

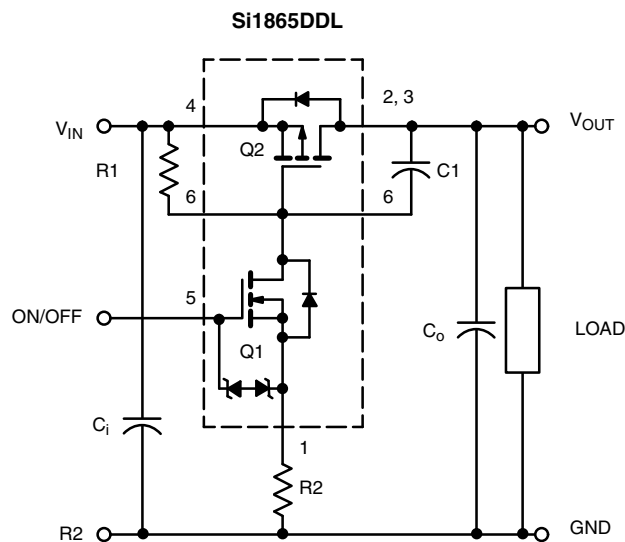
Load Switch with Level-Shift



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 k Ω to 1 M Ω ^a
R2	Optional slew-rate control	Typical 0 to 100 k Ω ^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



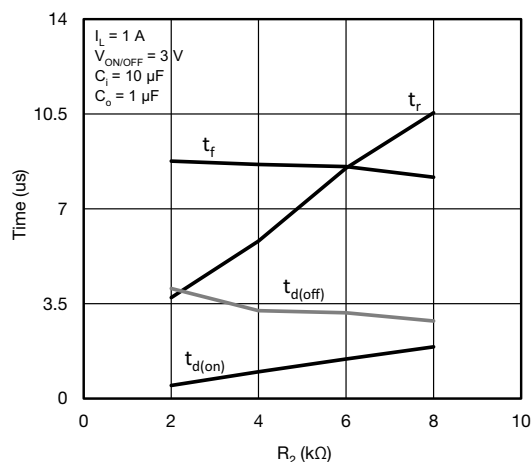
RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

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

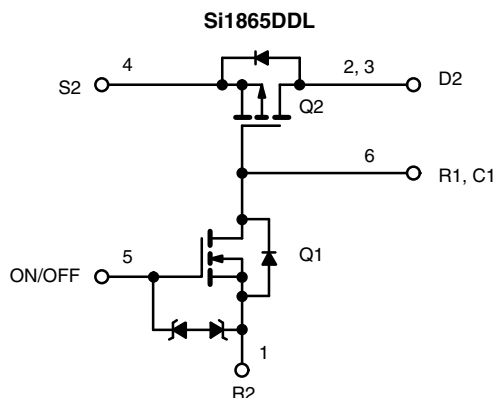
DESCRIPTION

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, $R1 = 20$ k Ω

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 ($T_A = 25\text{ }^{\circ}\text{C}$, 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}	± 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	$^{\circ}\text{C}$
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	$^{\circ}\text{C}/\text{W}$
Maximum junction-to-foot (Q2)	R_{thJF}	250	300	

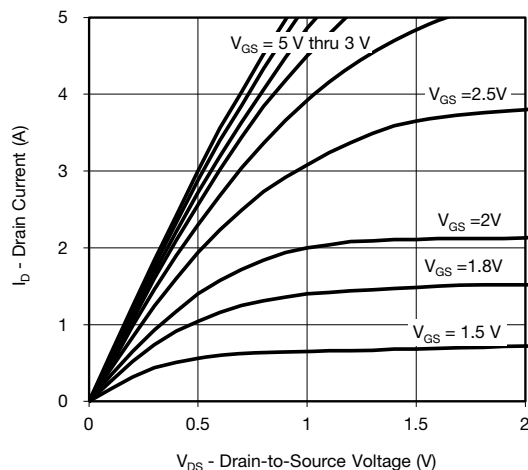
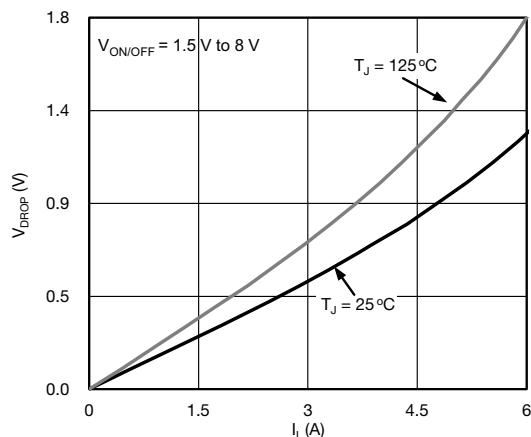
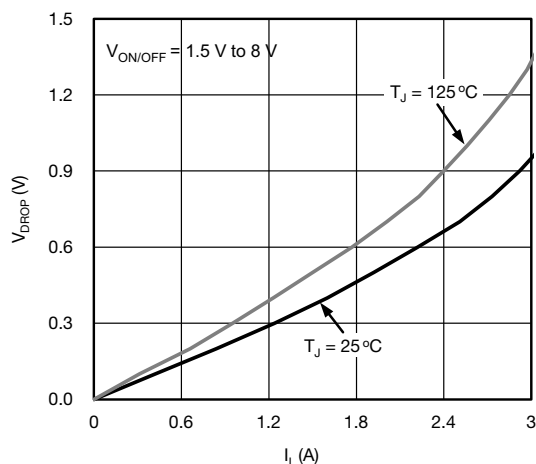
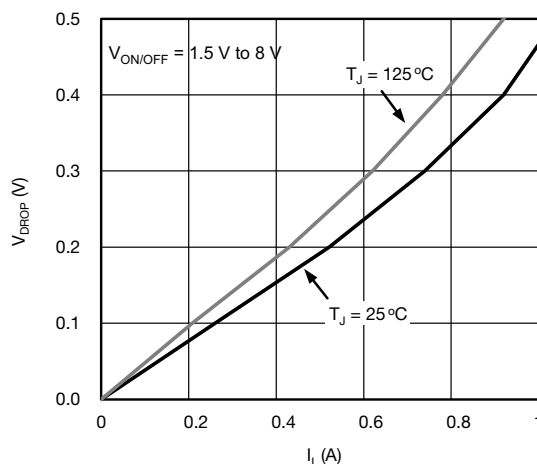
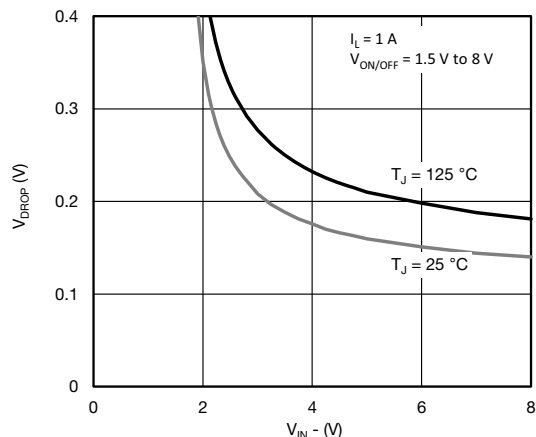
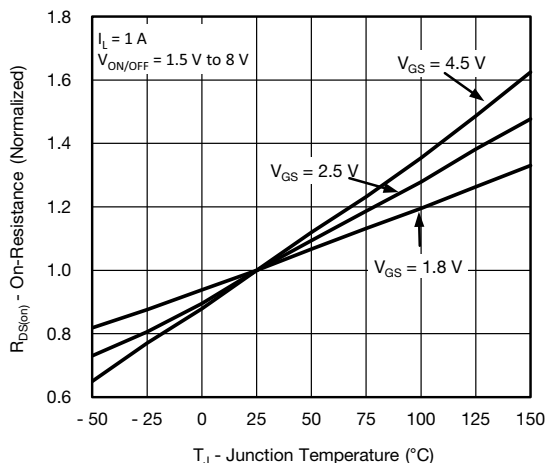
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

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}	$I_S = -0.8\text{ A}$	-	-0.84	-1.2	V
On Characteristics						
Input voltage range	V_{IN}		1.8	-	12	V
On-resistance (p-channel)	$R_{DS(on)}$	$V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 4.5\text{ V}, I_D = 1.1\text{ A}$	-	0.165	0.200	Ω
		$V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 2.5\text{ V}, I_D = 0.9\text{ A}$	-	0.250	0.300	
		$V_{ON/OFF} = 1.5\text{ V}, V_{IN} = 1.8\text{ V}, I_D = 0.2\text{ A}$	-	0.376	0.508	
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

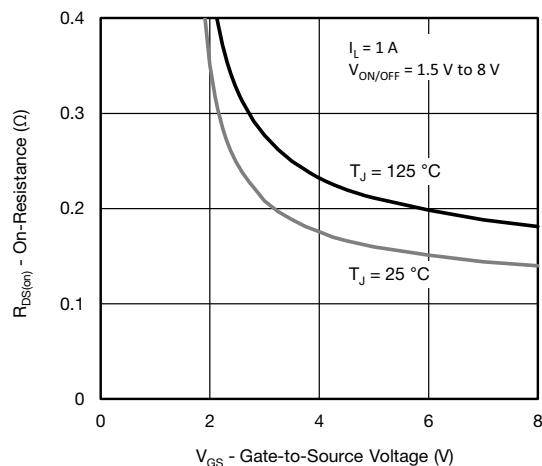
- a. Surface mounted on FR4 board
b. $V_{IN} = 12\text{ V}, V_{ON/OFF} = 8\text{ V}, T_A = 25\text{ }^{\circ}\text{C}$
c. Pulse test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

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.

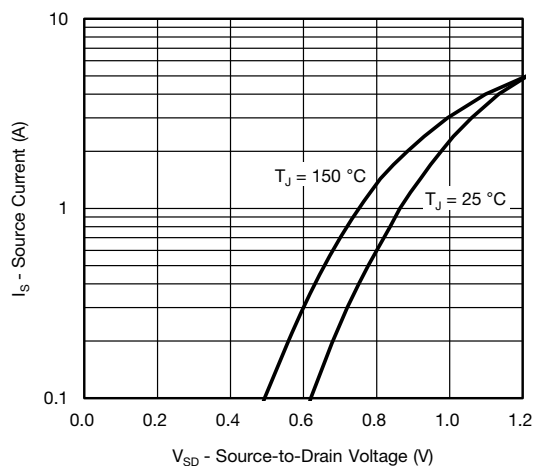
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

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



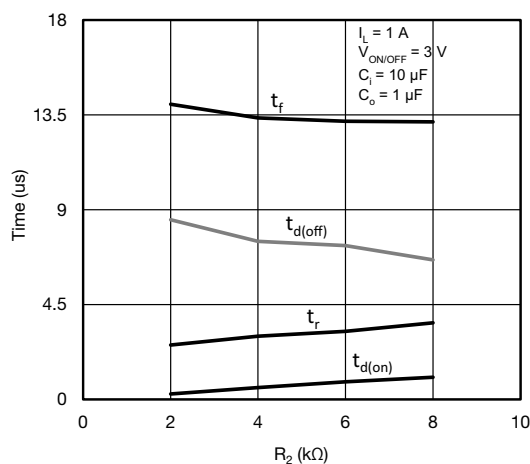
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



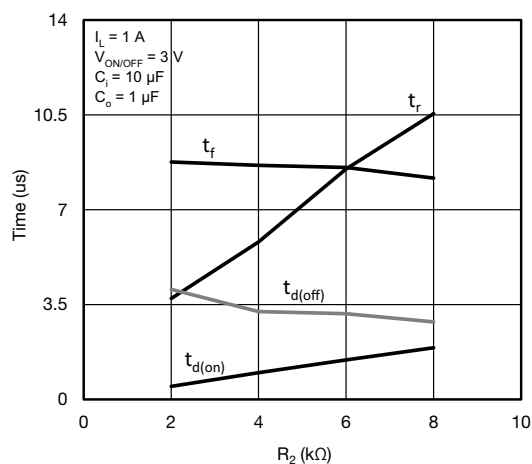
On-Resistance vs. Input Voltage



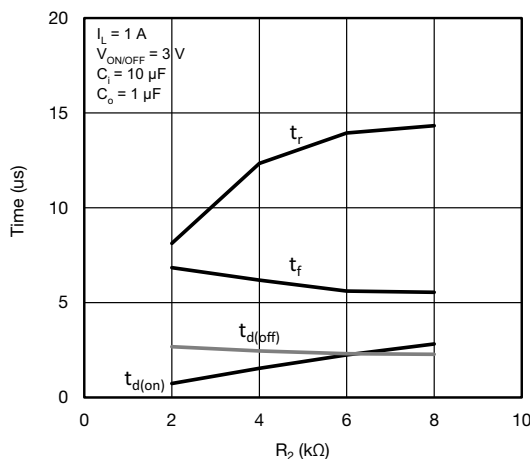
Source-Drain Diode Forward Voltage



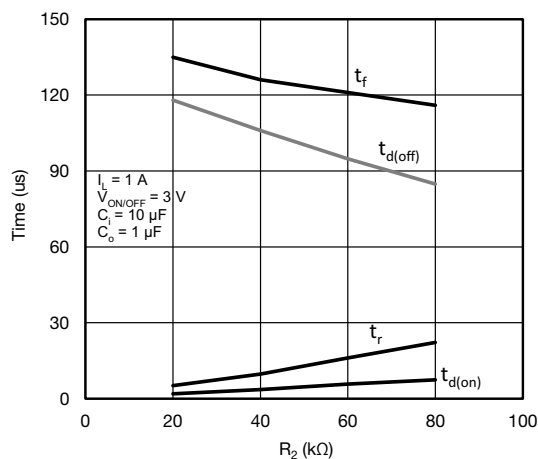
Switching Variation R2 at $V_{IN} = 4.5$ V, $R_1 = 20$ $k\Omega$



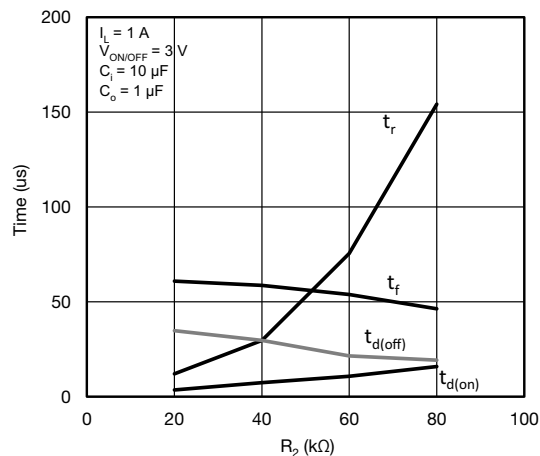
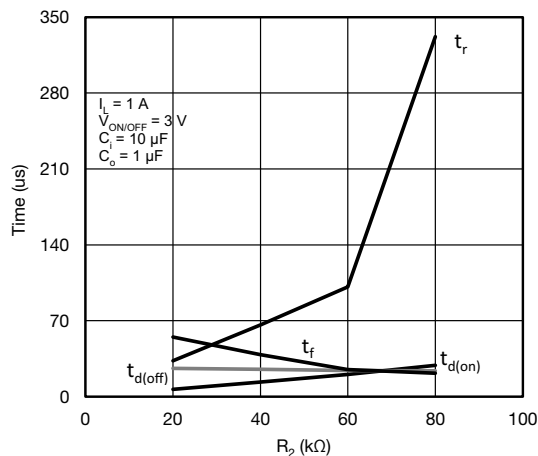
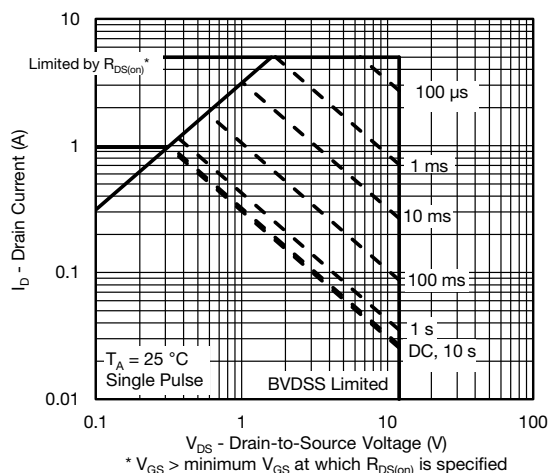
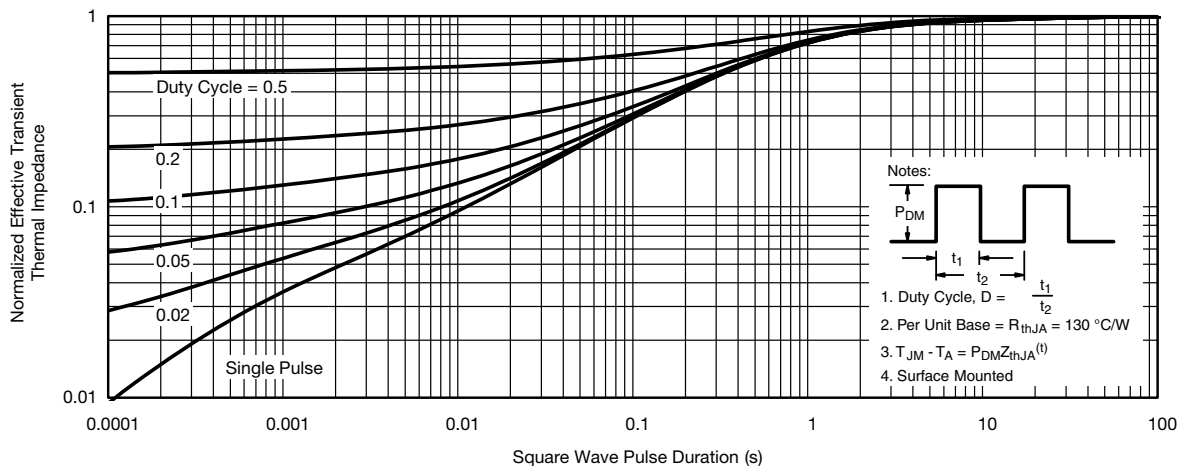
Switching Variation R2 at $V_{IN} = 2.5$ V, $R_1 = 20$ $k\Omega$



Switching Variation R2 at $V_{IN} = 1.8$ V, $R_1 = 20$ $k\Omega$



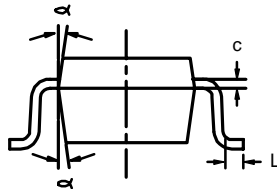
Switching Variation R2 at $V_{IN} = 4.5$ V, $R_1 = 300$ $k\Omega$

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 $V_{IN} = 1.8\text{ V}$, $R1 = 300\text{ k}\Omega$

Safe Operating Area, Junction-to-Foot

Normalized Thermal Transient Impedance, Junction-to-Ambient

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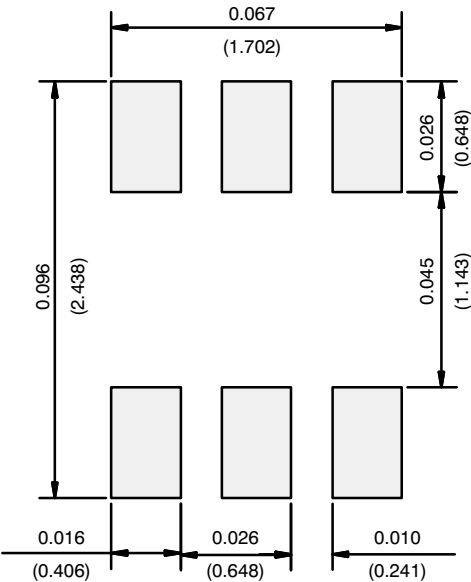
SC-70: 6-LEADS



	MILLIMETERS			INCHES		
Dim	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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