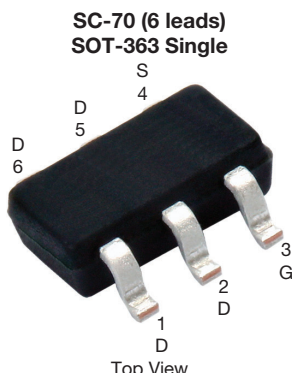


Dual P-Channel 12 V (D-S) MOSFET



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

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	
Continuous drain current ($T_J = 150$ °C)	$T_C = 25$ °C	I_D	-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	A
Continuous source-drain diode current	$T_C = 25$ °C	I_S	-1	
	$T_A = 25$ °C		-0.6 ^{b, c}	
Maximum power dissipation	$T_C = 25$ °C	P_D	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
Maximum junction-to-ambient ^{b, d}	$t \leq 5$ s	R_{thJA}	130	170
Maximum junction-to-foot (drain)	Steady state	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

FEATURES

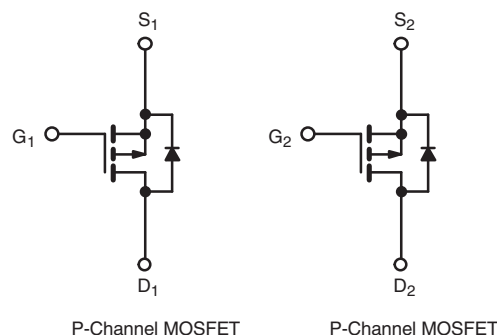
- TrenchFET® power MOSFET
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912

APPLICATIONS

- Load switch for portable devices



RoHS
COMPLIANT
HALOGEN
FREE
Available





SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = -250 μA	-12	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	I _D = -250 μA	-	-14	-	mV/°C
V _{GS(th)} temperature coefficient	ΔV _{GS(th)} /T _J		-	2		
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA	-0.4	-	-1.0	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V	-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = -12 V, V _{GS} = 0 V	-	-	-1	μA
		V _{DS} = -12 V, V _{GS} = 0 V, T _J = 85 °C	-	-	-10	
On-state drain current ^a	I _{D(on)}	V _{DS} ≤ -5 V, V _{GS} = -4.5 V	-3	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = -4.5 V, I _D = -1.0 A	-	0.315	0.390	Ω
		V _{GS} = -2.5 V, I _D = -0.86 A	-	0.425	0.535	
		V _{GS} = -1.8 V, I _D = -0.25 A	-	0.550	0.710	
Forward transconductance ^a	g _{fs}	V _{DS} = -6 V, I _D = -1.0 A	-	2.5	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{DS} = -6 V, V _{GS} = 0 V, f = 1 MHz	-	120	-	pF
Output capacitance	C _{oss}		-	41	-	
Reverse transfer capacitance	C _{rss}		-	25	-	
Total gate charge	Q _g	V _{DS} = -6 V, V _{GS} = -8 V, I _D = -1.1 A	-	2.8	4.2	nC
		V _{DS} = -6 V, V _{GS} = -4.5 V, I _D = -1.1 A	-	1.7	2.6	
Gate-source charge	Q _{gs}		-	0.3	-	
Gate-drain charge	Q _{gd}		-	0.4	-	
Gate resistance	R _g	f = 1 MHz	-	7.5	-	Ω
Turn-on delay time	t _{d(on)}	V _{DD} = -6 V, R _L = 6.7 Ω I _D ≅ -0.9 A, V _{GEN} = -4.5 V, R _g = 1 Ω	-	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 V, R _L = 6.7 Ω I _D ≅ -0.9 A, V _{GEN} = -8 V, R _g = 1 Ω	-	2	5	
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 °C	-	-	-1.0	A
Pulse diode forward current ^a	I _{SM}		-	-	-3.0	
Body diode voltage	V _{SD}	I _S = -0.9 A	-	-0.8	-1.2	V
Body diode reverse recovery time	t _{rr}	I _F = -0.9 A, dI/dt = 100 A/μs, T _J = 25 °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	-	

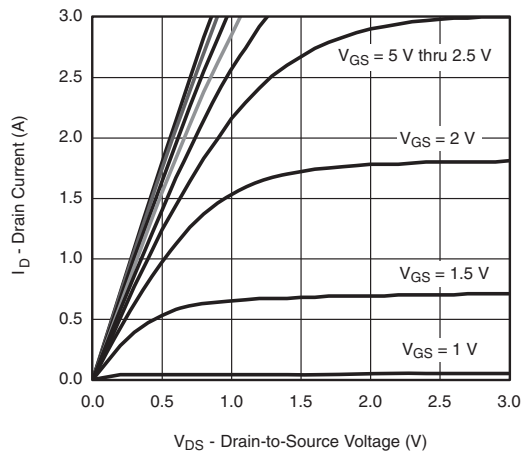
Notes

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

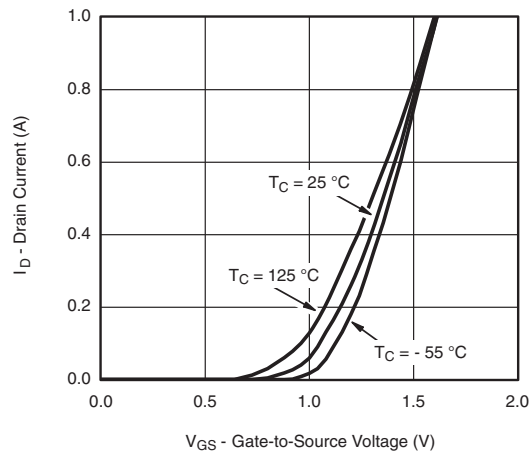
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



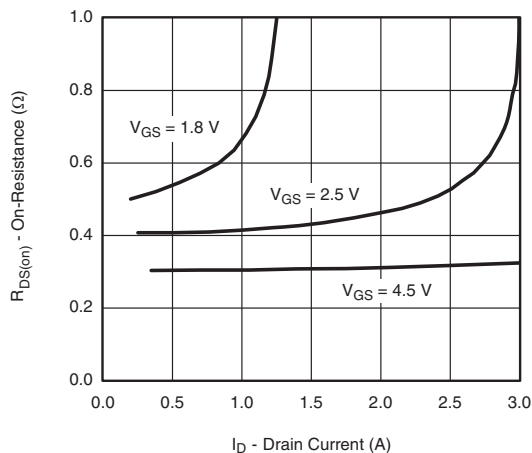
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



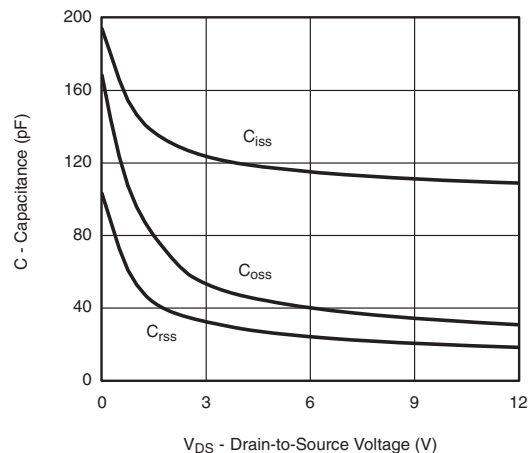
Output Characteristics



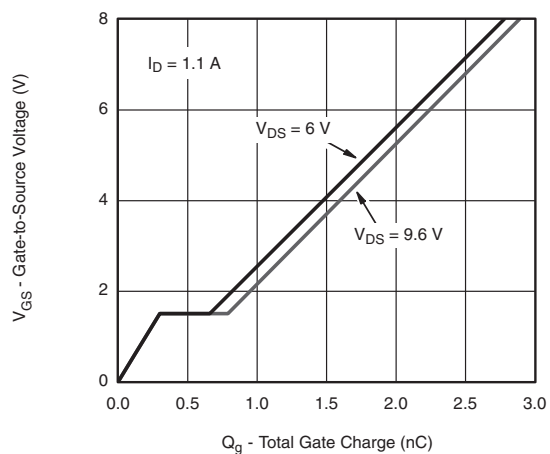
Transfer Characteristics



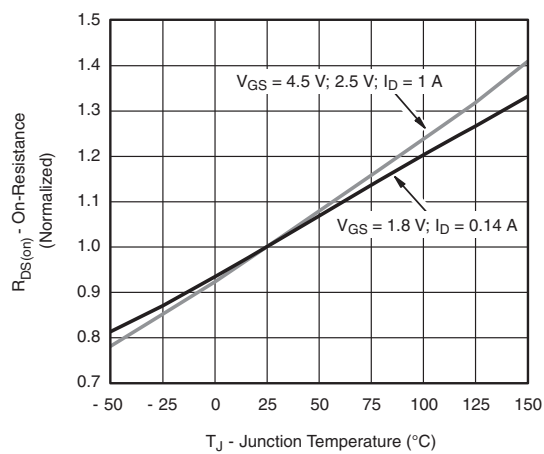
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



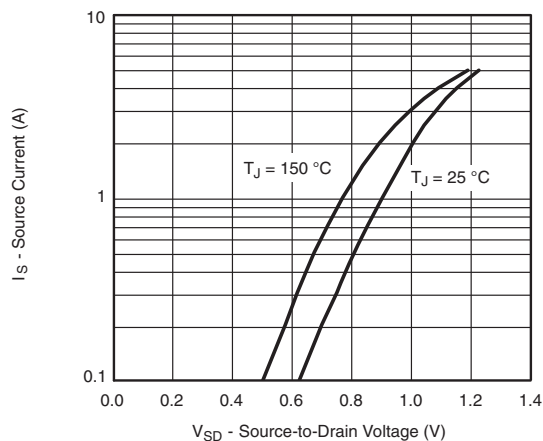
Gate Charge



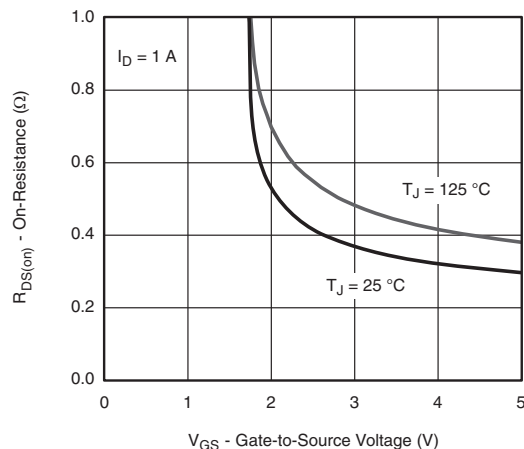
On-Resistance vs. Junction Temperature



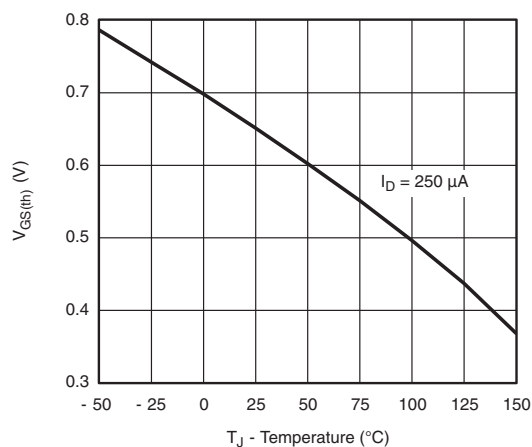
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



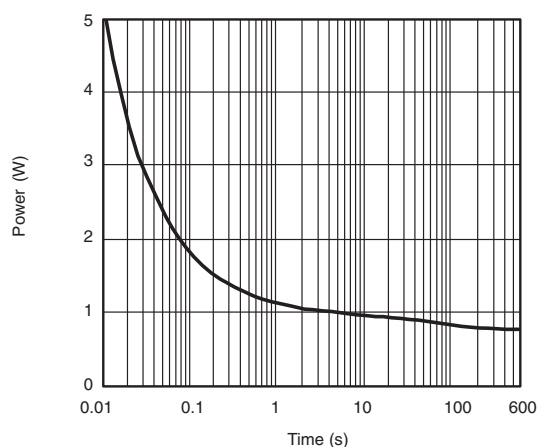
Source-Drain Diode Forward Voltage



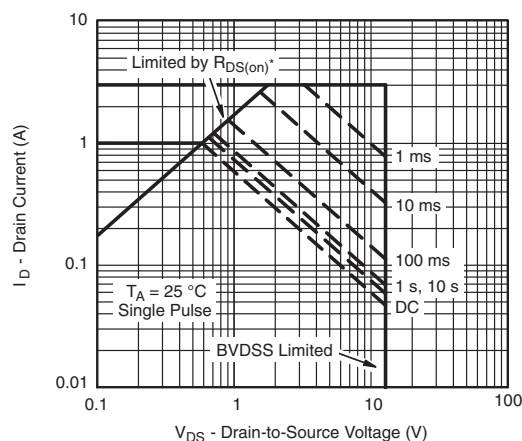
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



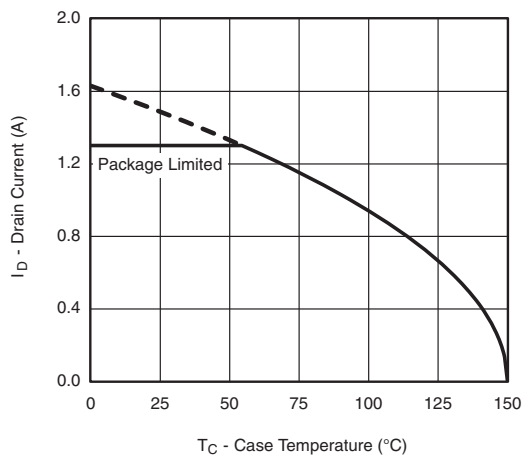
Single Pulse Power



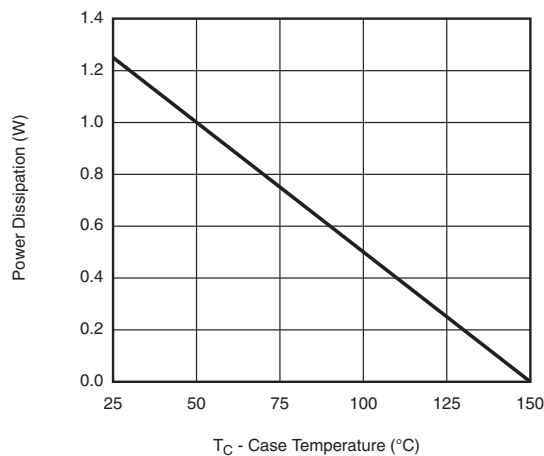
Safe Operating Area, Junction-to-Ambient



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



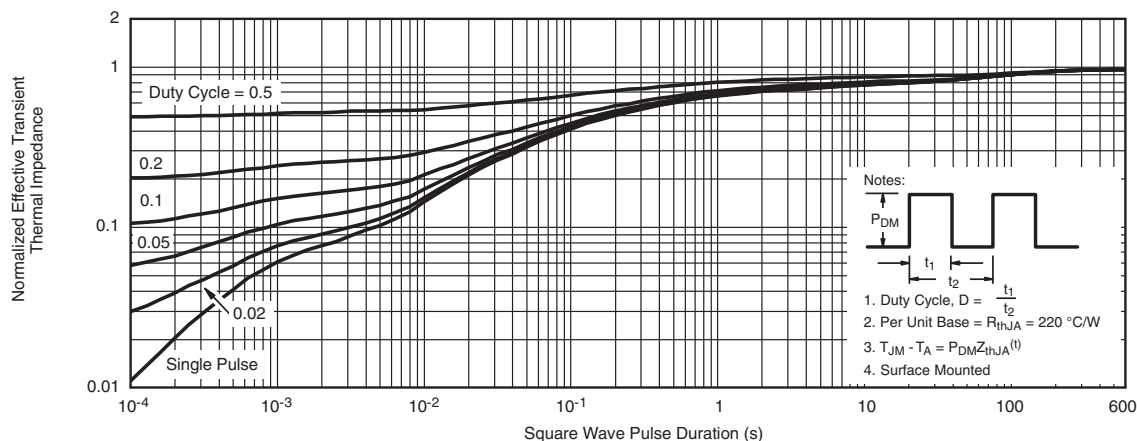
Power, Junction-to-Foot

Note

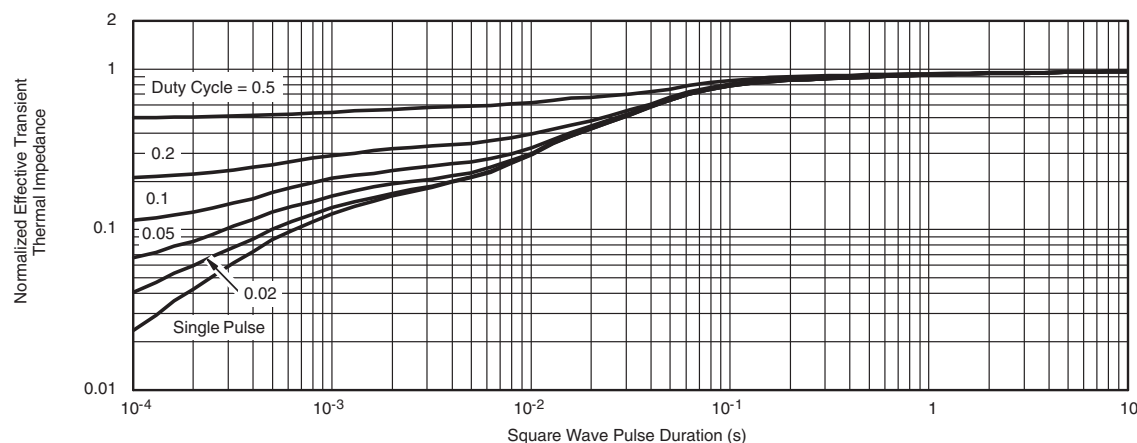
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

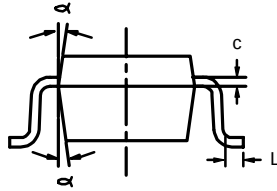
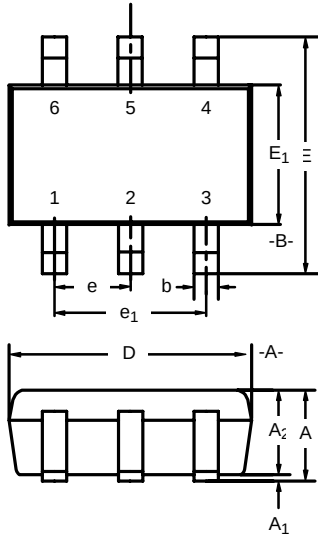


Normalized Thermal Transient Impedance, Junction-to-Foot

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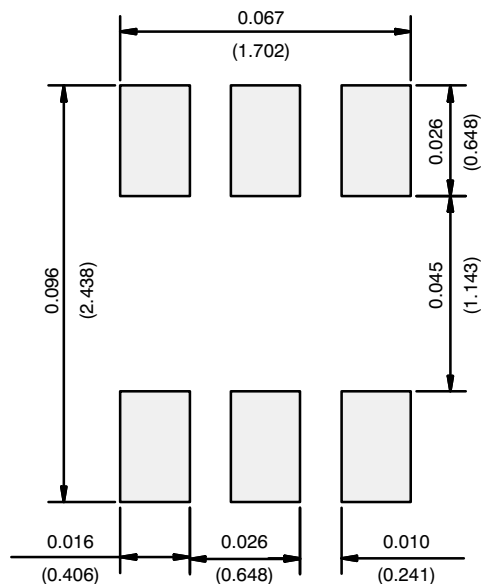
SC-70: 6-LEADS



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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