

FDMC7200-VB Datasheet

Dual N-Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
30	0.009 at $V_{GS} = 10$ V	35	15 nC
	0.016 at $V_{GS} = 4.5$ V	30	

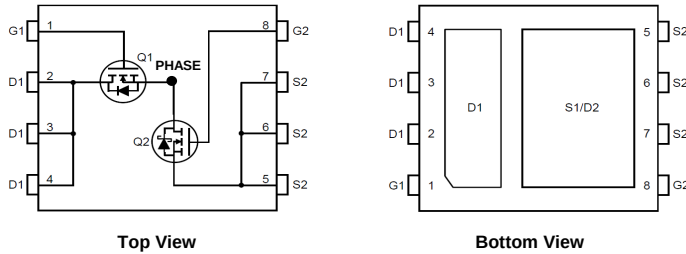
FEATURES

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



RoHS
COMPLIANT
HALOGEN
FREE

DFN 3*3



APPLICATIONS

- Set Top Box
- Low Current DC/DC

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	$T_C = 25$ °C	35 ^a	A
	$T_C = 70$ °C	24	
	$T_A = 25$ °C	17.5 ^{b, c}	
	$T_A = 70$ °C	15.5 ^{b, c}	
Pulsed Drain Current	I_{DM}	105	
Continuous Source-Drain Diode Current	$T_C = 25$ °C	2.25	
	$T_A = 25$ °C	1.48 ^{b, c}	
Single Pulse Avalanche Current	I_{AS}	5	
Single Pulse Avalanche Energy	E_{AS}	1.25	mJ
Maximum Power Dissipation	$T_C = 25$ °C	56	W
	$T_C = 70$ °C	15	
	$T_A = 25$ °C	2.18 ^{b, c}	
	$T_A = 70$ °C	1.34 ^{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 ^{a, c, d}	R_{thJA}	58	70	°C/W
Maximum Junction-to-Foot (Drain)	R_{thJF}	38	45	

Notes:

a. Package limited, $T_C = 25$ °C.

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

c. $t = 10$ s.

d. Maximum under Steady State conditions is 110 °C/W.

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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		32		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.0		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0		2.5	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}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	10			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		0.009		Ω
		$V_{GS} = 4.5\text{ V}, I_D = 4\text{ A}$		0.016		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 5\text{ A}$		16		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		900		pF
Output Capacitance	C_{oss}			257		
Reverse Transfer Capacitance	C_{rss}			155		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		15		nC
		$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$		3.7	5.6	
Q_{gs}			1.4			
Q_{gd}			1.05			
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.8	4.3	8.6	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		12	24	ns
Rise Time	t_r			55	100	
Turn-Off Delay Time	$t_{d(off)}$			11	22	
Fall Time	t_f			8	16	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		4	8	
Rise Time	t_r			9	18	
Turn-Off Delay Time	$t_{d(off)}$			10	20	
Fall Time	t_f			6	12	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			35	A
Pulse Diode Forward Current	I_{SM}				105	
Body Diode Voltage	V_{SD}	$I_S = 2\text{ A}, V_{GS} = 0\text{ V}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$		11	20	ns
Body Diode Reverse Recovery Charge	Q_{rr}			4	8	nC
Reverse Recovery Fall Time	t_a			7		ns
Reverse Recovery Rise Time	t_b			4		

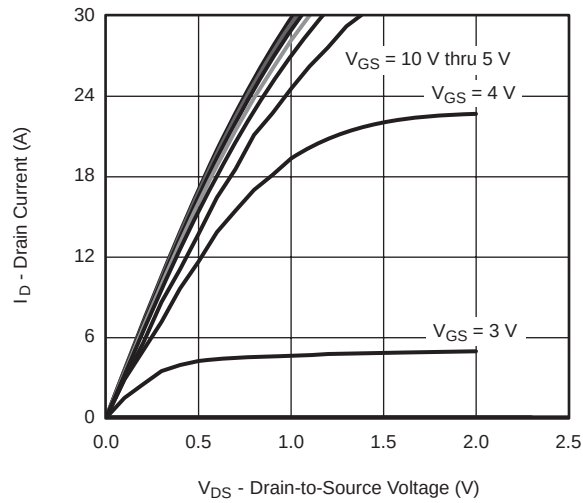
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

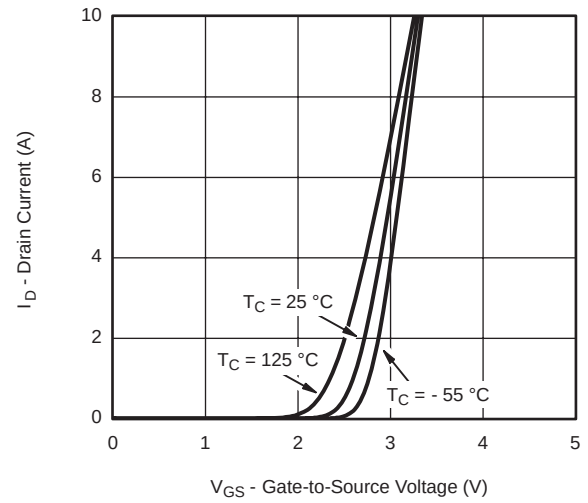
b. Guaranteed by design, not subject to production testing.

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.

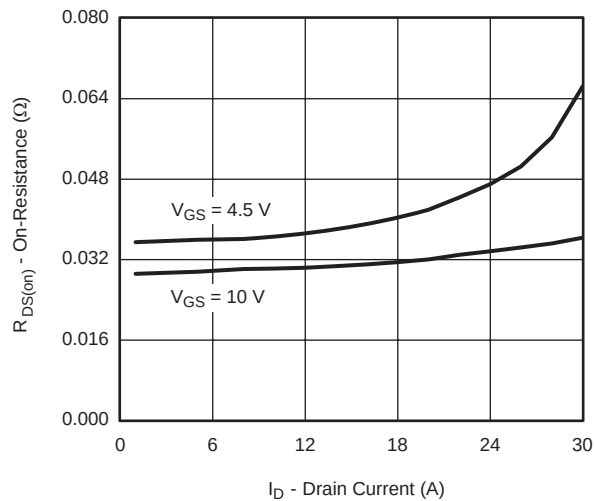
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



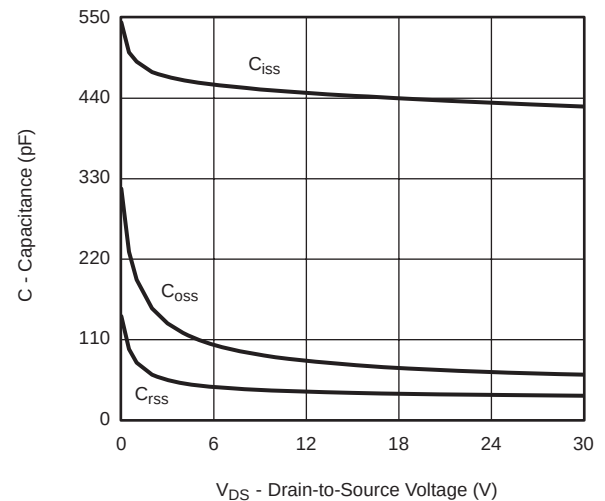
Output Characteristics



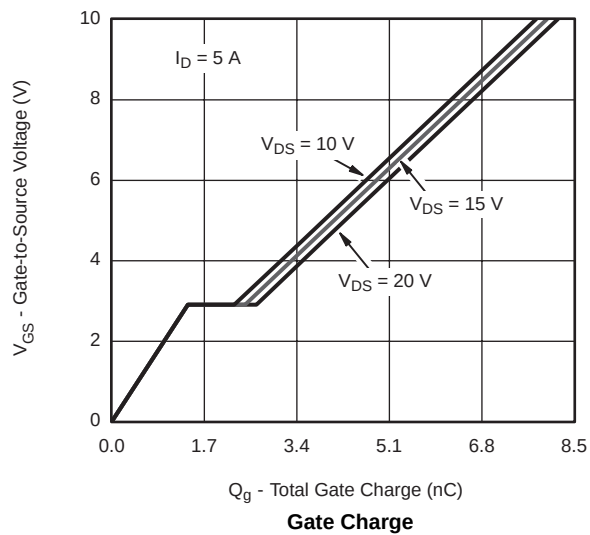
Transfer Characteristics



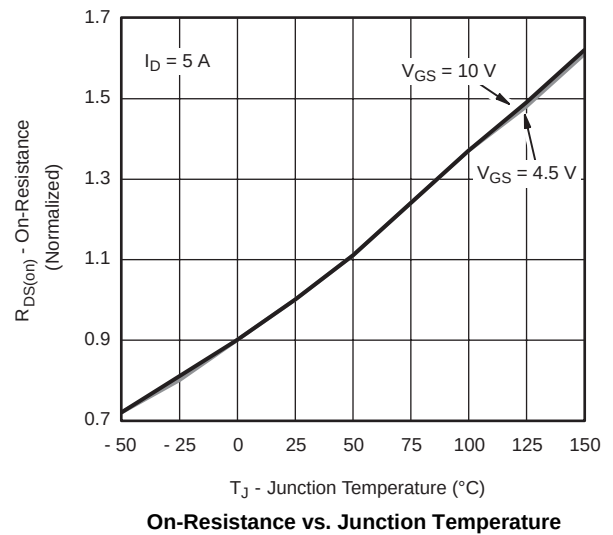
On-Resistance vs. Drain Current



Capacitance



Gate Charge



On-Resistance vs. Junction Temperature

$R_{DS(on)}$ - On-Resistance (Ω)

$I_D = 5\text{ A}$

$T_J = 125\text{ }^{\circ}\text{C}$

$T_J = 25\text{ }^{\circ}\text{C}$

V_{GS} - Gate-to-Source Voltage (V)

A graph showing the variance of $V_{GS(th)}$ (in Volts) versus T_J - Temperature (in $^{\circ}C$). The y-axis ranges from -1.0 to 0.5 V, and the x-axis ranges from -50 to 150 $^{\circ}C$. Two curves are plotted: one for $I_D = 5 \text{ mA}$ (darker line) and one for $I_D = 250 \mu A$ (lighter line). Both curves show a negative linear relationship between temperature and threshold voltage variance.

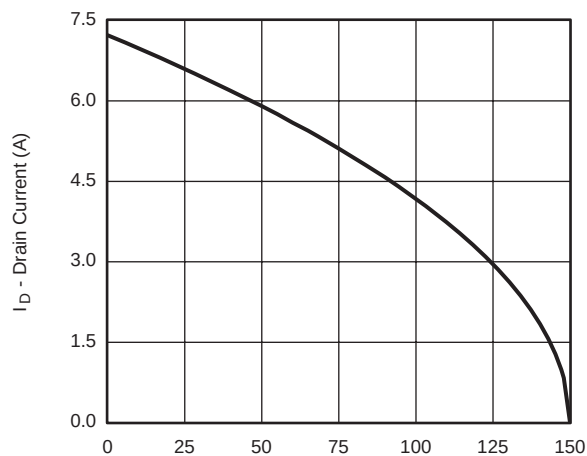
T_J - Temperature ($^{\circ}C$)	$V_{GS(th)}$ Variance (V) for $I_D = 5 \text{ mA}$	$V_{GS(th)}$ Variance (V) for $I_D = 250 \mu A$
-50	0.30	0.22
-25	0.18	0.18
0	0.06	0.14
25	-0.06	0.10
50	-0.18	0.06
75	-0.30	0.02
100	-0.42	-0.02
125	-0.54	-0.06
150	-0.66	-0.10

Figure 1 is a log-linear plot showing Power (W) versus Time (s). The y-axis is linear, ranging from 0 to 50 W. The x-axis is logarithmic, ranging from 0.001 to 1000 s. The curve starts at 50 W at 0.001 s and decays exponentially, reaching approximately 1 W at 1000 s.

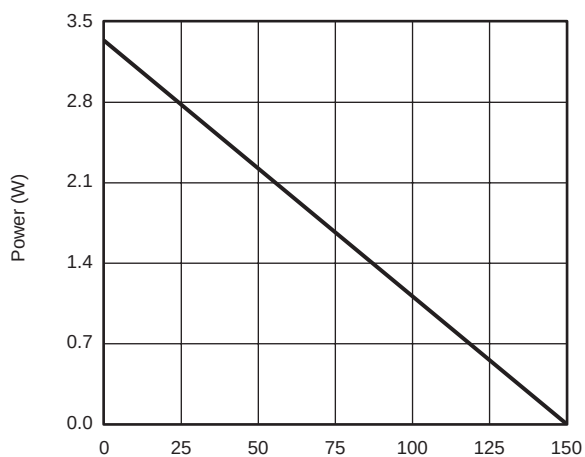
Figure 10 is a Power Dissipation Capability graph for the 2N7000 MOSFET. The y-axis represents Drain Current (I_D) in Amperes (A) on a logarithmic scale from 0.01 to 100. The x-axis represents Drain-to-Source Voltage (V_{DS}) in Volts (V) on a logarithmic scale from 0.1 to 100. The graph shows a solid line for 'Limited by $R_{DS(on)}^*$ ' and a dashed line for 'BVDSS Limited'. The solid line is horizontal at $I_D = 40$ A for $V_{DS} < 0.5$ V, then rises linearly to $I_D = 20$ A at $V_{DS} = 1$ V, and then continues as a dashed line. The dashed line represents the BVDSS limit, which decreases as V_{DS} increases. The graph is for $T_A = 25^\circ\text{C}$ and Single Pulse. The BVDSS limit is shown for pulse widths of 1 ms, 10 ms, 100 ms, 1 s, 10 s, and DC.

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

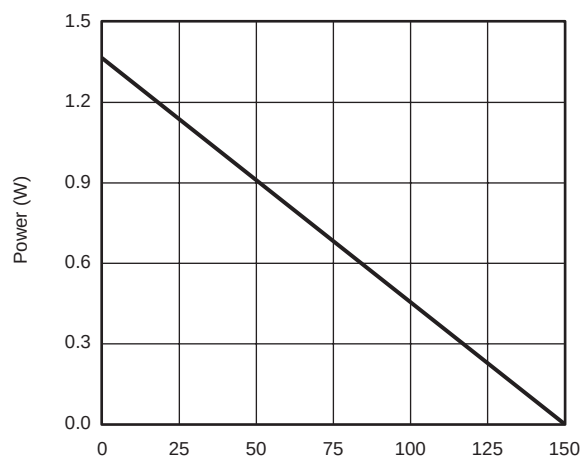
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TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


T_C - Case Temperature (°C)
Current Derating*

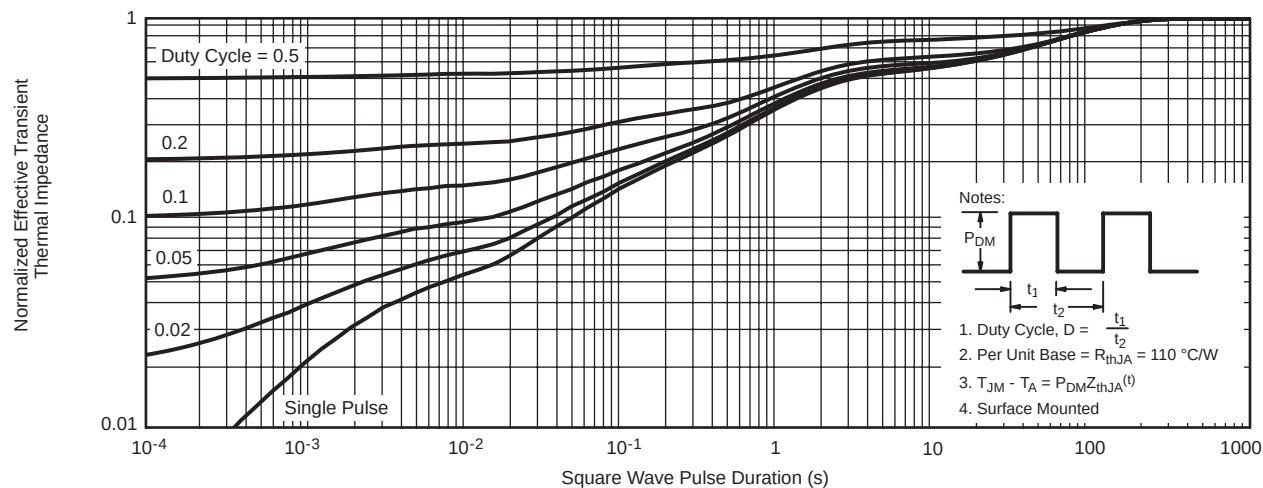
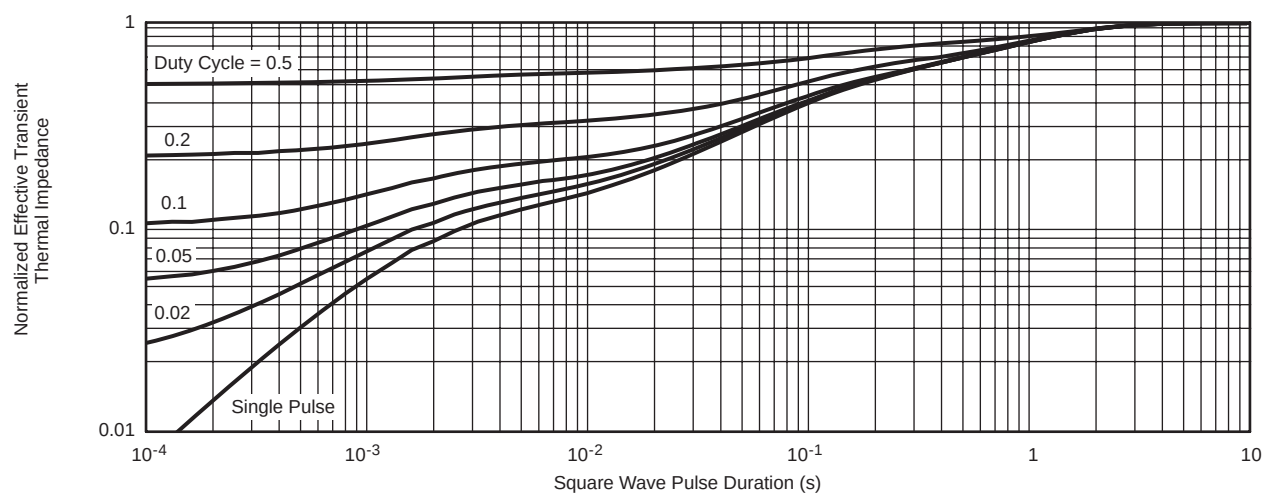


T_C - Case Temperature (°C)
Power, Junction-to-Foot

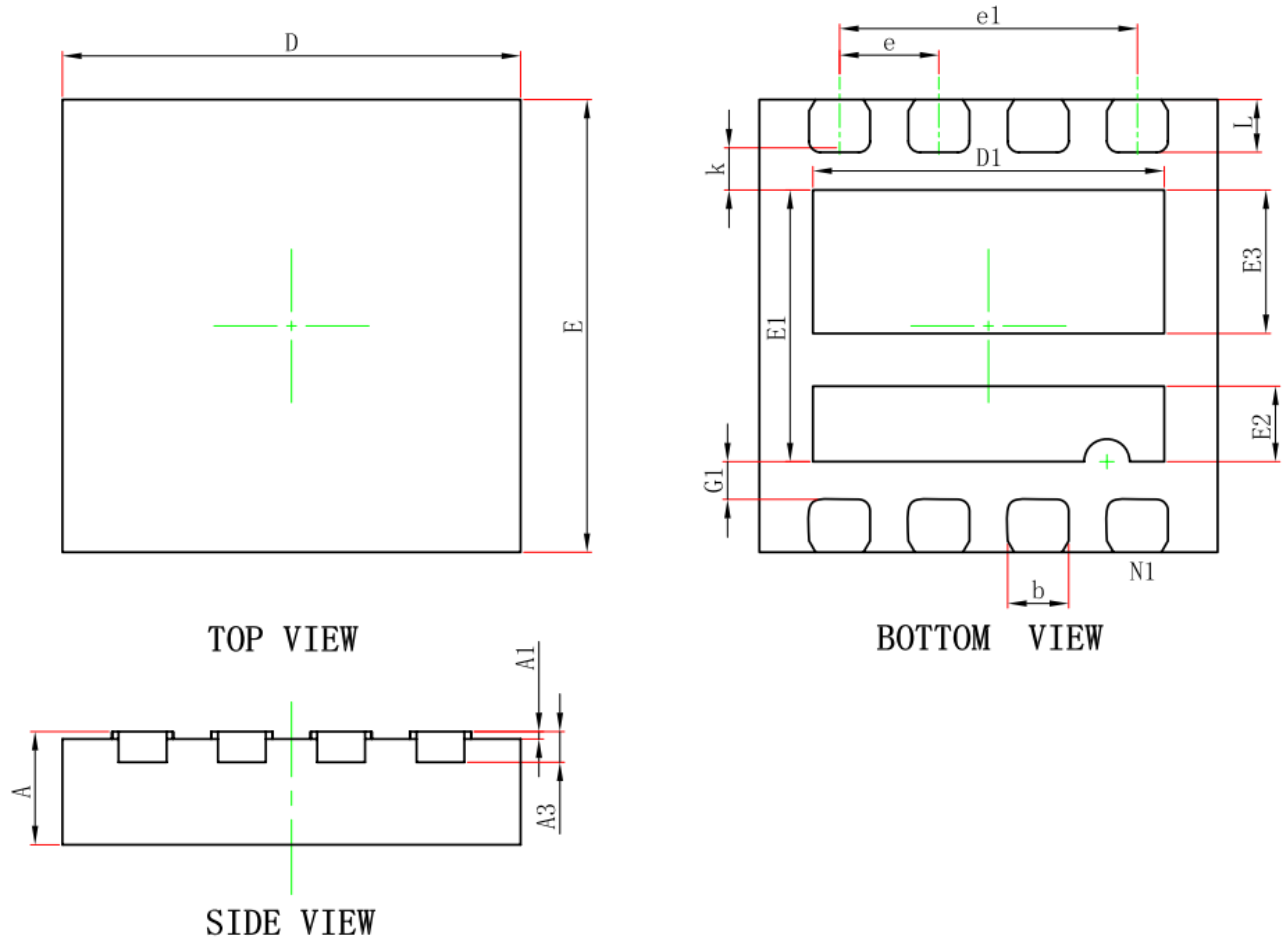


T_A - Ambient Temperature (°C)
Power, Junction-to-Ambient

* 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

DFN3X3-8L-C PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.950	3.050	0.116	0.120
E	2.950	3.050	0.116	0.120
D1	2.250	2.350	0.089	0.093
E1	1.700	1.900	0.067	0.075
E2	0.450	0.550	0.018	0.022
E3	0.900	1.000	0.035	0.039
k	0.200	0.300	0.008	0.012
G1	0.200	0.300	0.008	0.012
b	0.350	0.450	0.014	0.018
e	0.650BSC		0.026BSC	
e1	1.95BSC		0.077BSC	
L	0.300	0.400	0.012	0.016

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