

N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
60	0.078 at V _{GS} = 10 V	3.0	2.1 nC
	0.089 at V _{GS} = 4.5 V	2.1	

FEATURES

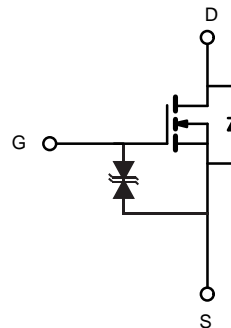
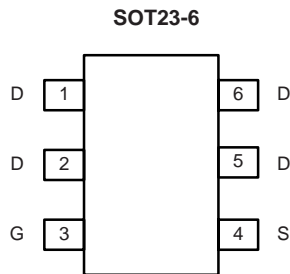
- DT-Trench Power MOSFET
- 100 % R_G Tested
- 100 % UIS Tested
- Typical ESD Protection

APPLICATIONS

- Battery Switch
- DC/DC Converter



RoHS
COMPLIANT



ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	60	V
Gate-Source Voltage	V _{GS}	± 20	
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	A
		T _C = 70 °C	
		T _A = 25 °C	
		T _A = 70 °C	
Pulsed Drain Current	I _{DM}	9	A
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	
		T _A = 25 °C	0.91 ^{b, c}
Avalanche Current	I _{AS}	6	mJ
Single-Pulse Avalanche Energy	E _{AS}	1.8	
Maximum Power Dissipation	P _D	T _C = 25 °C	W
		T _C = 70 °C	
		T _A = 25 °C	
		T _A = 70 °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}	90	115	°C/W
Maximum Junction-to-Foot (Drain)	R _{thJF}	60	75	

Notes:

- Based on T_C = 25 °C.
- Surface Mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under Steady State conditions is 120 °C/W.

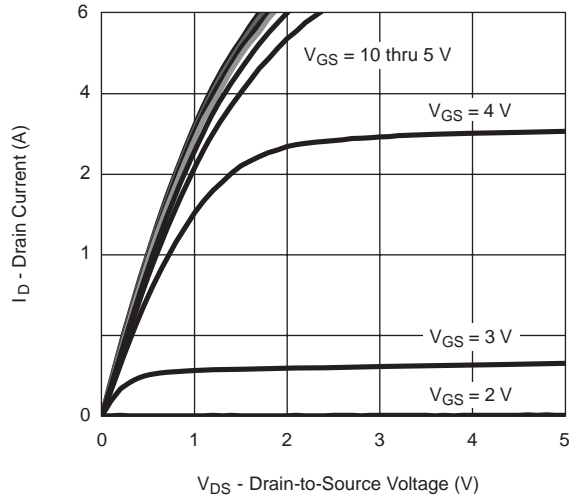
MOSFET SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted								
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit		
Static								
Drain-Source Breakdown Voltage	V_{DS}	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V		
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		55		mV/°C		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5				
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.5		3	V		
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA		
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	μA		
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10			
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	8			A		
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 1.9\text{ A}$		0.075	0.078	Ω		
		$V_{GS} = 4.5\text{ V}, I_D = 1.7\text{ A}$		0.086	0.089			
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 1.9\text{ A}$		5		S		
Dynamic^b								
Input Capacitance	C_{iss}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		180		pF		
Output Capacitance	C_{oss}			22				
Reverse Transfer Capacitance	C_{rss}			13				
Total Gate Charge	Q_g	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 1.9\text{ A}$		4.2	6.1	nC		
				2.1	3.2			
Gate-Source Charge	Q_{gs}	$V_{DS} = 30\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 1.9\text{ A}$		0.7				
Gate-Drain Charge	Q_{gd}			1				
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.6	2.2	5.1	Ω		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 20\text{ }\Omega$ $I_D \cong 1.5\text{ A}, V_{GEN} = 10\text{ V}, R_G = 1\text{ }\Omega$		4	6	ns		
Rise Time	t_r			10	15			
Turn-Off Delay Time	$t_{d(off)}$			10	15			
Fall Time	t_f			7	10.5			
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 20\text{ }\Omega$ $I_D = 1.5\text{ A}, V_{GEN} = 4.5\text{ V}, R_G = 1\text{ }\Omega$		15	23	ns		
			Rise Time	t_r			16	24
			Turn-Off Delay Time	$t_{d(off)}$			11	17
			Fall Time	t_f			11	17
Drain-Source Body Diode Characteristics								
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			2.19	A		
Pulse Diode Forward Current ^a	I_{SM}				9			
Body Diode Voltage	V_{SD}	$I_S = 1.5\text{ A}$		0.8	1.2	V		
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 1.5\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		15	23	ns		
Body Diode Reverse Recovery Charge	Q_{rr}			10	15	nC		
Reverse Recovery Fall Time	t_a			12		ns		
Reverse Recovery Rise Time	t_b			3				

Notes:

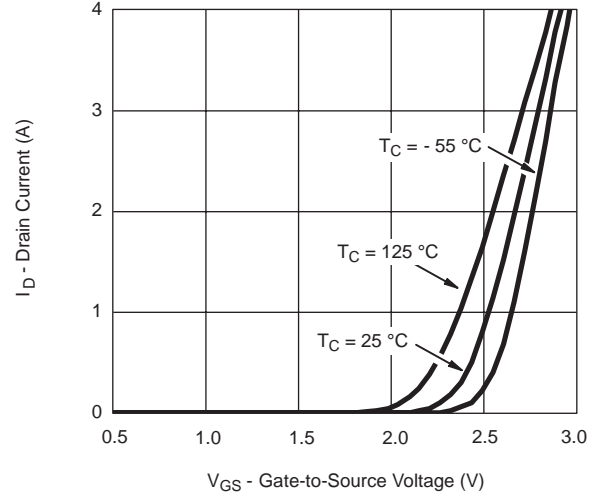
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

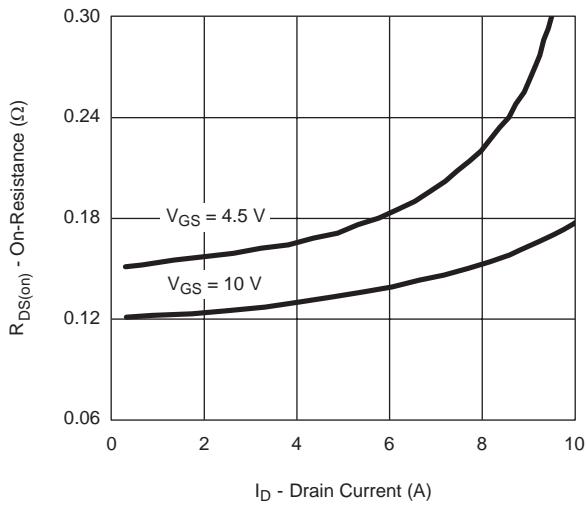
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



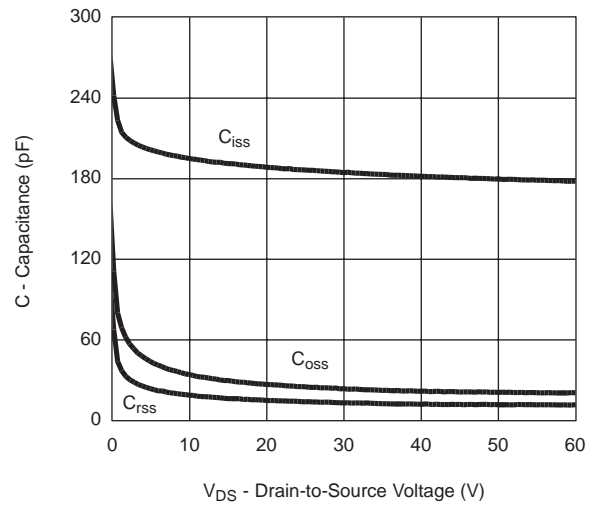
Output Characteristics



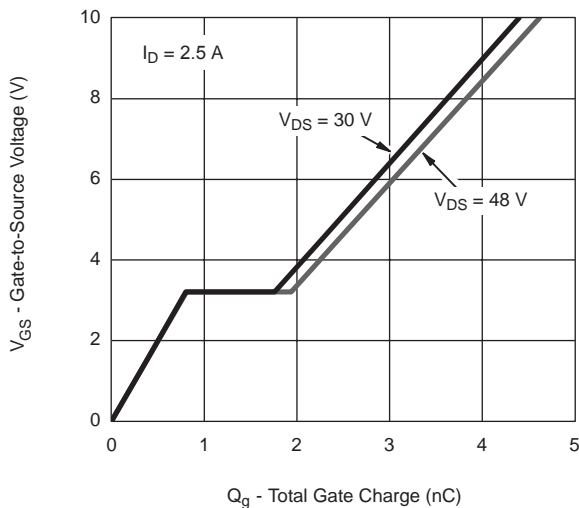
Transfer Characteristics



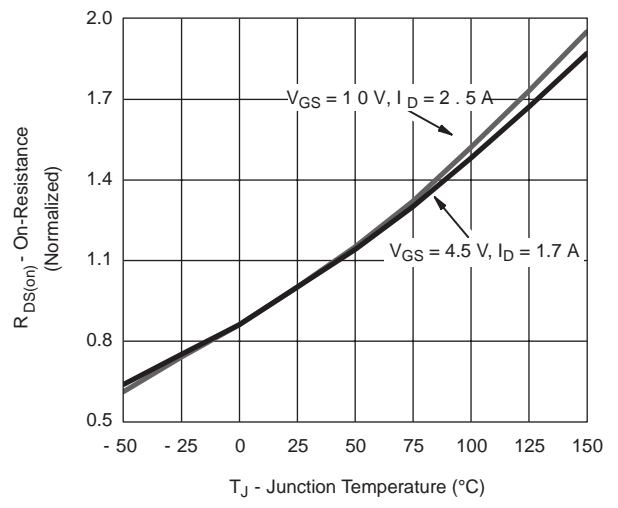
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

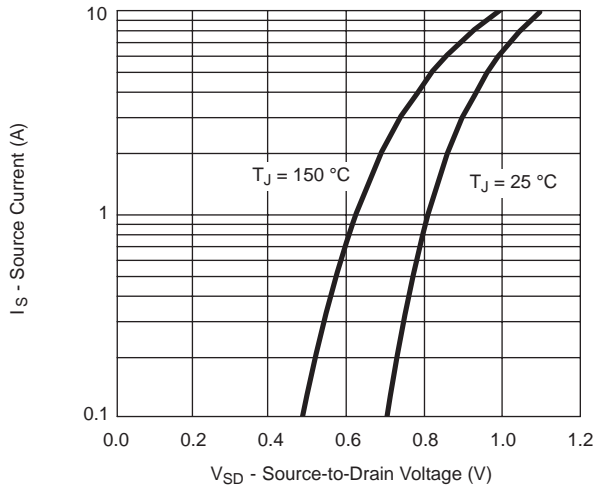


Gate Charge

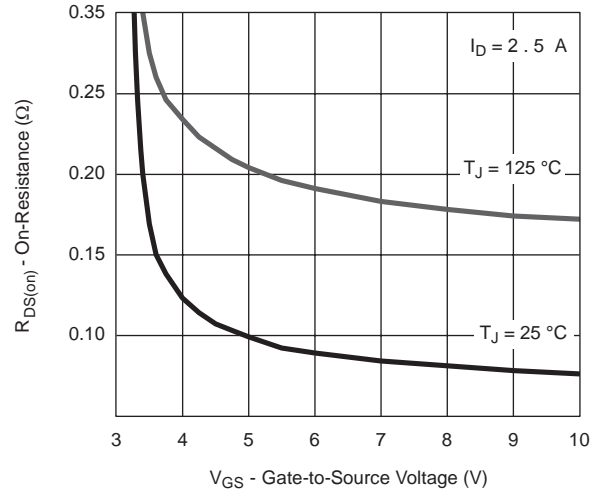


On-Resistance vs. Junction Temperature

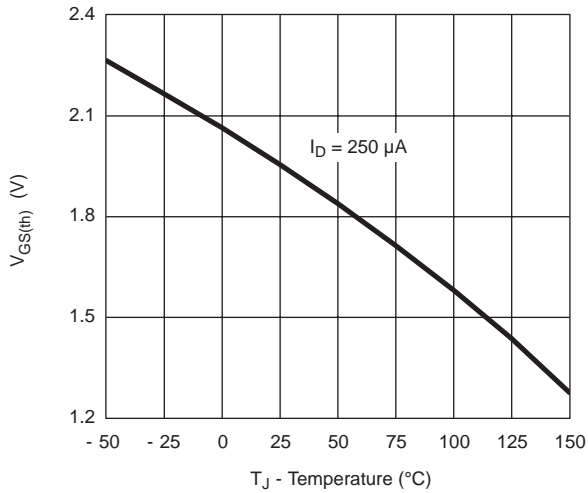
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



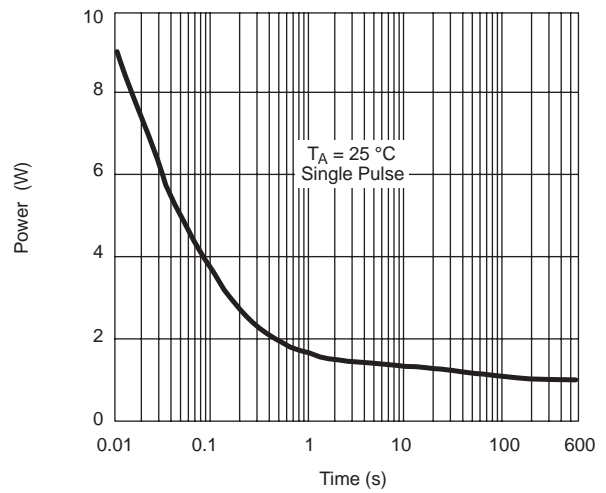
Source-Drain Diode Forward Voltage



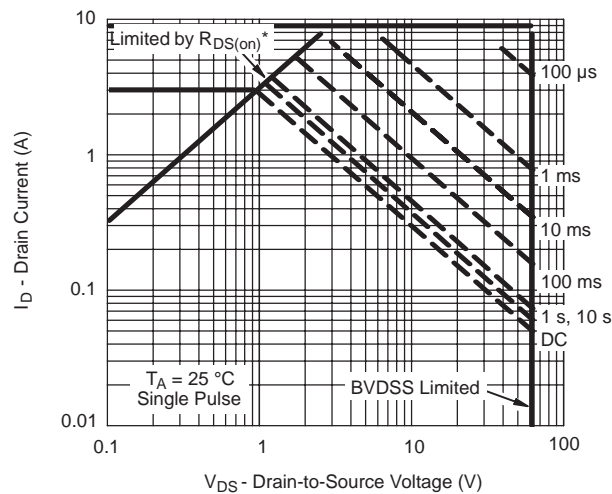
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



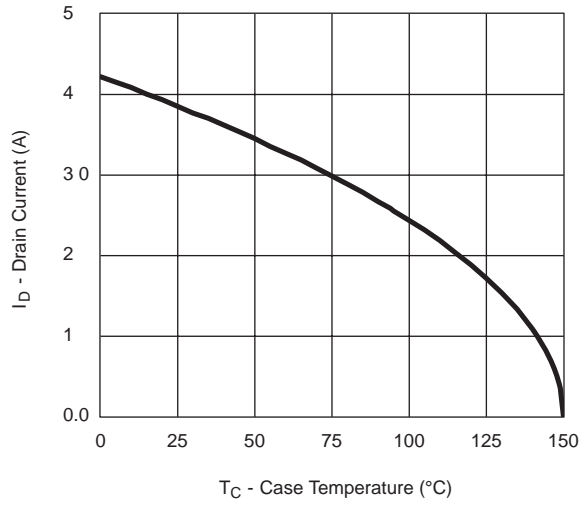
Single Pulse Power



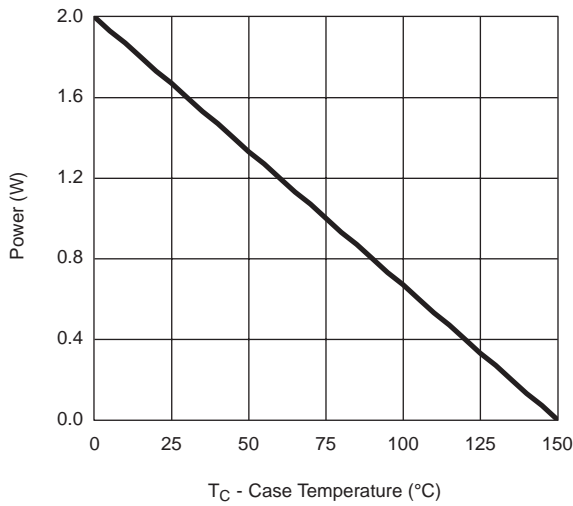
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

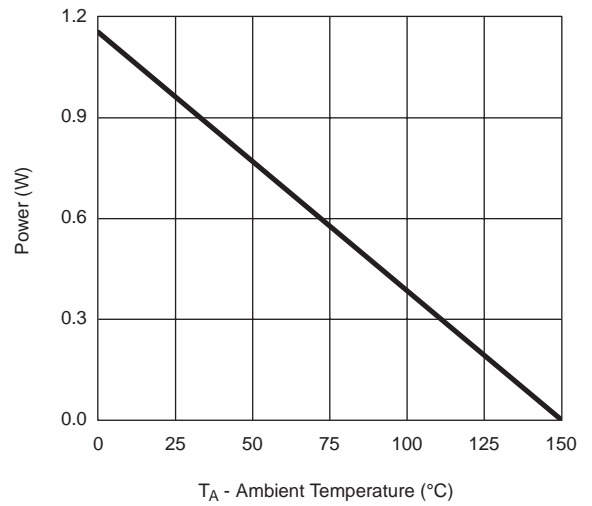
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



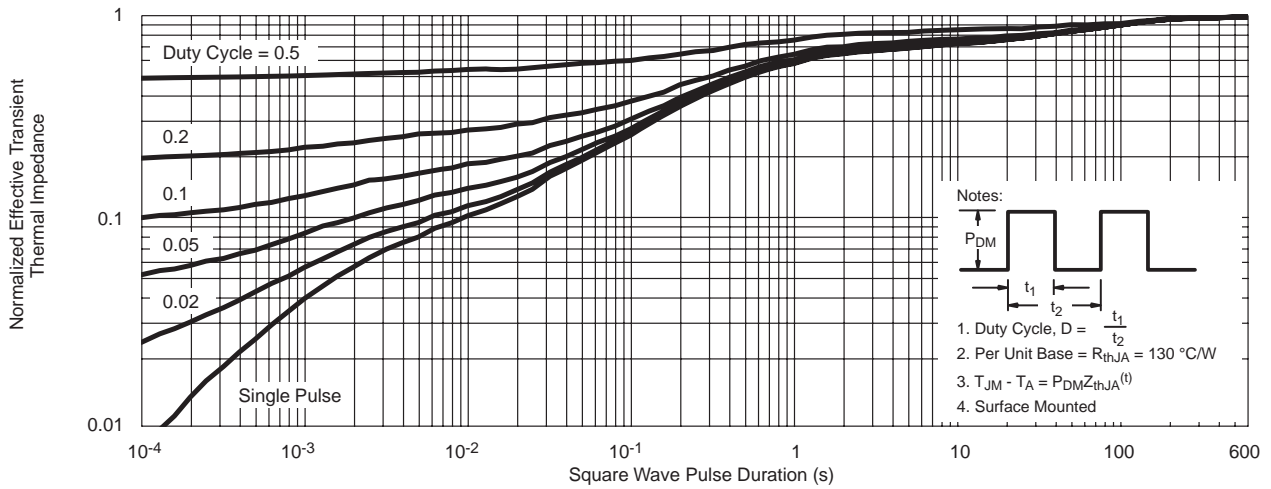
Power Derating, Junction-to-Case



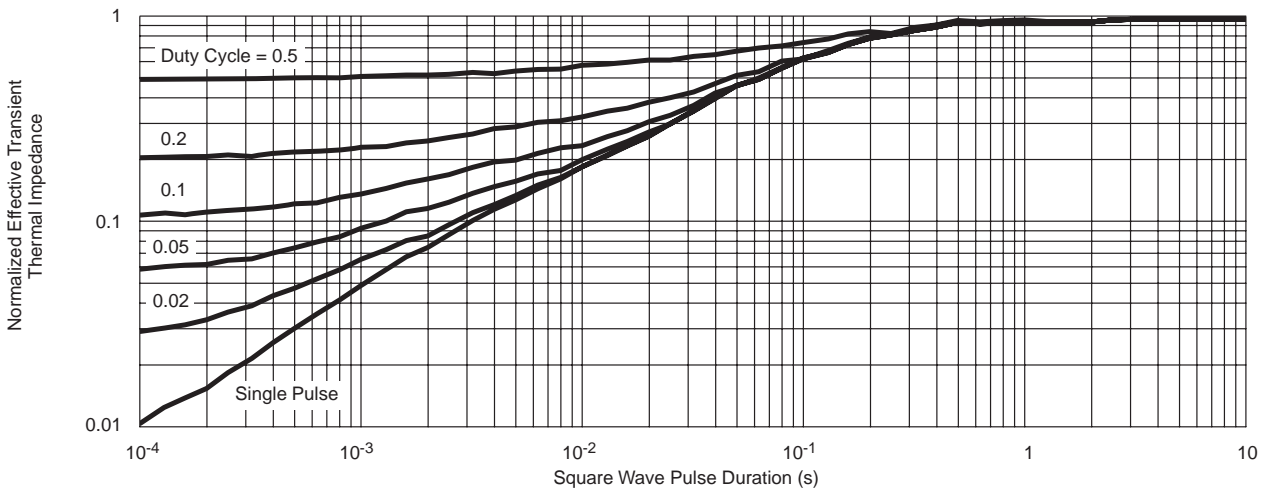
Power Derating, Junction-to-Ambient

* 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.

THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)

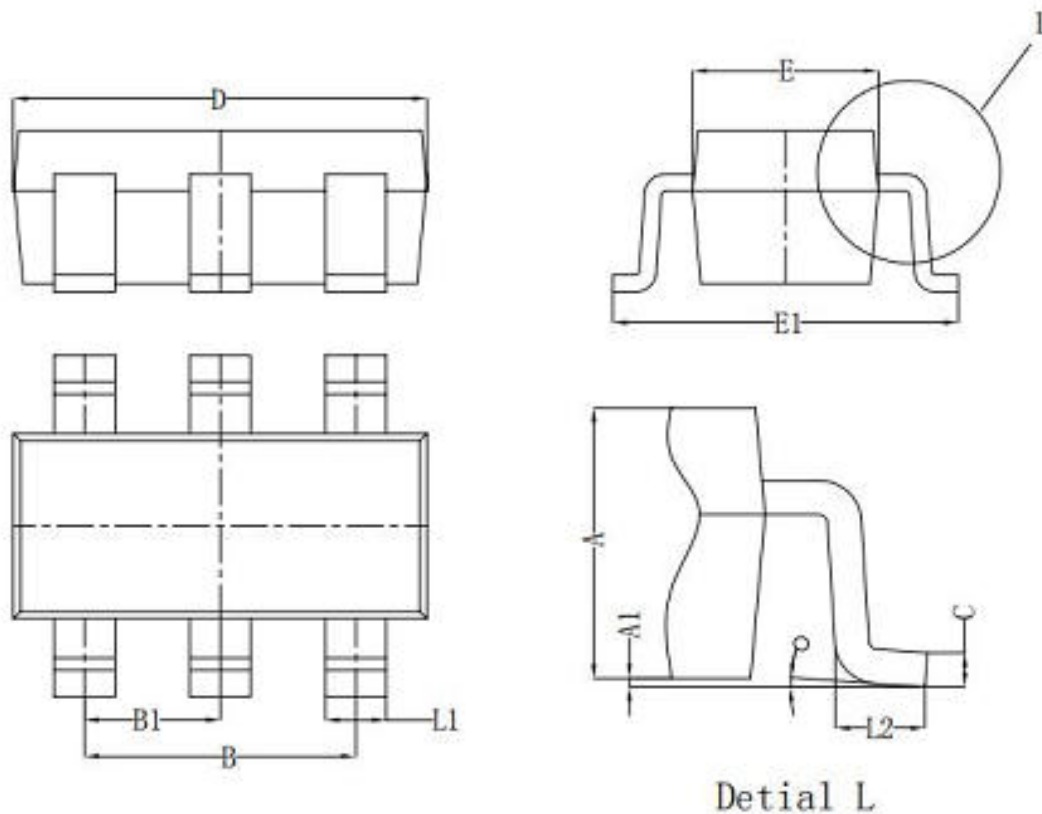


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

SOT-23-6L PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	TYP	MAX
A	0.95	1.10	1.35
A1	0.00	0.05	0.12
L1	0.25	0.40	0.55
C	0.08	0.15	0.22
D	2.77	2.92	3.12
E	1.45	1.60	1.75
E1	2.50	2.80	3.10
B	1.75	1.90	2.10
B1	0.95TYP		
L2	0.28	0.45	0.63
o	0°	4°	8°

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