SI1988DH-T1-GE3-VB Datasheet

Dual N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
20	0.086 at V_{GS} = 4.5 V	2.6[a]	5.0 nC
	0.110 at V_{GS} = 2.5 V	2.5[a]	
	0.180 at V_{GS} = 1.8 V	2.3[a]	

FEATURES

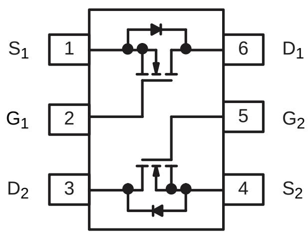
- **Halogen-free According to IEC 61249-2-21 Definition**
- Trench Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS
COMPLIANT

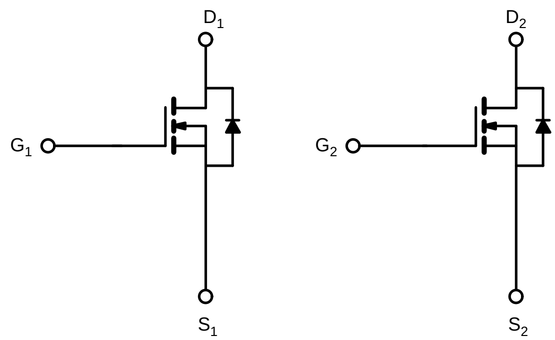
APPLICATIONS

- Load Switch for Portable Applications

SOT-363
SC-70



Top View



ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	± 12	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	2.6[a]	A
	T_C = 70 °C		2.2[a]	
	T_A = 25 °C		2.3[a, b, c]	
	T_A = 70 °C		1.8[b, c]	
Pulsed Drain Current		I_{DM}	8	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	2.3	
	T_A = 25 °C		2.10[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	2.70	W
	T_C = 70 °C		1.70	
	T_A = 25 °C		1.5[b, c]	
	T_A = 70 °C		1.0[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]	t ≤ 5 s	R_{thJA}	130	170	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	80	100	

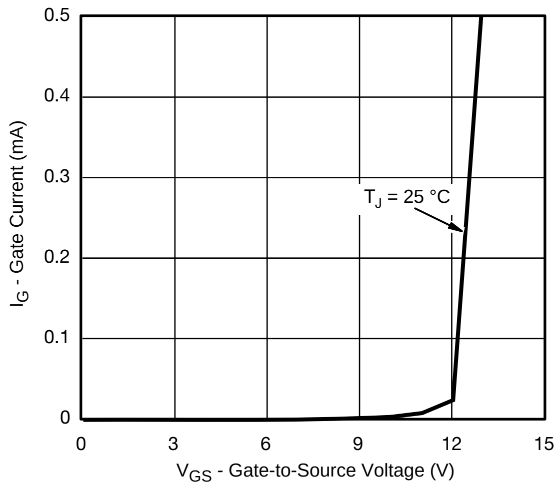
Notes:
a. Package limited.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. Maximum under steady state conditions is 220 °C/W.

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	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		20		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 2.3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.5		2.0	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			± 25	µA
		V_{DS} = 0 V, V_{GS} = ± 4.5 V			1	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			1	µA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 55 °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ 5 V, V_{GS} = 4.5 V	4			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 1 A		0.086		Ω
		V_{GS} = 2.5 V, I_D = 1 A		0.110		
		V_{GS} = 1.8 V, I_D = 0.2 A		0.180		
Forward Transconductance[a]	g_{fs}	V_{DS} = 4 V, I_D = 1.5 A		4		S
Dynamic[b]						
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 8 V, I_D = 1.5 A		5.0		nC
		V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 1.5 A		3.0		
Gate-Source Charge	Q_{gs}			1.0		
Gate-Drain Charge	Q_{gd}			2.0		
Gate Resistance	R_g	f = 1 MHz	0.4	1.9	3.8	kΩ
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 8.3 Ω $I_D \cong$ 1.2 A, V_{GEN} = 4.5 V, R_g = 1 Ω		43	65	ns
Rise Time	t_r			80	120	
Turn-Off Delay Time	$t_{d(off)}$			480	720	
Fall Time	t_f			220	330	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 8.3 Ω $I_D \cong$ 1.2 A, V_{GEN} = 8 V, R_g = 1 Ω		22	33	
Rise Time	tr			46	70	
Turn-Off Delay Time	$t_{d(off)}$			645	968	
Fall Time	tr			215	323	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C		2.6		A
Pulse Diode Forward Current	I_{SM}			4		
Body Diode Voltage	V_{SD}	I_S = 1.2 A, V_{GS} = 0 V		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 1.2 A, dI/dt = 100 A/µs, T_J = 25 °C		9	18	ns
Body Diode Reverse Recovery Charge	Q_{rr}			2	4	nC
Reverse Recovery Fall Time	t_a			5		ns
Reverse Recovery Rise Time	t_b			4		

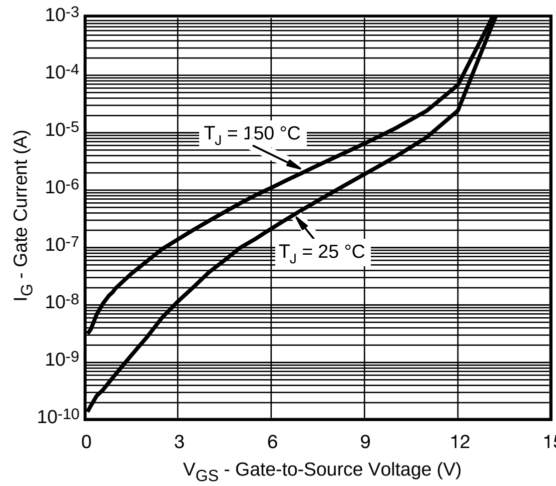
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

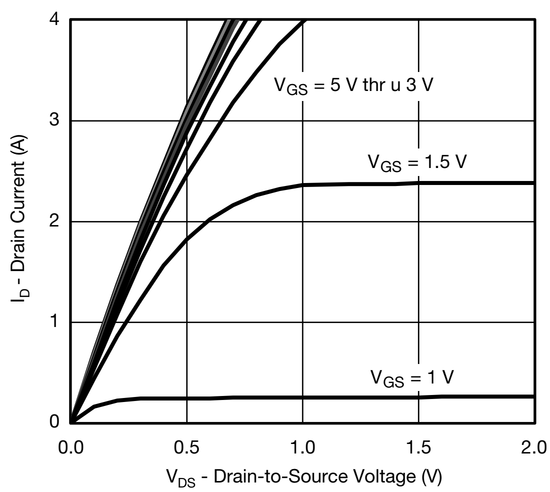
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



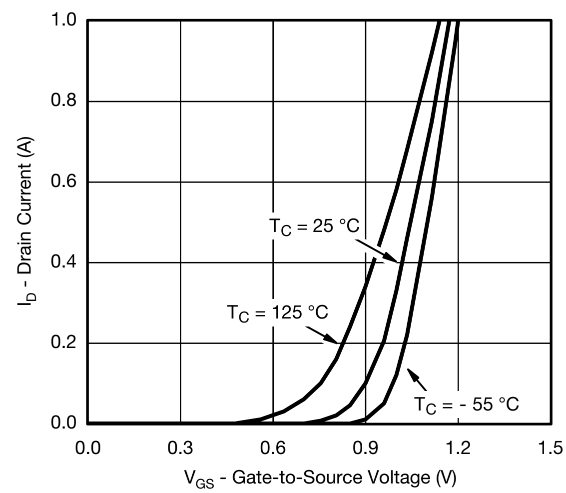
Gate Current vs. Gate-to-Source Voltage



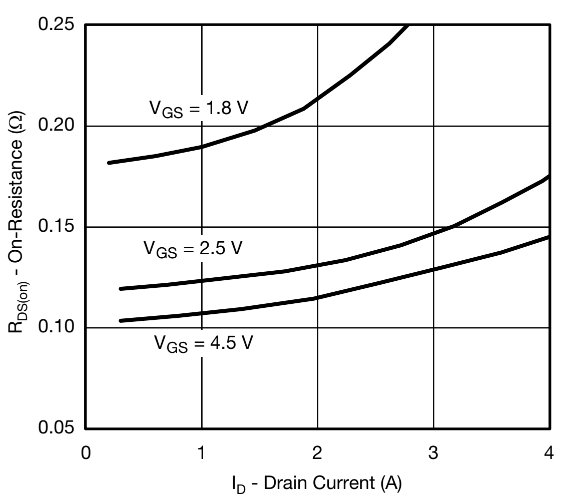
Gate Current vs. Gate-to-Source Voltage



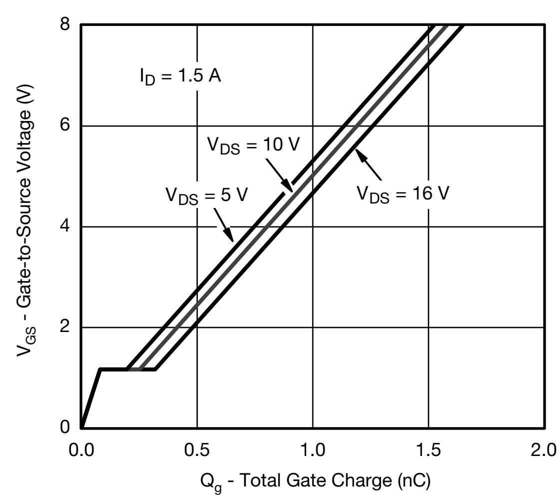
Output Characteristics



Transfer Characteristics

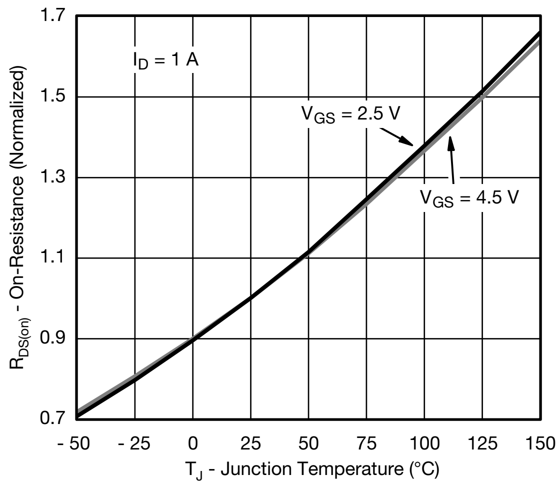


On-Resistance vs. Drain Current

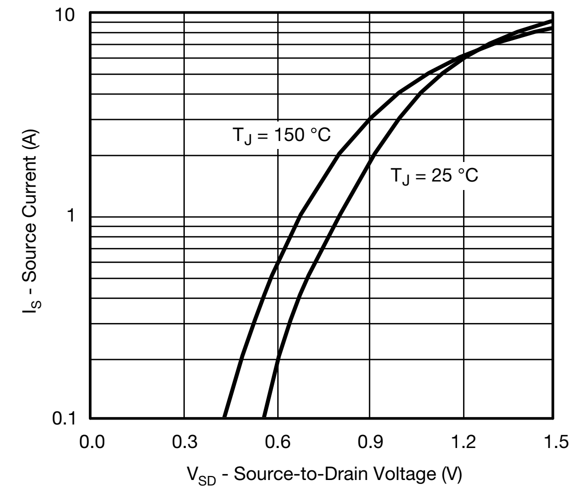


Gate Charge

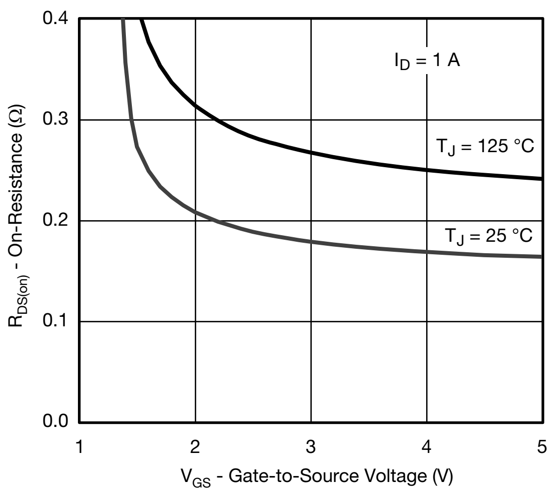
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



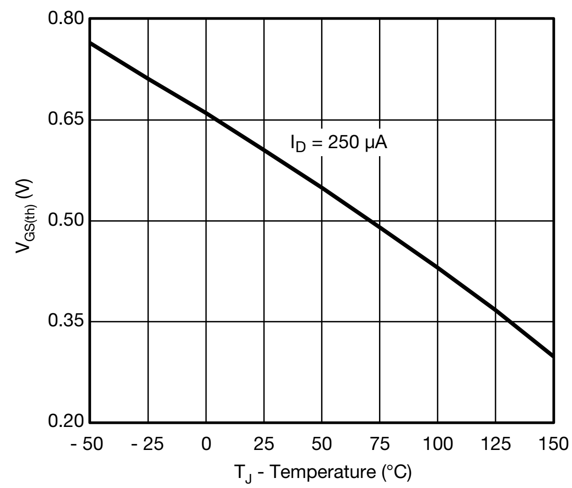
On-Resistance vs. Junction Temperature



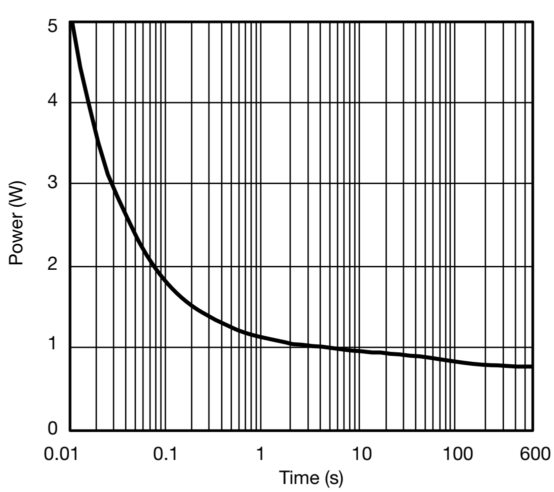
Source-Drain Diode Forward Voltage



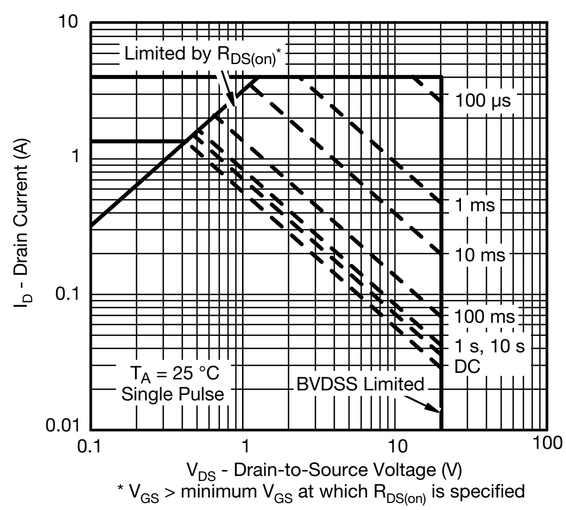
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

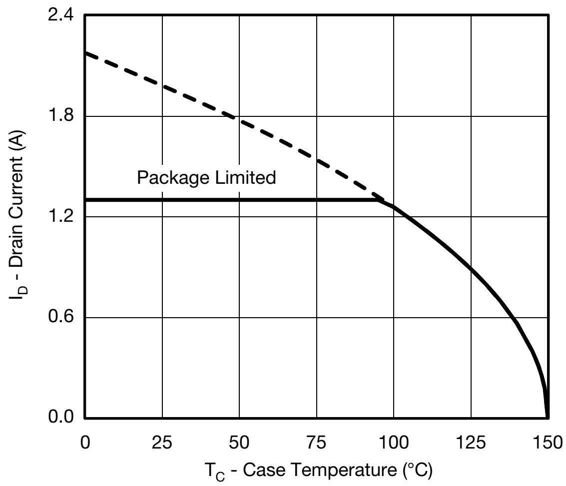


Single Pulse Power, Junction-to-Ambient

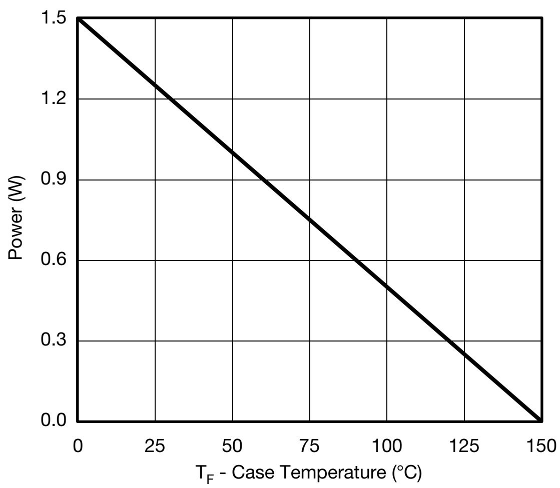


Safe Operating Area, Junction-to-Ambient

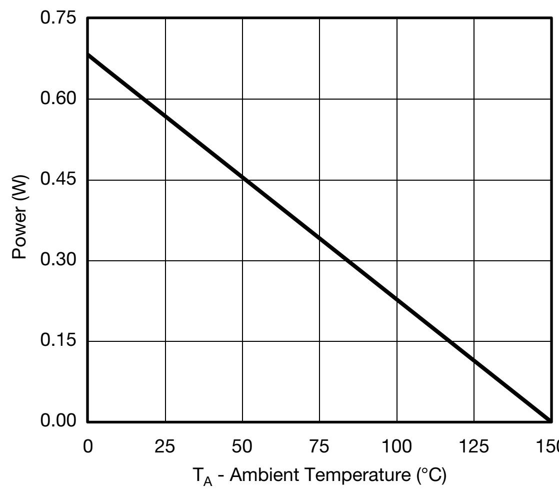
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



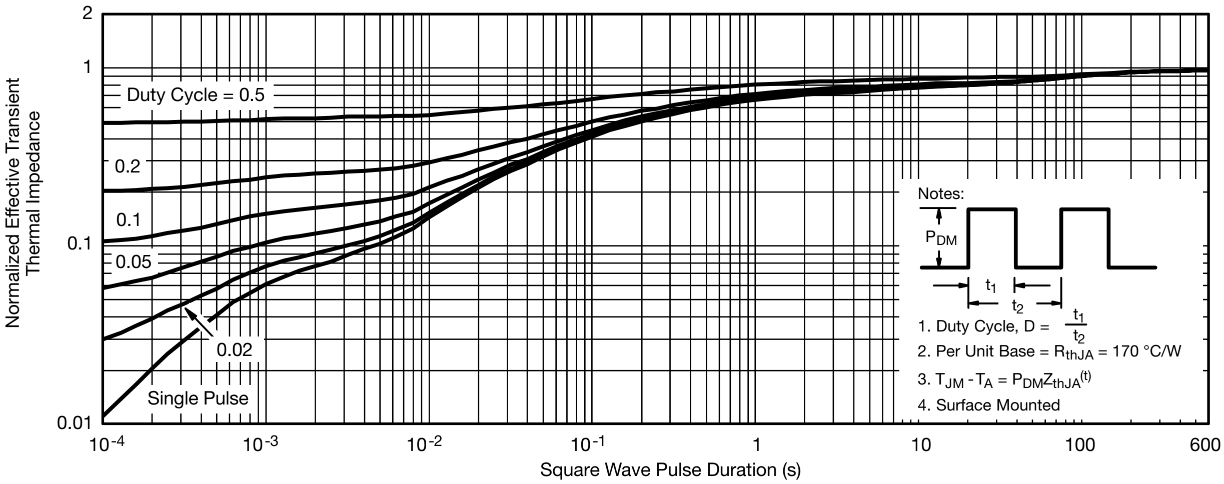
Power, Junction-to-Foot



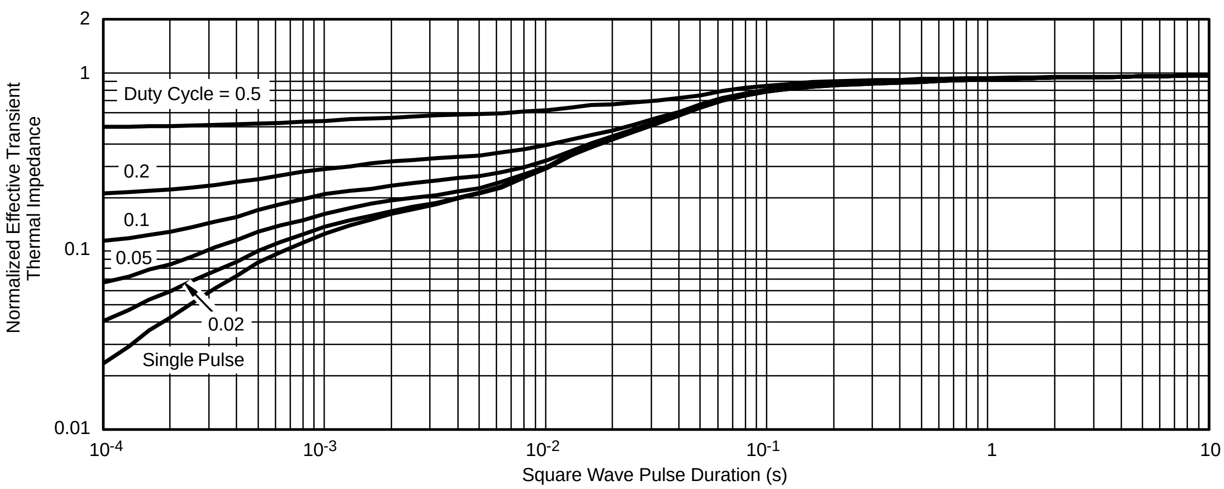
Power, Junction-to-Ambient

* 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)

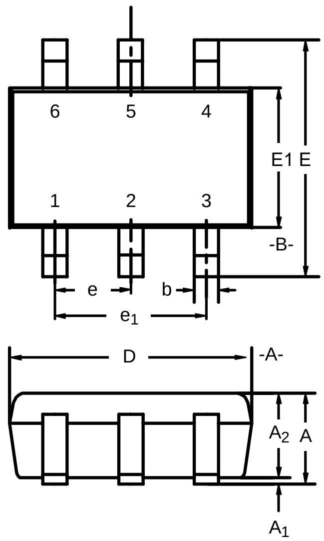


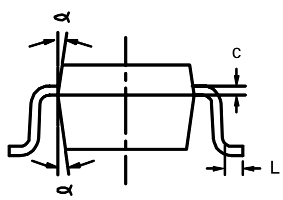
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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		

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