SM1A53NSUB-VB Datasheet

N-Channel 100-V (D-S), 175 °C MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
100	0.0125 at V_{GS} = 10 V	65	48 nC

FEATURES

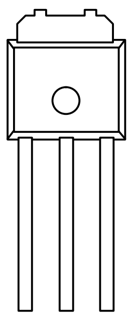
- Trench Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested

RoHS COMPLIANT

APPLICATIONS

- Primary Side Switch
- Isolated DC/DC Converter

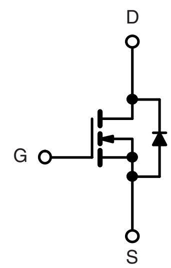
TO-251



Drain Connected to Drain-Tab

G D S

Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	65[a]	A
	T_C = 100 °C		52	
	T_A = 25 °C		8.2[b]	
	T_A = 100 °C		5.8[b]	
Pulsed Drain Current		I_{DM}	200	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	65[a]	
	T_A = 25 °C		2.0[b]	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	48	
Avalanche Energy		E_{AS}	121	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	156.4	W
	T_C = 100 °C		78.2	
	T_A = 25 °C		3.0[b]	
	T_A = 100 °C		1.5[b]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[b]	Steady State	R_{thJA}	40	50	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	0.85	1.1	

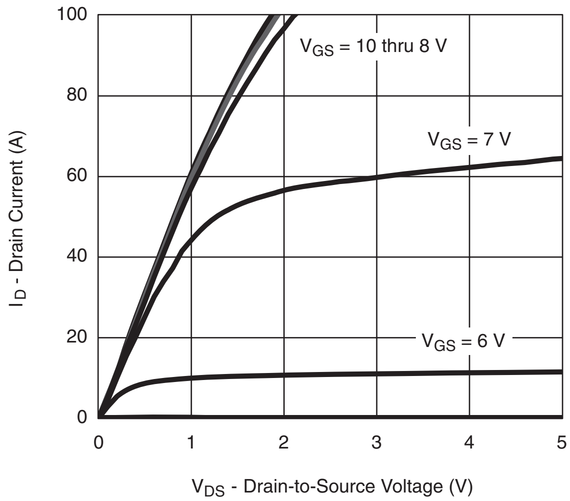
Notes:
a. Package limited.
b. Surface mounted on 1" x 1" FR4 board.

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	100			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		110		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 12.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2.5		5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 100 V, V_{GS} = 0 V			1	µA
		V_{DS} = 100 V, V_{GS} = 0 V, T_J = 125 °C			50	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	50			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 15 A		0.0125		Ω
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 15 A		33		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz		2800		pF
Output Capacitance	C_{oss}			260		
Reverse Transfer Capacitance	C_{rss}			100		
Total Gate Charge	Q_g	V_{DS} = 50 V, V_{GS} = 10 V, I_D = 50 A		48	75	nC
Gate-Source Charge	Q_{gs}			16		
Gate-Drain Charge	Q_{gd}			13		
Gate Resistance	R_g	f = 1 MHz		1.6	2.5	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 50 V, R_L = 1.0 Ω $I_D \cong$ 50 A, V_{GEN} = 10 V, R_g = 1 Ω		12	20	ns
Rise Time	t_r			10	20	
Turn-Off Delay Time	$t_{d(off)}$			18	35	
Fall Time	t_f			8	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			50	A
Pulse Diode Forward Current[a]	I_{SM}				100	
Body Diode Voltage	V_{SD}	I_S = 15 A		0.85	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 50 A, dI/dt = 100 A/µs, T_J = 25 °C		80	120	ns
Body Diode Reverse Recovery Charge	Q_{rr}			160	240	nC
Reverse Recovery Fall Time	t_a			57		ns
Reverse Recovery Rise Time	t_b			23		

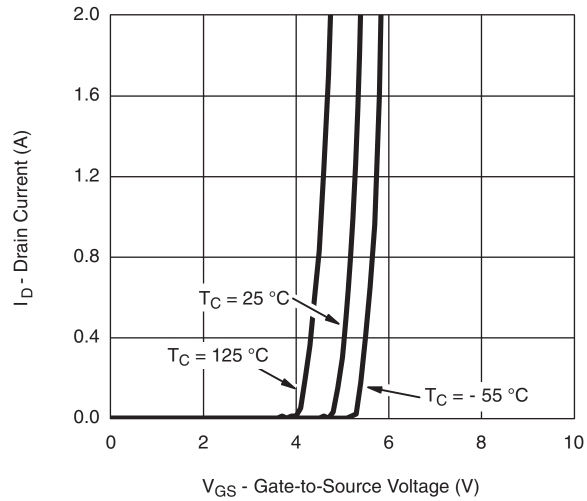
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

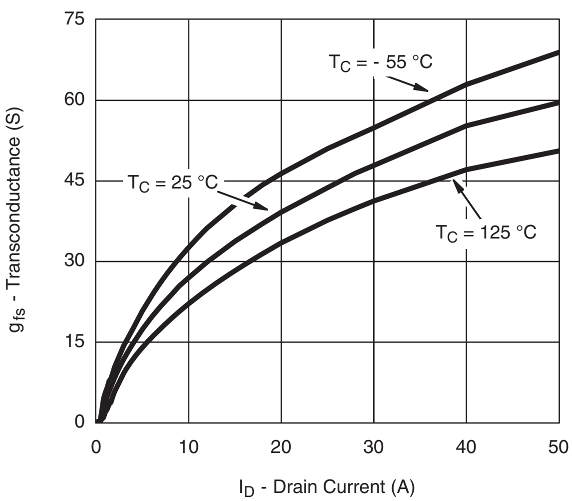
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



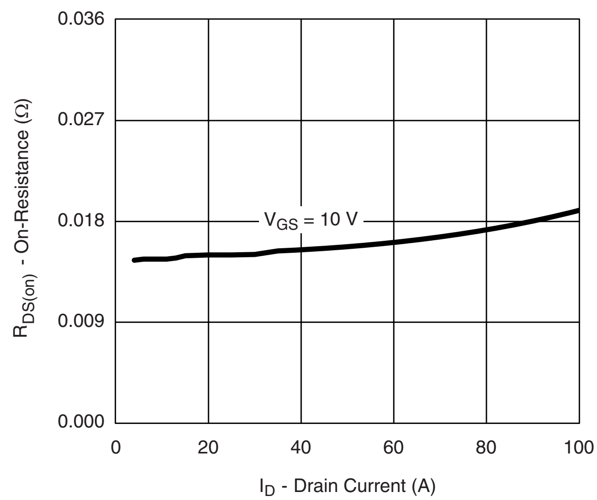
Output Characteristics



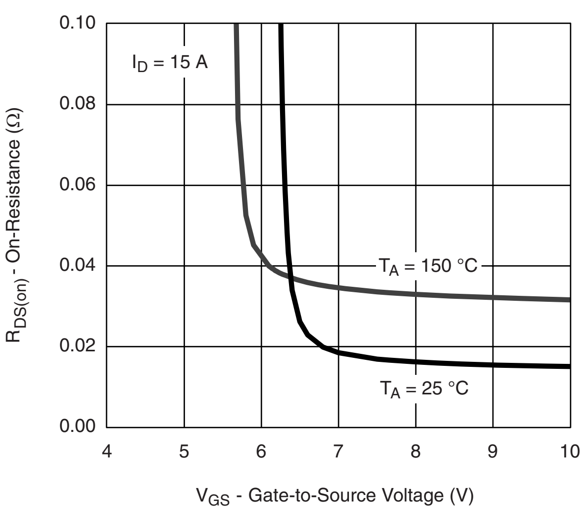
Transfer Characteristics



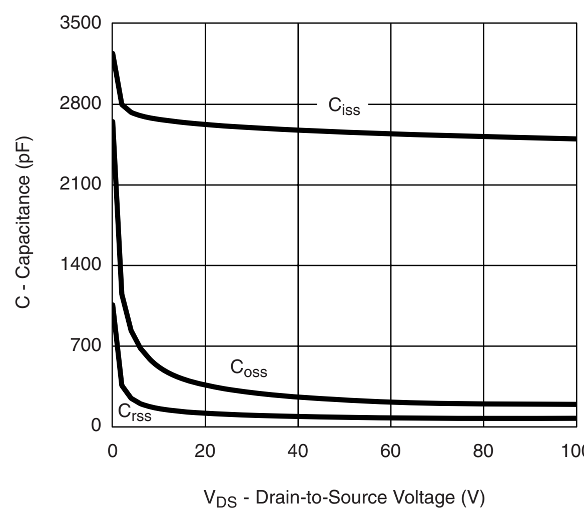
Transconductance



On-Resistance vs. Drain Current



On-Resistance vs. Gate-to-Source Voltage



Capacitance

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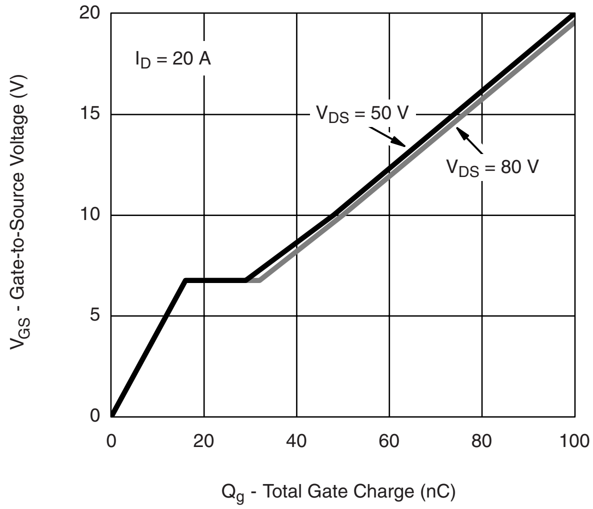
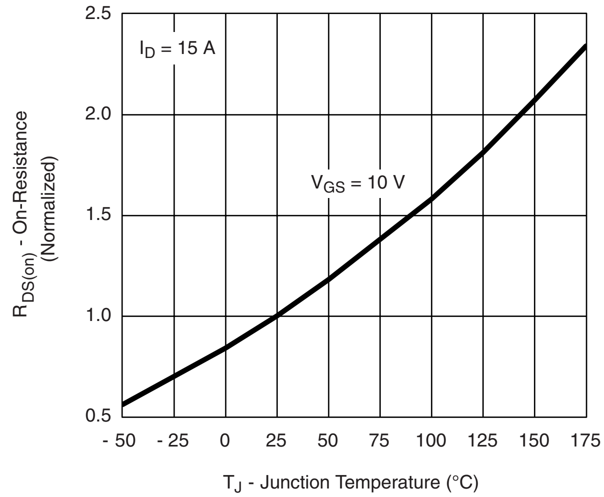
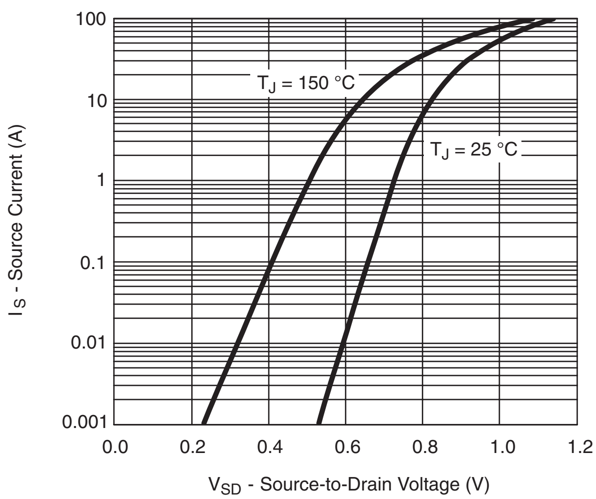


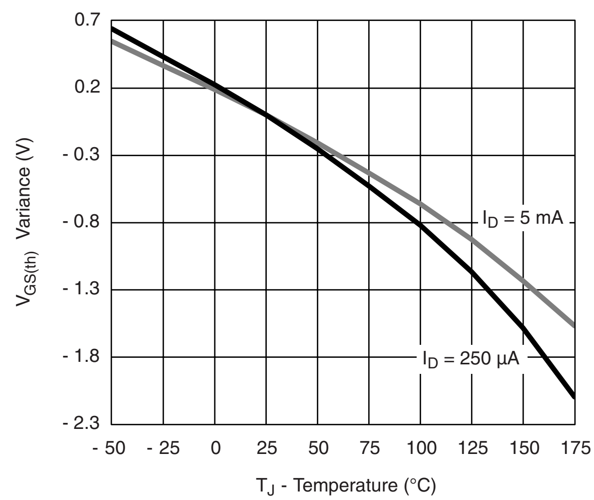
Gate Charge



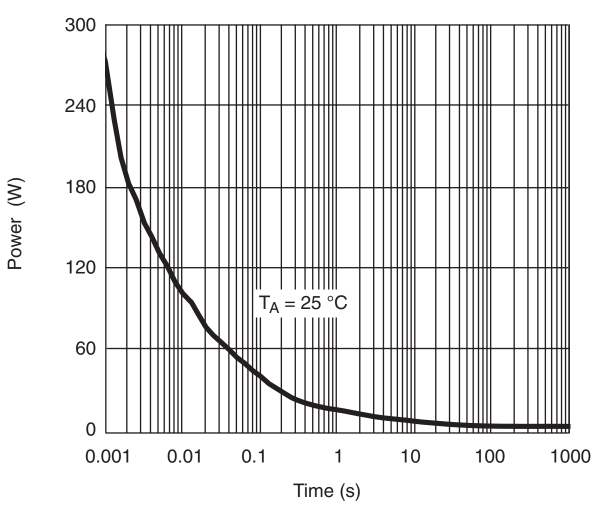
On-Resistance vs. Junction Temperature



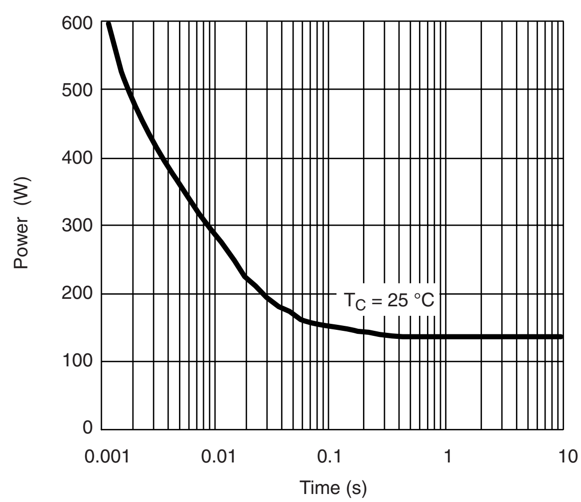
Source-Drain Diode Forward Voltage



Threshold Voltage

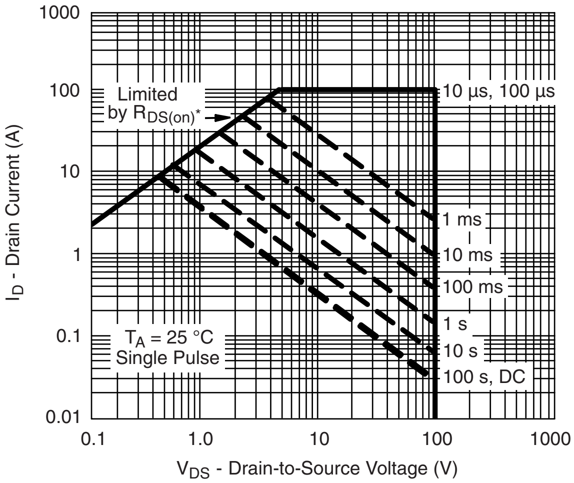


Single Pulse Power, Junction-to-Ambient



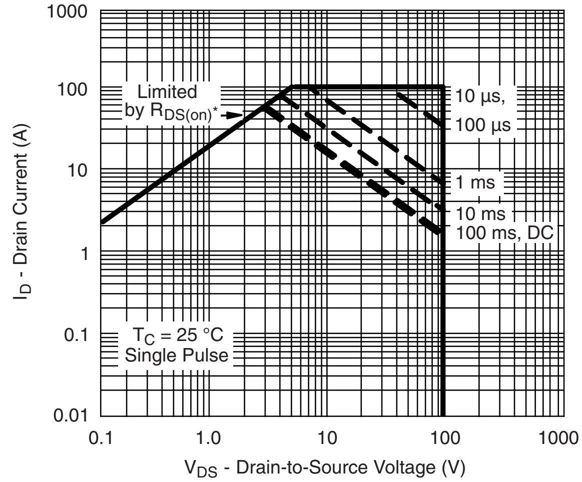
Single Pulse Power, Junction-to-Case

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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

Safe Operating Area, Junction-to-Ambient



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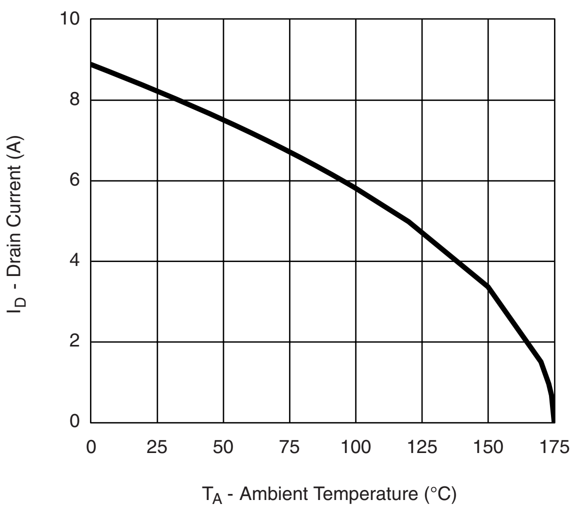
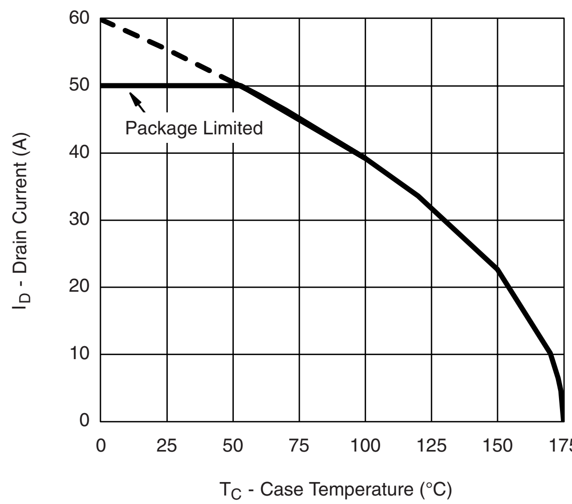
Safe Operating Area, Junction-to-Case



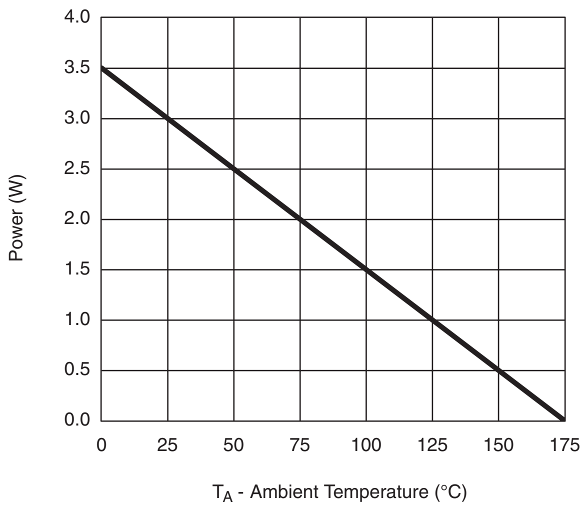
Current Derating, Junction-to-Ambient**



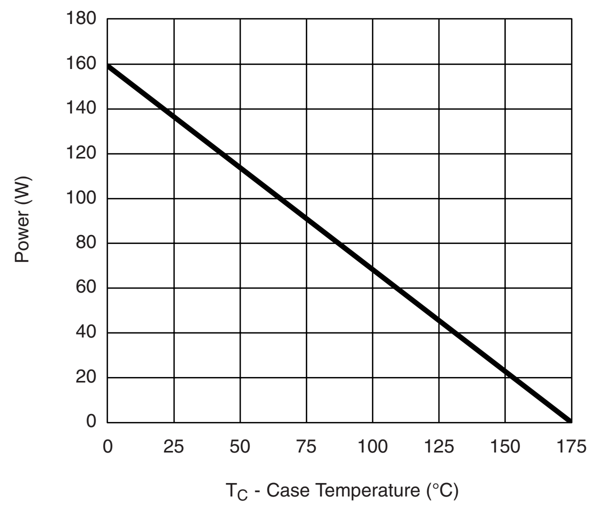
Current Derating, Junction-to-Case**

** The power dissipation P_D is based on $T_{J(max)}$ = 175 °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



Power Derating*, Junction-to-Ambient



Power Derating*, Junction-to-Case

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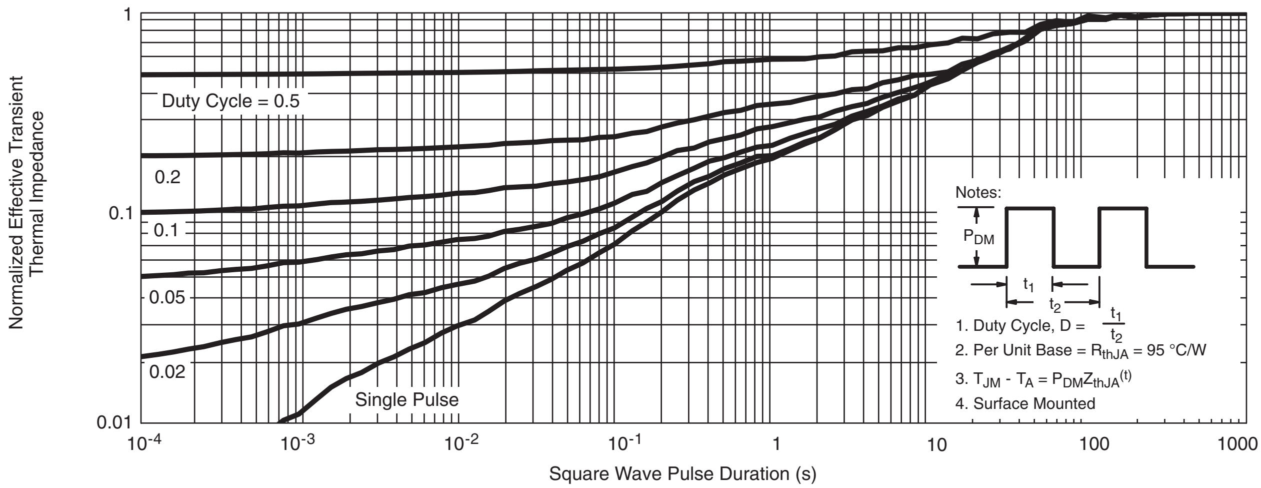
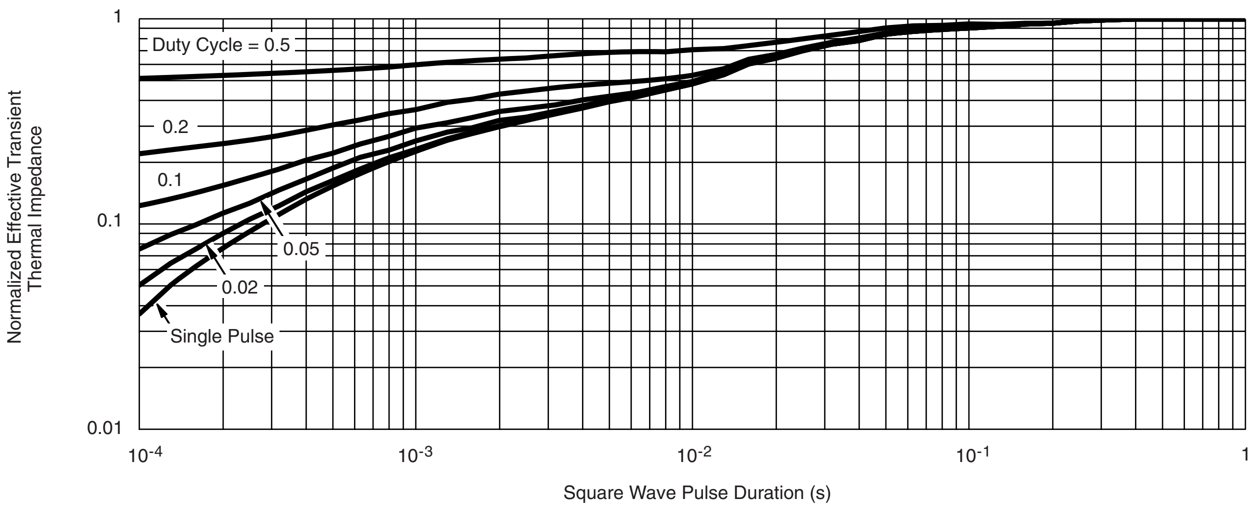
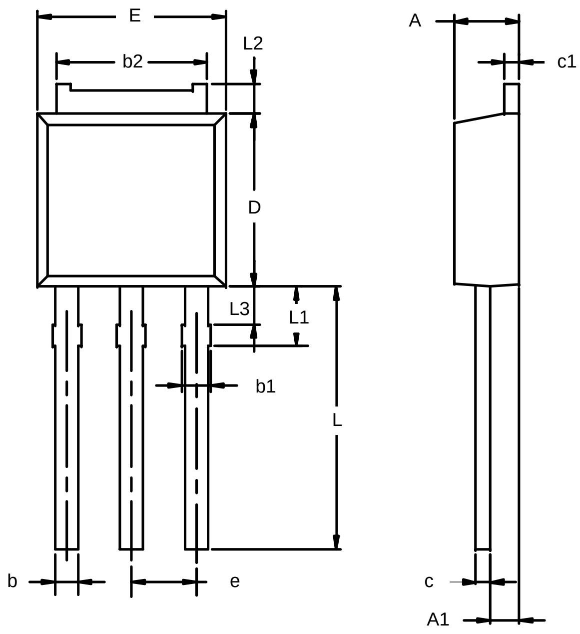


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

TO-251AA (DPAK)



Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	3.89	9.53	0.153	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060

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