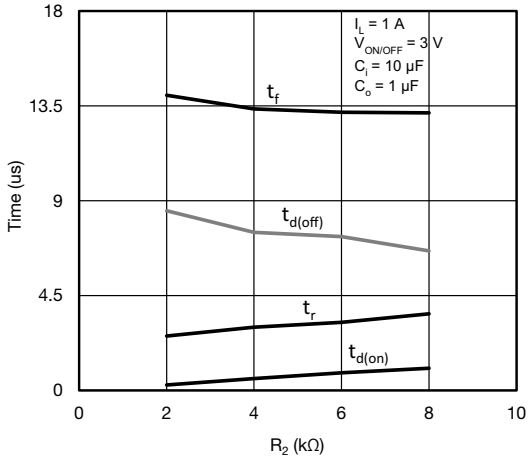
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



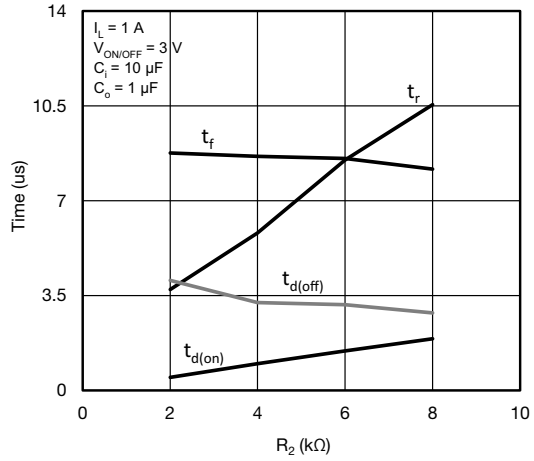
On-Resistance vs. Input Voltage



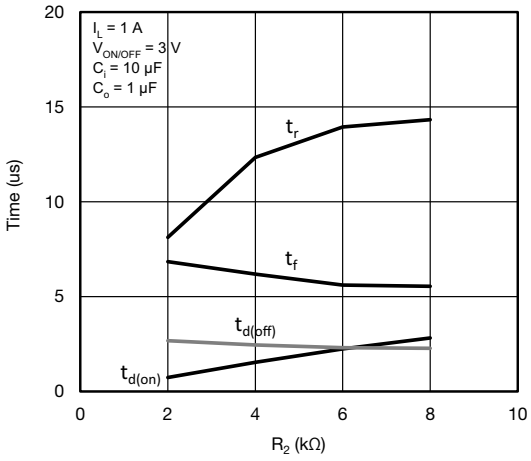
Source-Drain Diode Forward Voltage



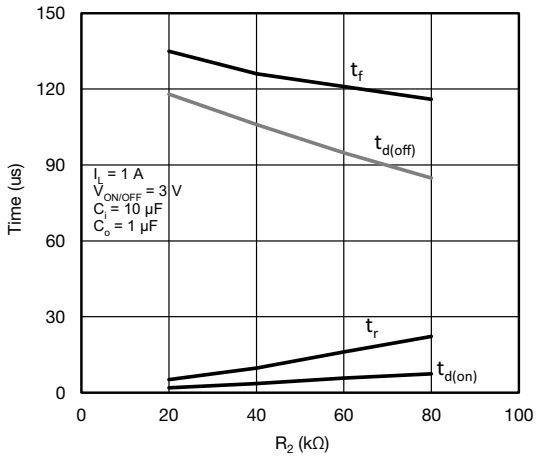
Switching Variation R2 at V_{IN} = 4.5 V, R1 = 20 kΩ



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

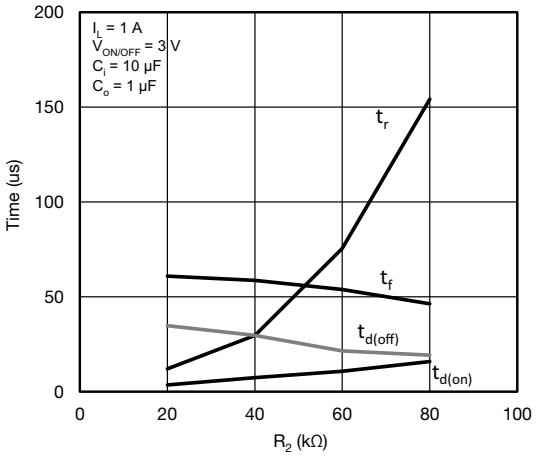


Switching Variation R2 at V_{IN} = 1.8 V, R1 = 20 kΩ

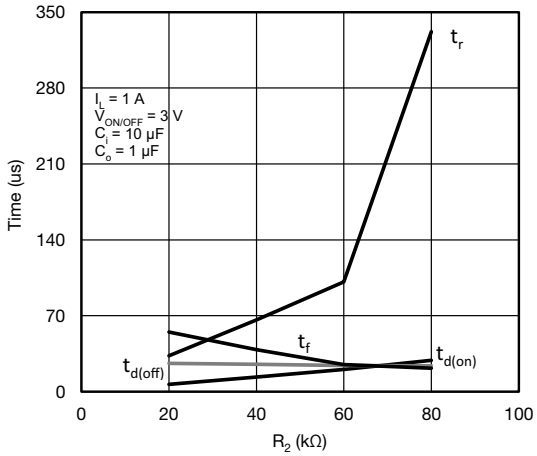


Switching Variation R2 at V_{IN} = 4.5 V, R1 = 300 kΩ

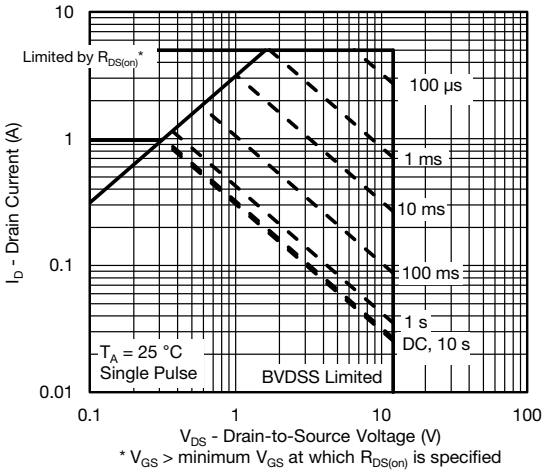
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



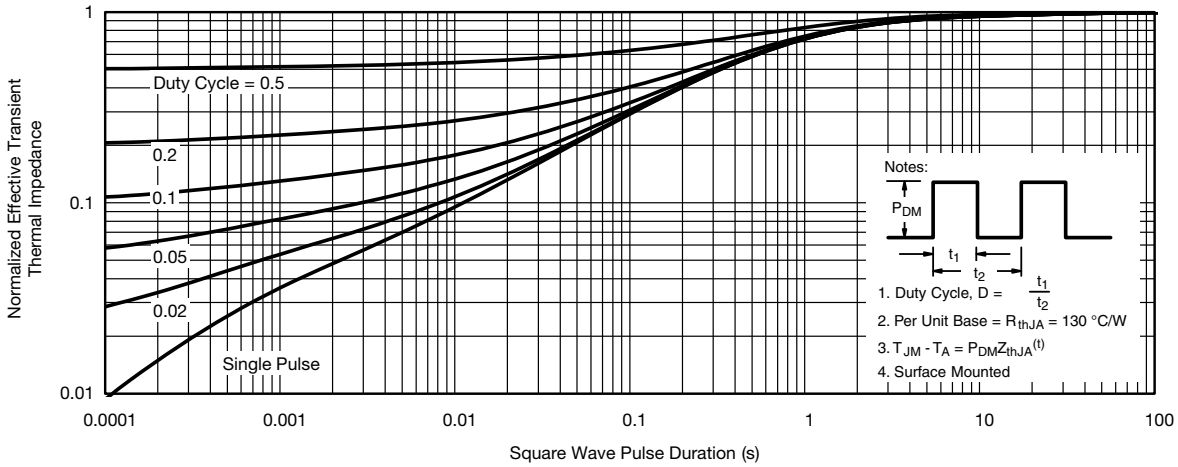
Switching Variation R2 at V_{IN} = 2.5 V, R1 = 300 kΩ



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



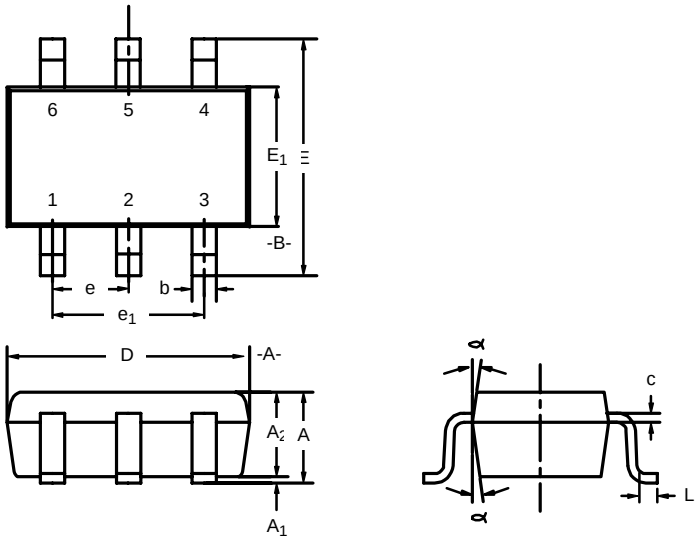
Safe Operating Area, Junction-to-Foot



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?62888.

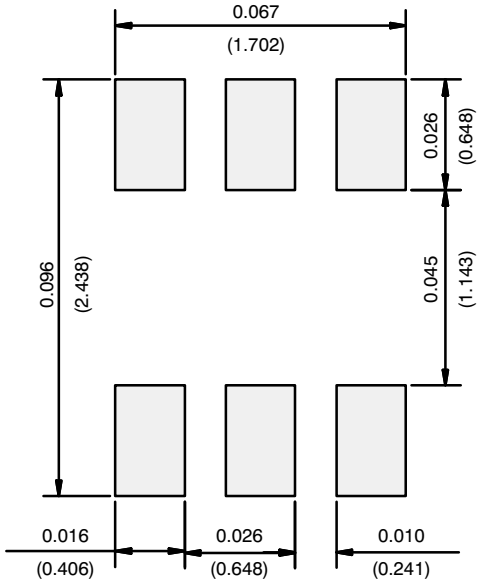
SC-70: 6-LEADS



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.90	–	1.10	0.035	–	0.043
A_1	–	–	0.10	–	–	0.004
A_2	0.80	–	1.00	0.031	–	0.039
b	0.15	–	0.30	0.006	–	0.012
c	0.10	–	0.25	0.004	–	0.010
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.80	2.10	2.40	0.071	0.083	0.094
E_1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65BSC			0.026BSC		
e_1	1.20	1.30	1.40	0.047	0.051	0.055
L	0.10	0.20	0.30	0.004	0.008	0.012
α	7°Nom			7°Nom		

ECN: S-03946—Rev. B, 09-Jul-01
DWG: 5550

RECOMMENDED MINIMUM PADS FOR SC-70: 6-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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