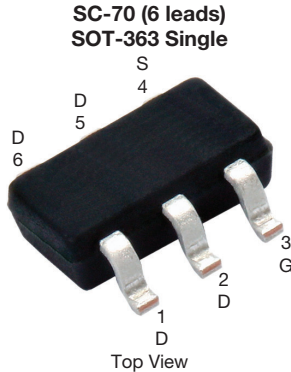


Dual P-Channel 12 V (D-S) MOSFET


Marking Code: DE

PRODUCT SUMMARY	
V_{DS} (V)	-12
$R_{DS(on)}$ max. (Ω) at $V_{GS} = -4.5$ V	0.390
$R_{DS(on)}$ max. (Ω) at $V_{GS} = -2.5$ V	0.535
$R_{DS(on)}$ max. (Ω) at $V_{GS} = -1.8$ V	0.710
Q_g typ. (nC)	1.7
I_D (A) ^d	-1.3
Configuration	Dual

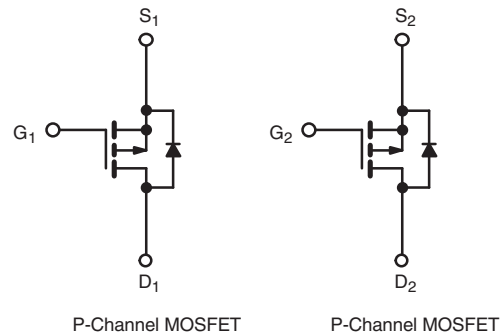
FEATURES

- TrenchFET® power MOSFET
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load switch for portable devices



ORDERING INFORMATION	
Package	SC70-6
Lead (Pb)-free	Si1965DH-T1-E3
Lead (Pb)-free and halogen-free	Si1965DH-T1-GE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	V_{DS}	-12	V	
Gate-source voltage	V_{GS}	± 8	V	
Continuous drain current ($T_J = 150$ °C)	$T_C = 25$ °C	-1.3 ^a	A	
	$T_C = 70$ °C	-1.2		
	$T_A = 25$ °C	-1.14 ^{b, c}		
	$T_A = 70$ °C	-0.9 ^{b, c}		
Pulsed drain current	I_{DM}	-3		
Continuous source-drain diode current	$T_C = 25$ °C	-1		
	$T_A = 25$ °C	-0.6 ^{b, c}		
Maximum power dissipation	$T_C = 25$ °C	1.25	W	
	$T_C = 70$ °C	0.8		
	$T_A = 25$ °C	0.74 ^{b, c}		
	$T_A = 70$ °C	0.47 ^{b, c}		
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C	

THERMAL RESISTANCE RATINGS					
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT	
Maximum junction-to-ambient ^{b, d}	R_{thJA}	130	170	°C/W	
Maximum junction-to-foot (drain)	R_{thJF}	80	100		

Notes

- Package limited
- Surface mounted on 1" x 1" FR4 board
- $t = 5$ s
- Maximum under steady state conditions is 220 °C/W

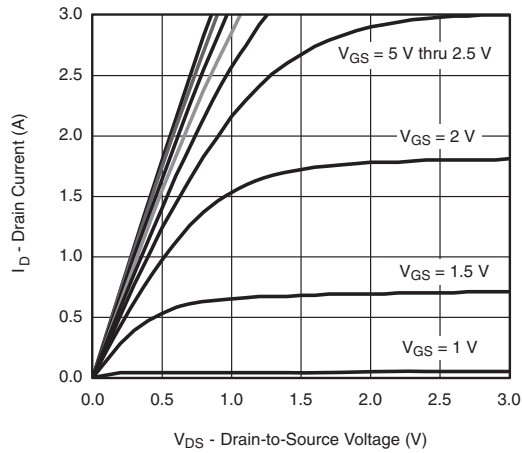
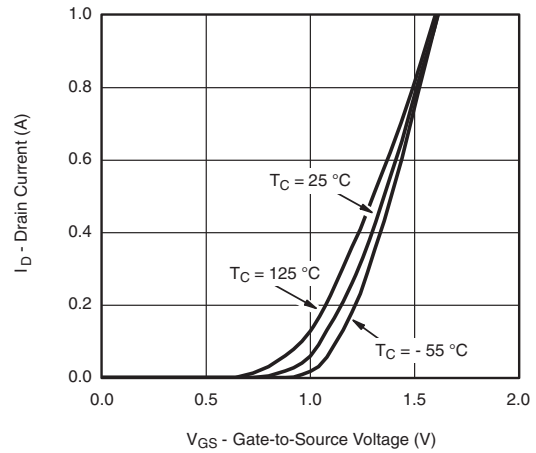
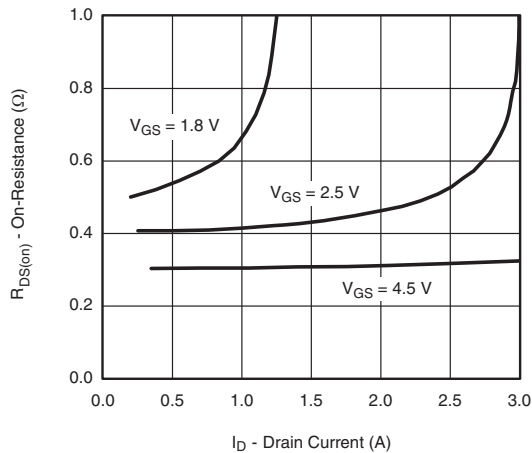
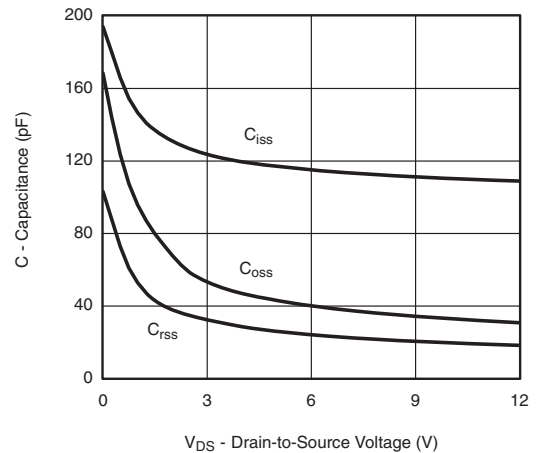
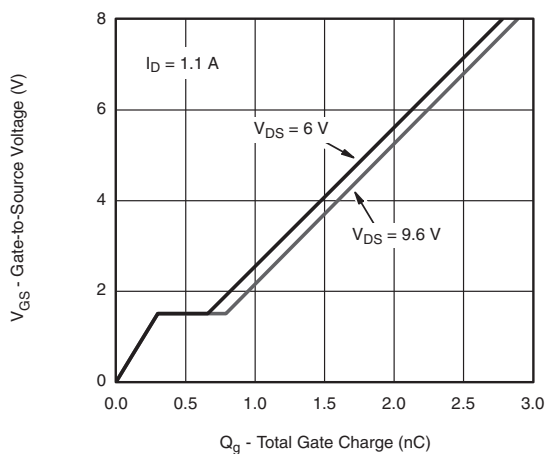
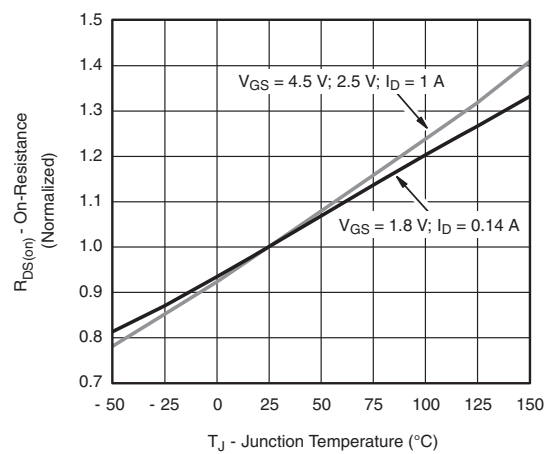


SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-12	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$	-	-14	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$		-	2	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.4	-	-1.0	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}	$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$	-	-	-1	μA
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$	-	-	-10	
On-state drain current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	-3	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1.0\text{ A}$	-	0.315	0.390	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -0.86\text{ A}$	-	0.425	0.535	
		$V_{GS} = -1.8\text{ V}, I_D = -0.25\text{ A}$	-	0.550	0.710	
Forward transconductance ^a	g_{fs}	$V_{DS} = -6\text{ V}, I_D = -1.0\text{ A}$	-	2.5	-	S
Dynamic ^b						
Input capacitance	C_{iss}	$V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	120	-	pF
Output capacitance	C_{oss}		-	41	-	
Reverse transfer capacitance	C_{rss}		-	25	-	
Total gate charge	Q_g	$V_{DS} = -6\text{ V}, V_{GS} = -8\text{ V}, I_D = -1.1\text{ A}$	-	2.8	4.2	nC
		$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1.1\text{ A}$	-	1.7	2.6	
Gate-source charge	Q_{gs}	$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1.1\text{ A}$	-	0.3	-	
Gate-drain charge	Q_{gd}		-	0.4	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	-	7.5	-	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 6.7\text{ }\Omega$ $I_D \cong -0.9\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$	-	12	20	ns
Rise time	t_r		-	27	40	
Turn-off delay time	$t_{d(off)}$		-	15	25	
Fall time	t_f		-	10	15	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 6.7\text{ }\Omega$ $I_D \cong -0.9\text{ A}, V_{GEN} = -8\text{ V}, R_g = 1\text{ }\Omega$	-	2	5	ns
Rise time	t_r		-	12	20	
Turn-off delay time	$t_{d(off)}$		-	12	20	
Fall time	t_f		-	10	15	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	-1.0	A
Pulse diode forward current ^a	I_{SM}		-	-	-3.0	
Body diode voltage	V_{SD}	$I_S = -0.9\text{ A}$	-	-0.8	-1.2	V
Body diode reverse recovery time	t_{rr}	$I_F = -0.9\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	20	40	ns
Body diode reverse recovery charge	Q_{rr}		-	10	20	nC
Reverse recovery fall time	t_a		-	9.5	-	ns
Reverse recovery rise time	t_b		-	11.5	-	

Notes

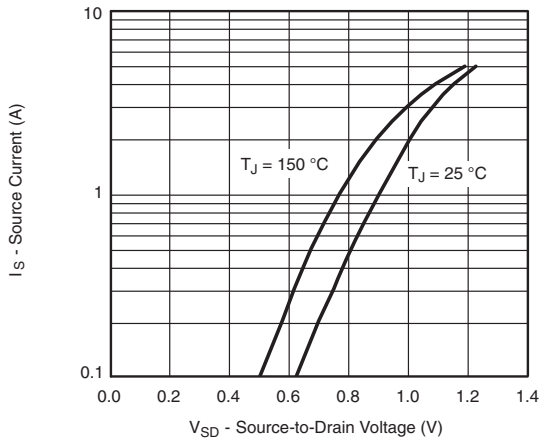
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing

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.

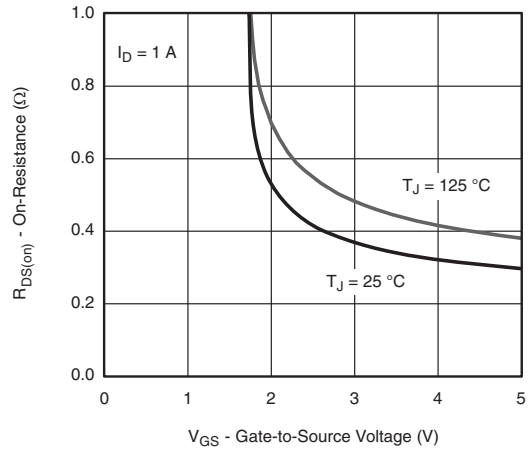
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature



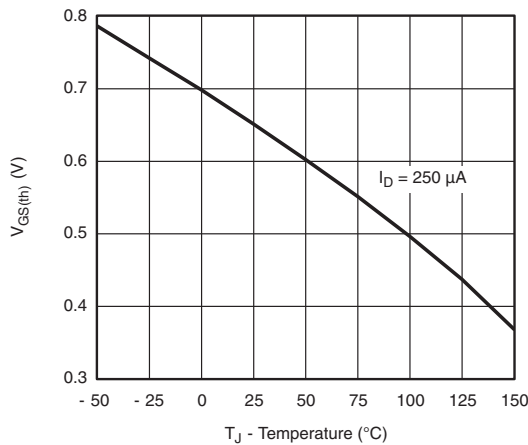
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



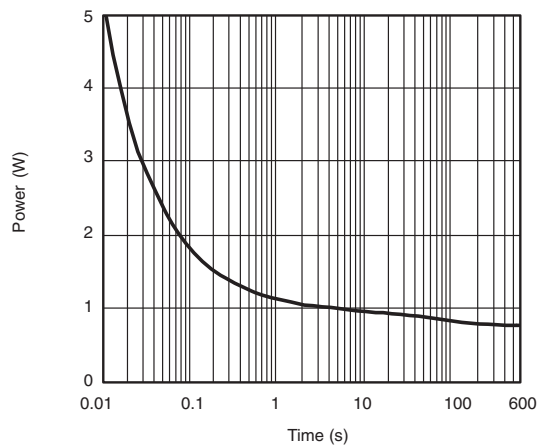
Source-Drain Diode Forward Voltage



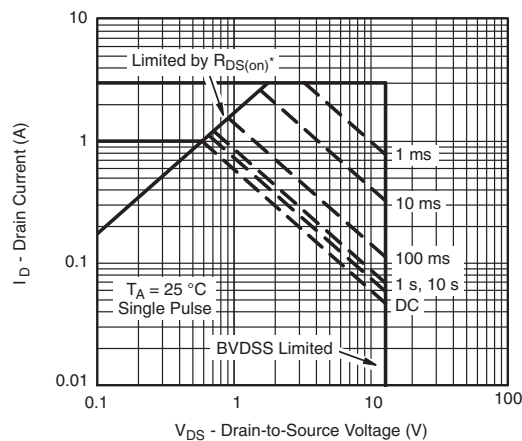
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



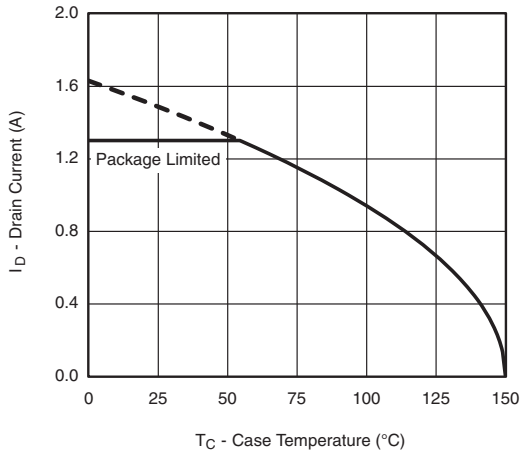
Single Pulse Power



Safe Operating Area, Junction-to-Ambient

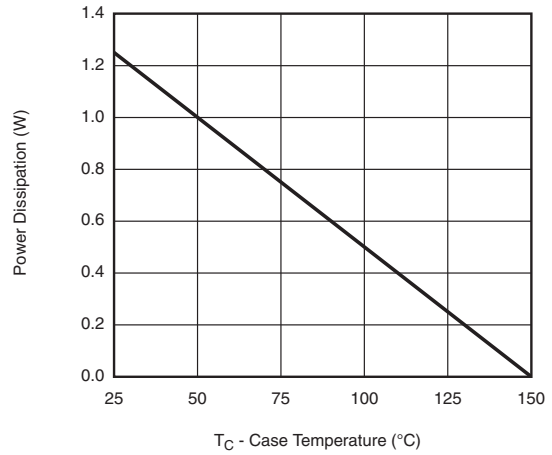


TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



T_C - Case Temperature (°C)

Current Derating ^a



T_C - Case Temperature (°C)

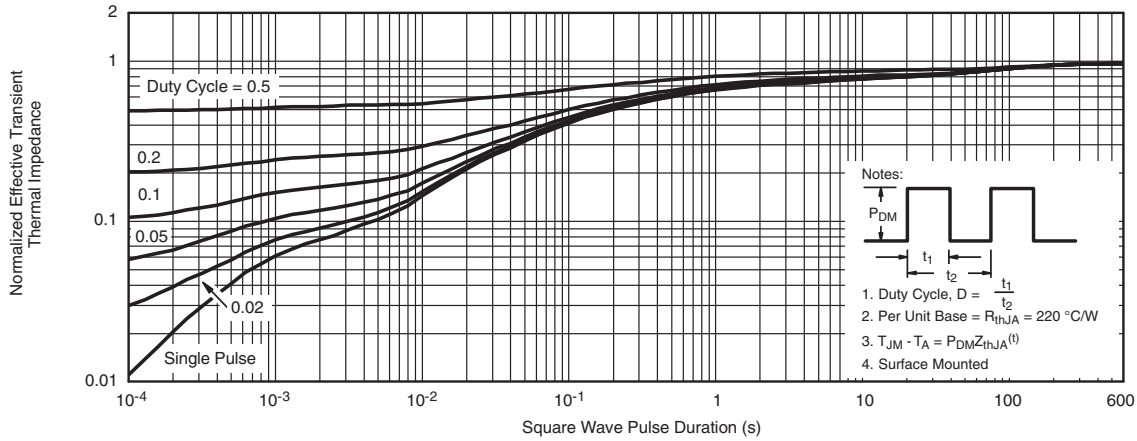
Power, Junction-to-Foot

Note

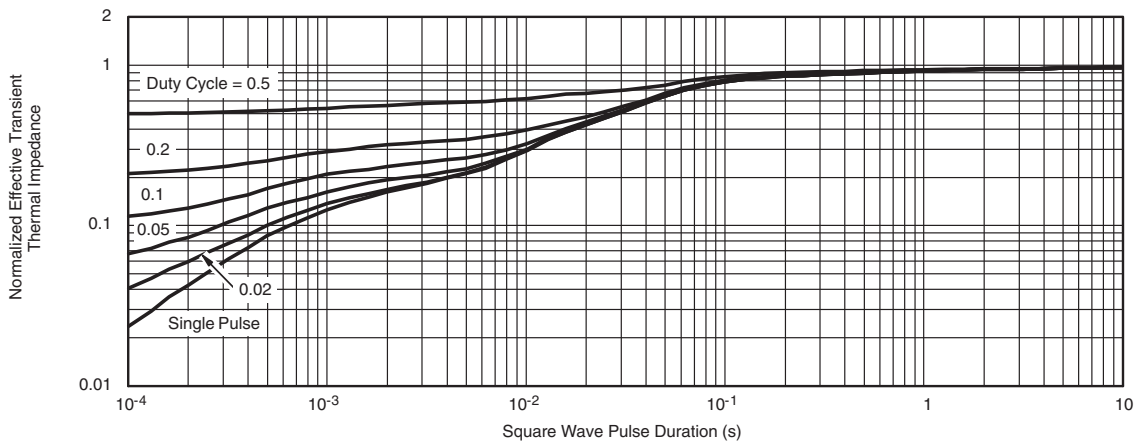
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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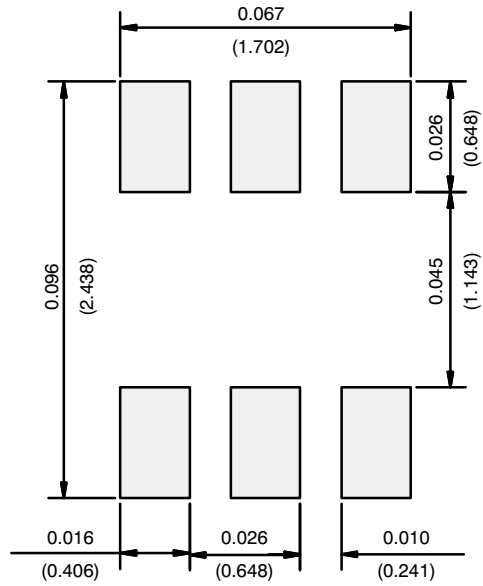
SC-70: 6-LEADS



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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