

P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)(Typ.)	I _D (A) ^a	Q _g (Typ.)
- 20	0.012 at V _{GS} = - 4.5 V	- 12.5	28 nC
	0.015 at V _{GS} = - 2.5 V	- 11.0	
	0.022 at V _{GS} = - 1.8 V	- 9.5	

FEATURES

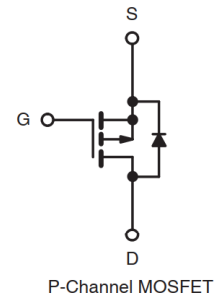
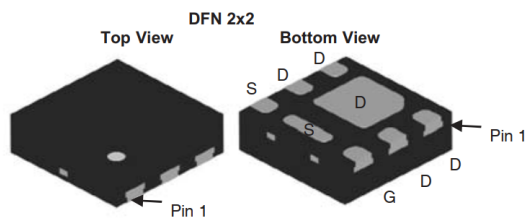
- DT-Trench Power MOSFET
- Ultra Small DFN2x2 Chip-scale Packaging Reduces Footprint Area, Profile (0.62 mm) and On-Resistance Per Footprint Area
- AEC-Q101 Qualified for Automotive Applications



RoHS
COMPLIANT

APPLICATIONS

- PA Switch
- Battery Switch
- Load Switch



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}	± 8		
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 12.5	A
		T _C = 70 °C	- 9.7	
		T _A = 25 °C	- 7.7 ^{b, c}	
		T _A = 70 °C	- 5.7 ^{b, c}	
Pulsed Drain Current	I _{DM}	- 36		
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	- 8.2	
		T _A = 25 °C	- 4.5 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	6.57	W
		T _C = 70 °C	4.2	
		T _A = 25 °C	2.9 ^{b, c}	
		T _A = 70 °C	1.86 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 175	°C	
Package Reflow Conditions ^d	IR/Convection	260		

Notes:

a. Based on T_C = 25 °C.

b. Surface mounted on 1" x 1" FR4 board.

c. t = 10 s.

d. Refer to IPC/JEDEC (J-STD-020), no manual or hand soldering.

e. In this document, any reference to the Case represents the body of the DFN2X2 device and Foot is the bump.

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{a, b}	R_{thJA}	35	48	°C/W
Maximum Junction-to-Foot (Drain)	Steady State R_{thJF}	16	26	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. Maximum under steady state conditions is 72 °C/W.

SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 15			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 13.3		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		2.4			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 0.35		- 0.9	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 6\text{ V}$			- 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$			- 1	μA
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ °C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq 5\text{ V}, V_{GS} = -4.5\text{ V}$	- 12.5			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		0.012	0.019	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$		0.015	0.024	
		$V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$		0.022	0.037	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -4\text{ V}, I_D = -1\text{ A}$		5.1		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1980		pF
Output Capacitance	C_{oss}		237			
Reverse Transfer Capacitance	C_{rss}		211			
Total Gate Charge	Q_g	$V_{DS} = -6\text{ V}, V_{GS} = -5\text{ V}, I_D = -1\text{ A}$		28		nC
				32		
Gate-Source Charge	Q_{gs}	$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		7.3		
Gate-Drain Charge	Q_{gd}			5.9		
Gate Resistance	R_g	$V_{GS} = -0.1\text{ V}, f = 1\text{ MHz}$		28		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 4\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$		14	21	ns
Rise Time	t_r			25	40	
Turn-Off Delay Time	$t_{d(off)}$			380	570	
Fall Time	t_f			240	360	

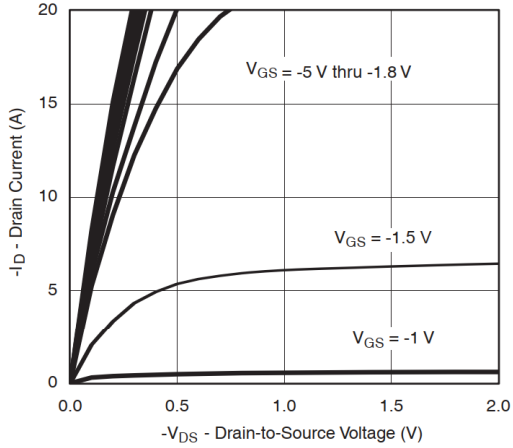
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			- 12.5	A
Pulse Diode Forward Current	I_{SM}				- 36	
Body Diode Voltage	V_{SD}	$I_S = -1\text{ A}, V_{GS} = 0\text{ V}$		- 0.65	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		311		ns
Body Diode Reverse Recovery Charge	Q_{rr}			1.136		μC
Reverse Recovery Fall Time	t_a			116		ns
Reverse Recovery Rise Time	t_b			195		

Notes:

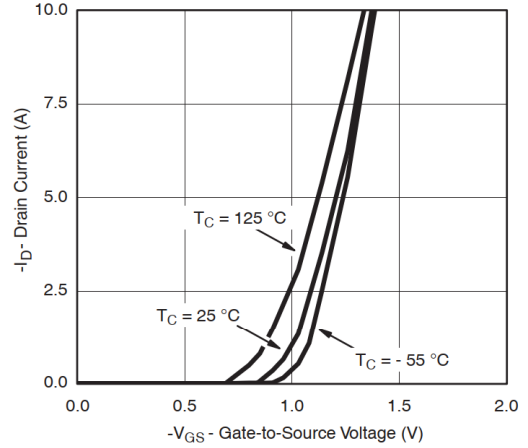
- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.

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.

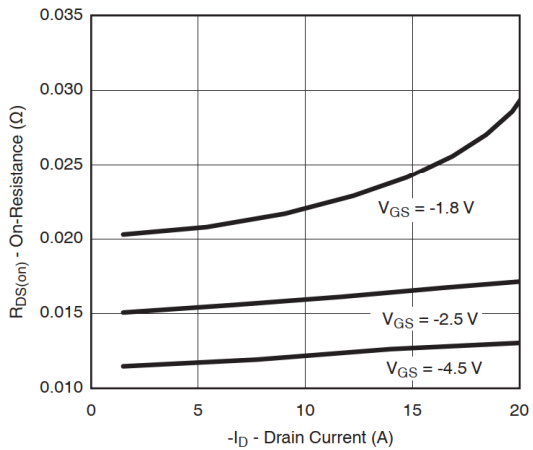
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



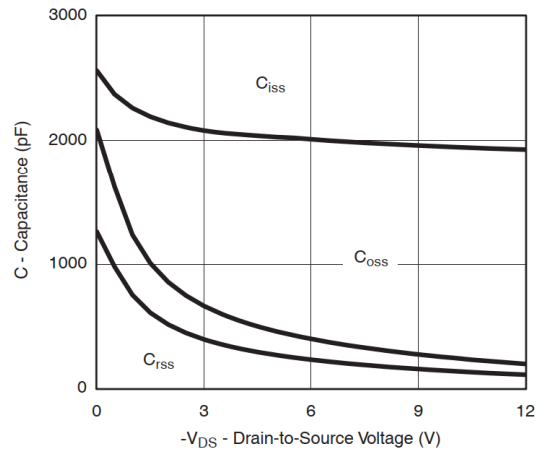
Output Characteristics



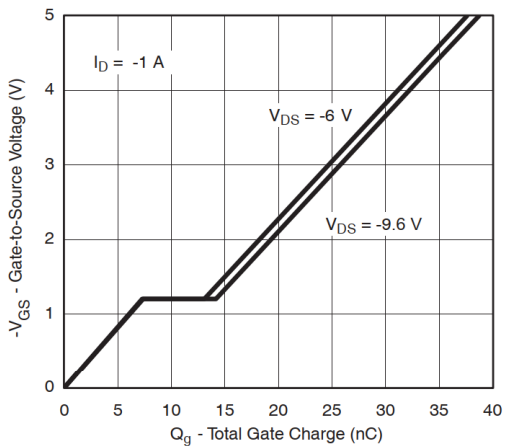
Transfer Characteristics



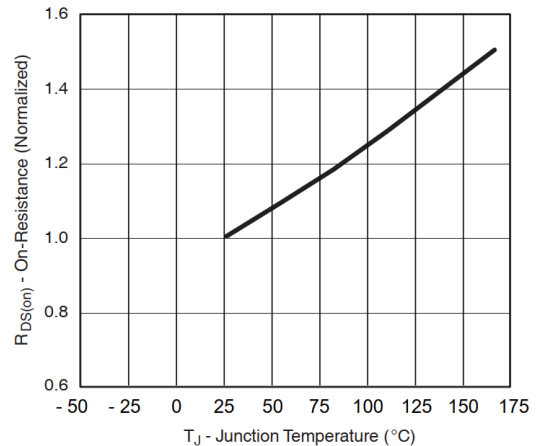
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

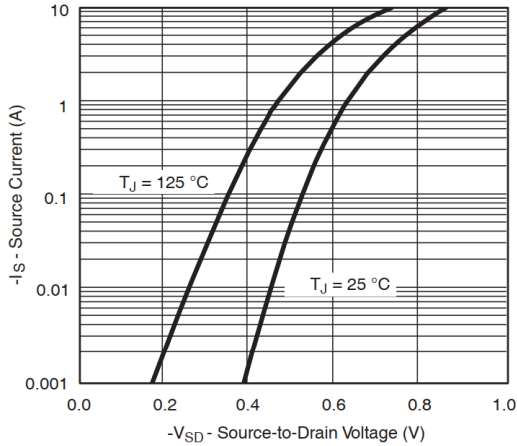


Gate Charge

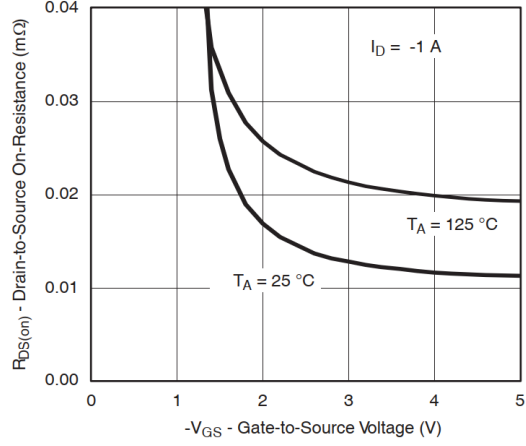


On-Resistance vs. Junction Temperature

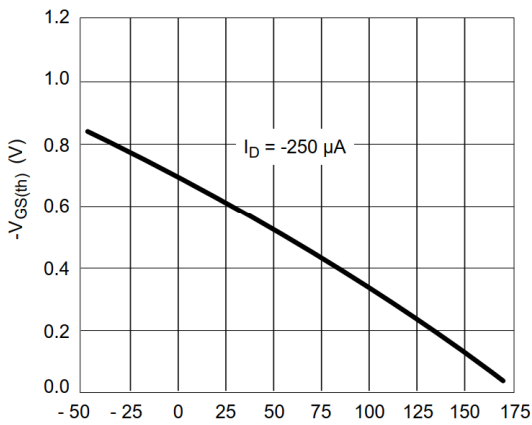
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



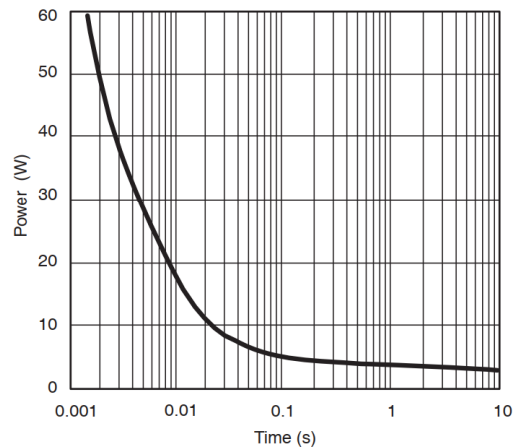
Source-Drain Diode Forward Voltage



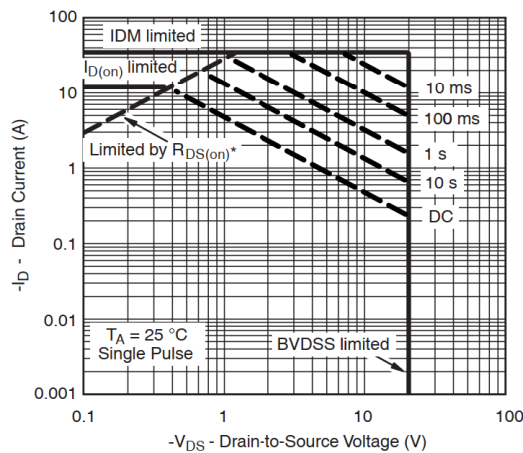
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

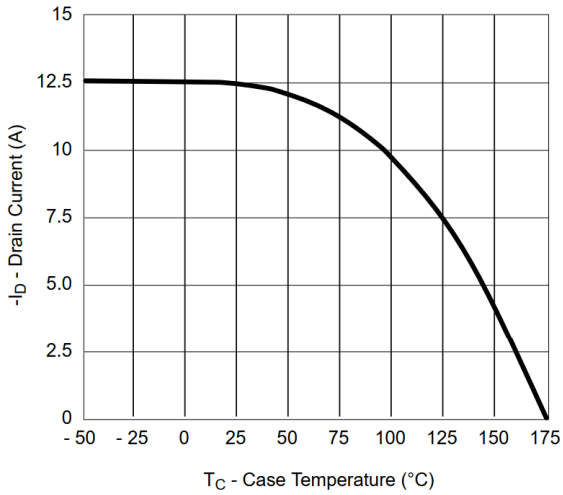


Single Pulse Power, Junction-to-Ambient

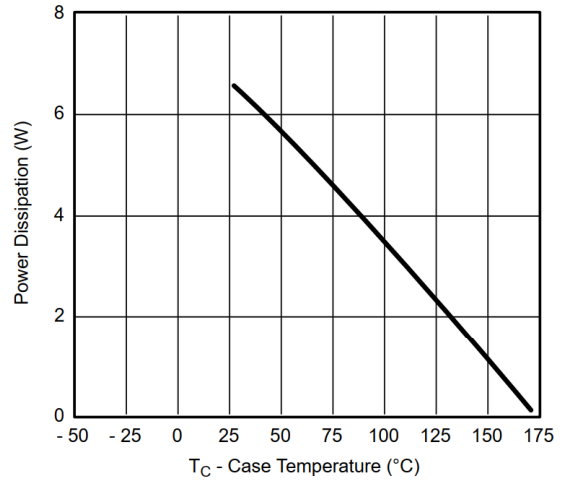


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

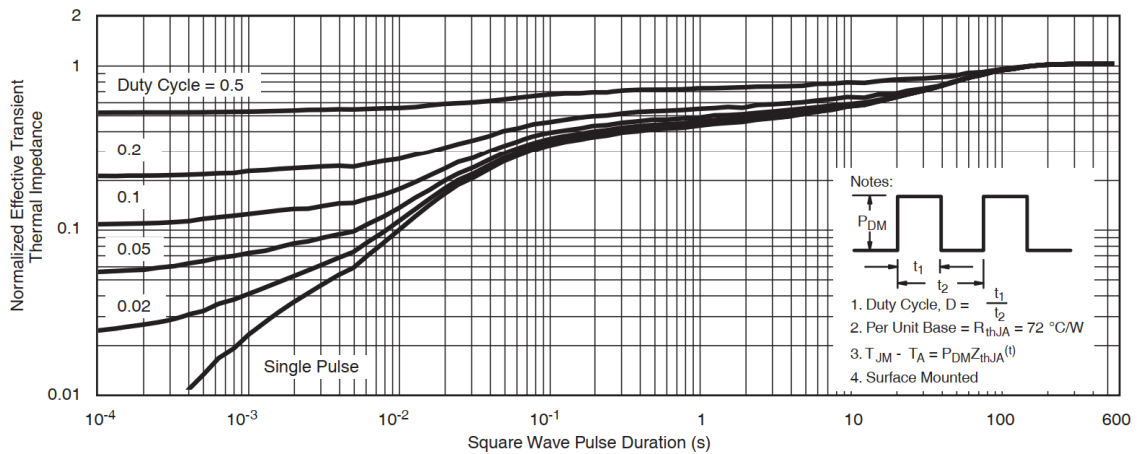
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



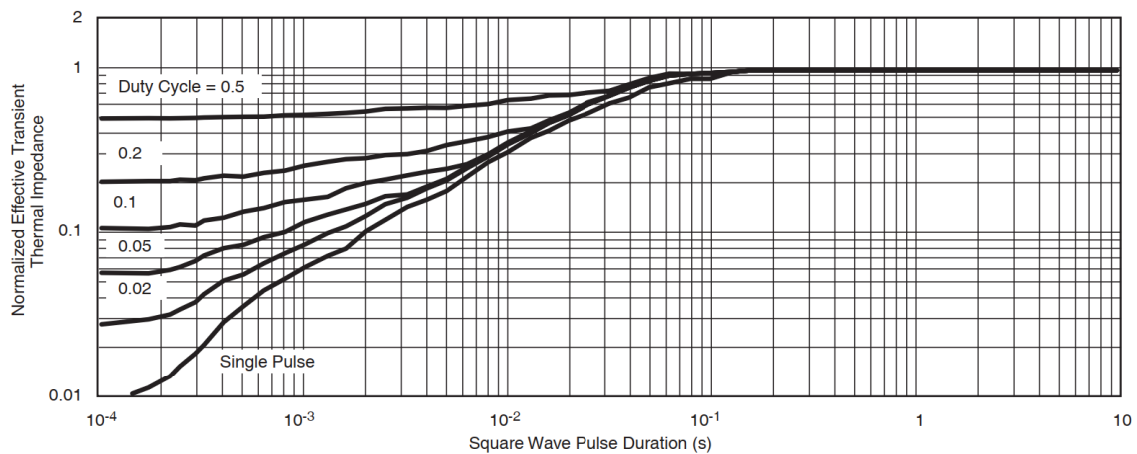
Current Derating*



Power Derating

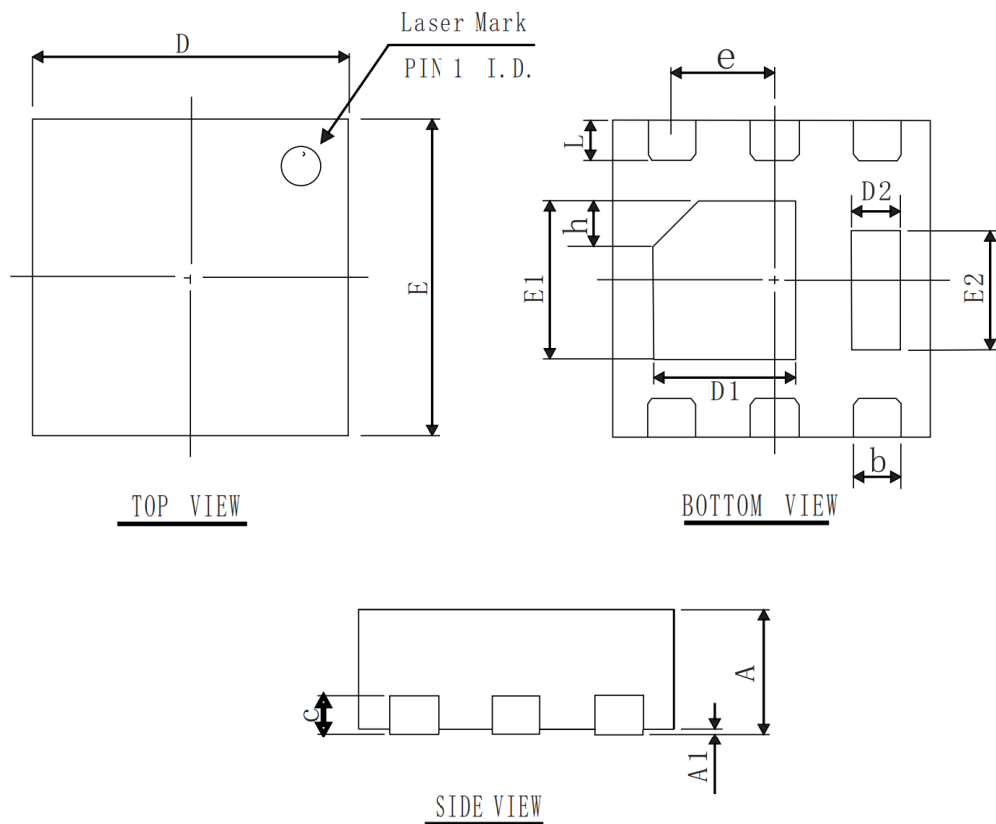


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

DFN 2X2 PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	0.60	0.75	0.90
A1	0.00	0.02	0.10
b	0.15	0.25	0.40
D	1.80	2.00	2.25
E	1.80	2.00	2.25
D1	0.70	0.90	1.10
E1	0.75	1.00	1.20
D2	0.15	0.30	0.45
E2	0.45	0.75	0.95
L	0.15	0.25	0.40
h	0.15	0.25	0.40
c	0.203 REF		
e	0.65 BSC		

Other thickness dimensions are as follows

A	0.50	0.55	0.60
A	0.40	0.45	0.50

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