

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

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)	Q <sub>g</sub> (TYP.)
20	0.0120 at V <sub>GS</sub> = 4.5 V	25	12 nC
	0.0160 at V <sub>GS</sub> = 2.5 V	20	
	0.0190 at V <sub>GS</sub> = 1.8 V	16	

### FEATURES

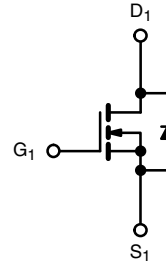
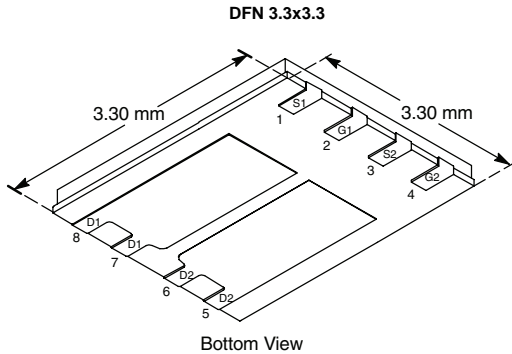
- TrenchFET® power MOSFET

### APPLICATIONS

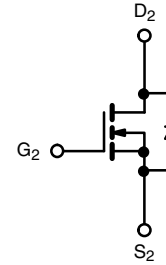
- DC/DC
- Notebook system power
- POL



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**



N-Channel MOSFET



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V <sub>DS</sub>	20	V	
Gate-Source Voltage	V <sub>GS</sub>	± 8		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	25	
		T <sub>C</sub> = 70 °C	23.8	
		T <sub>A</sub> = 25 °C	10 a, b	
		T <sub>A</sub> = 70 °C	8 a, b	
Pulsed Drain Current	I <sub>DM</sub>	40	A	
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C		19
		T <sub>A</sub> = 25 °C		2.2 a, b
Single Pulse Avalanche Current	I <sub>AS</sub>	15		mJ
Single Pulse Avalanche Energy	E <sub>AS</sub>	11		
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	23	
		T <sub>C</sub> = 70 °C	14.8	
		T <sub>A</sub> = 25 °C	2.6 a, b	
		T <sub>A</sub> = 70 °C	1.7 a, b	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C	
Soldering Recommendations (Peak Temperature) c, d		260		

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum Junction-to-Ambient	t ≤ 10 s	R <sub>thJA</sub>	38	48	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R <sub>thJC</sub>	4.3	5.4	

### Notes

- Package limited, T<sub>C</sub> = 25 °C.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under Steady State conditions is 110 °C/W.

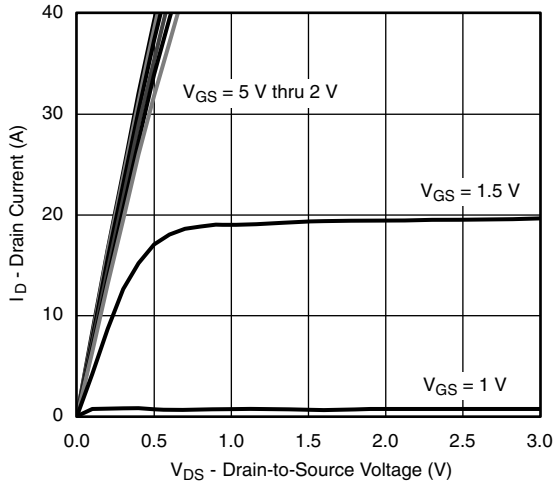
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	22	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	-3	-	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.4	-	1	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	-	-	10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	20	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	-	0.0120	-	$\Omega$
		$V_{GS} = 2.5\text{ V}, I_D = 9\text{ A}$	-	0.0160	-	
		$V_{GS} = 1.8\text{ V}, I_D = 8.2\text{ A}$	-	0.0190	-	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$	-	47	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	1220	-	pF
Output Capacitance	$C_{OSS}$		-	180	-	
Reverse Transfer Capacitance	$C_{RSS}$		-	80	-	
Total Gate Charge	$Q_g$	$V_{DS} = 15\text{ V}, V_{GS} = 8\text{ V}, I_D = 10\text{ A}$	-	21	32	nC
		$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	-	12	18	
Gate-Source Charge	$Q_{gs}$		-	2	-	
Gate-Drain Charge	$Q_{gd}$		-	1.3	-	
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	-	1.8	3.6	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 1.25\text{ }\Omega$ $I_D \cong 8\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	10	15	ns
Rise Time	$t_r$		-	10	15	
Turn-Off Delay Time	$t_{d(off)}$		-	35	55	
Fall Time	$t_f$		-	10	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 1.25\text{ }\Omega$ $I_D \cong 8\text{ A}, V_{GEN} = 8\text{ V}, R_g = 1\text{ }\Omega$	-	10	15	
Rise Time	$t_r$		-	10	15	
Turn-Off Delay Time	$t_{d(off)}$		-	25	40	
Fall Time	$t_f$		-	10	15	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	19	A
Pulse Diode Forward Current	$I_{SM}$		-	-	40	
Body Diode Voltage	$V_{SD}$	$I_S = 8\text{ A}, V_{GS} = 0\text{ V}$	-	0.81	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 8\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	20	30	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	15	25	nC
Reverse Recovery Fall Time	$t_a$		-	12.5	-	ns
Reverse Recovery Rise Time	$t_b$		-	7.5	-	

**Notes**

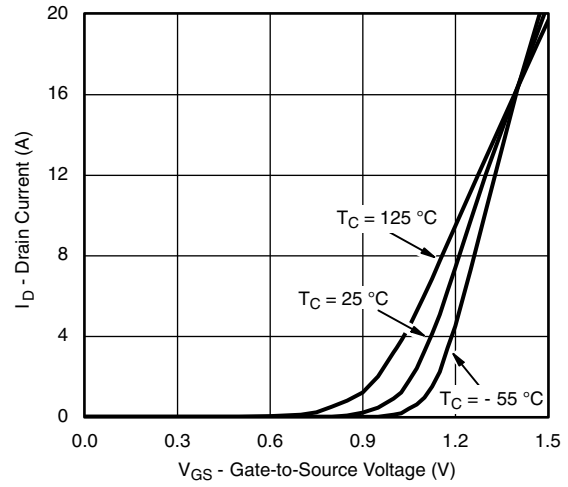
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$   
 b. Guaranteed by design, not subject to production testing.

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.

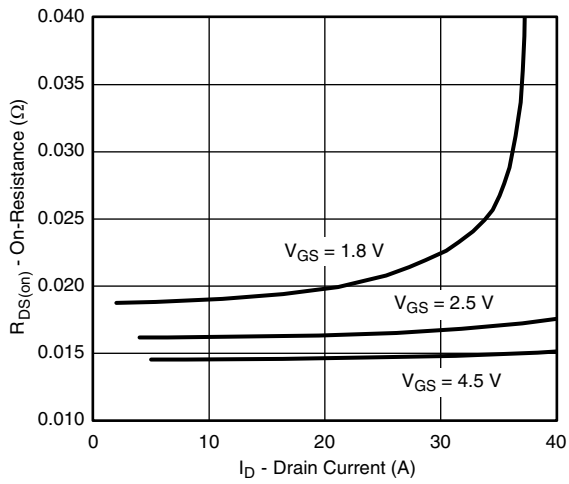
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



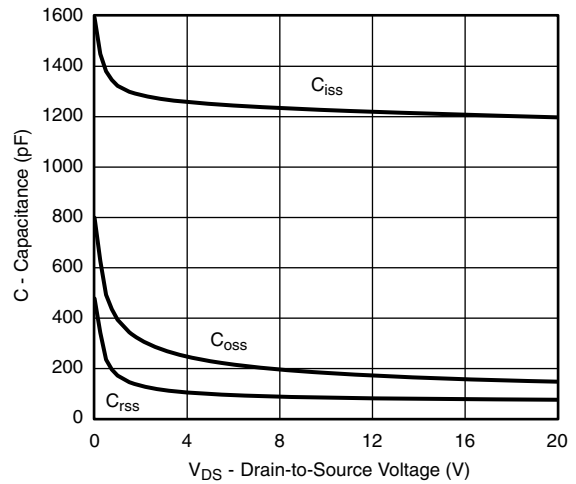
**Output Characteristics**



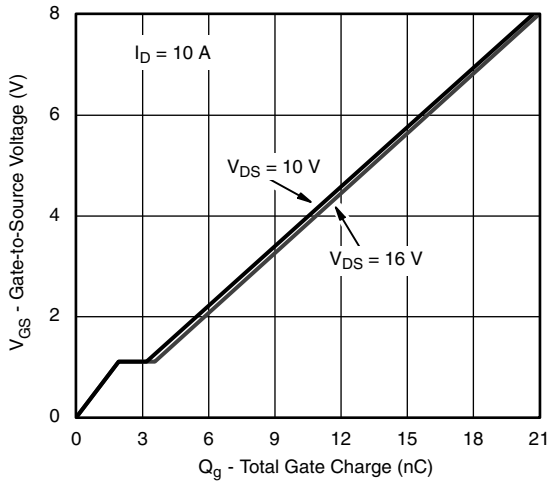
**Transfer Characteristics**



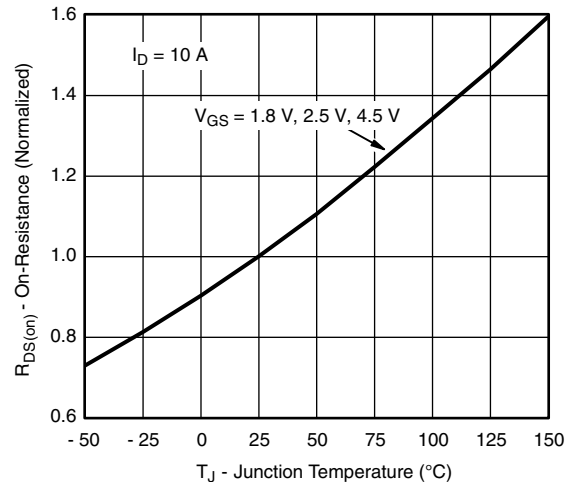
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**

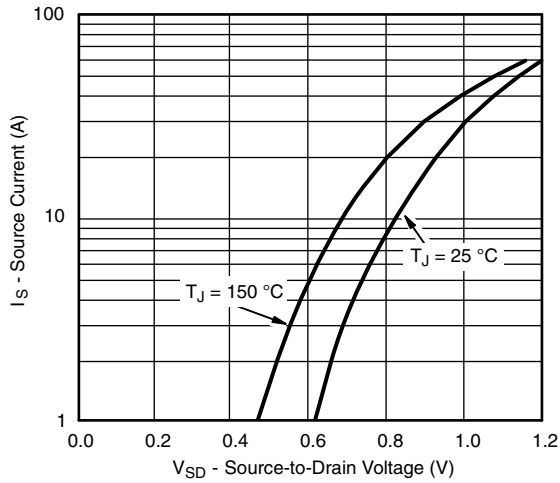


**Gate Charge**

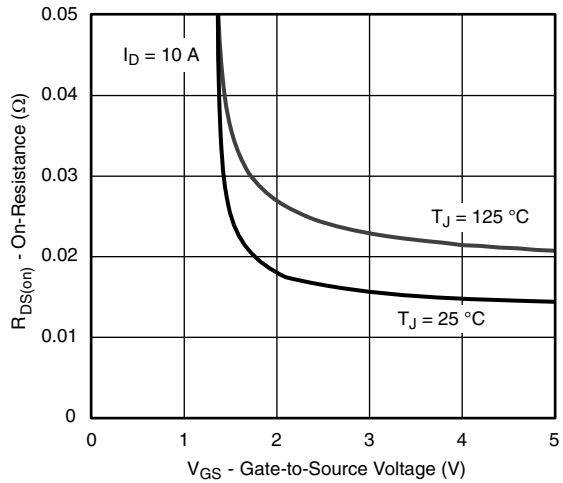


**On-Resistance vs. Junction Temperature**

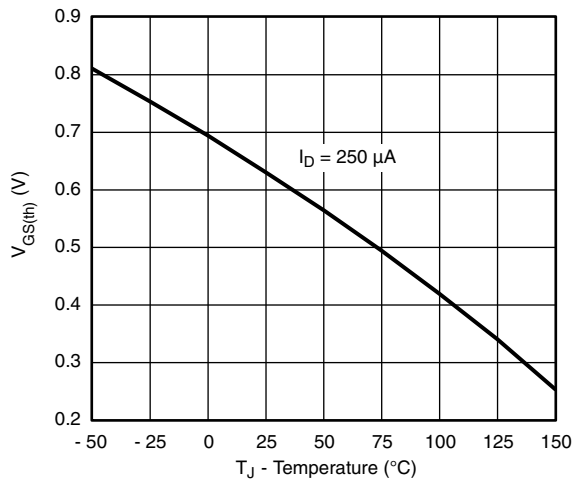
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



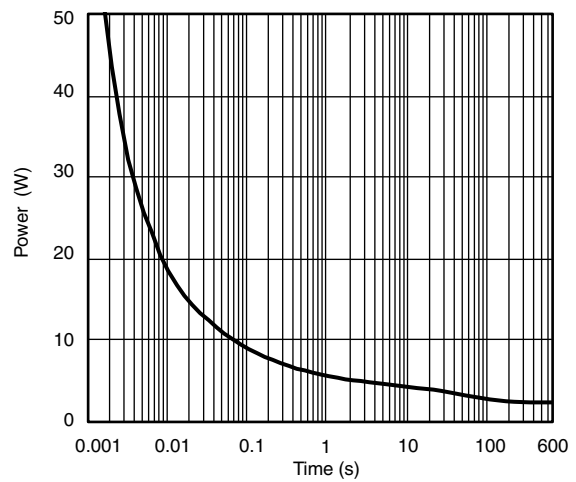
**Source-Drain Diode Forward Voltage**



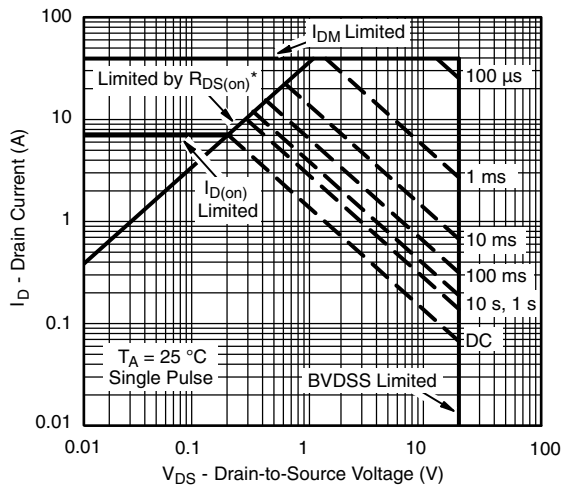
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**



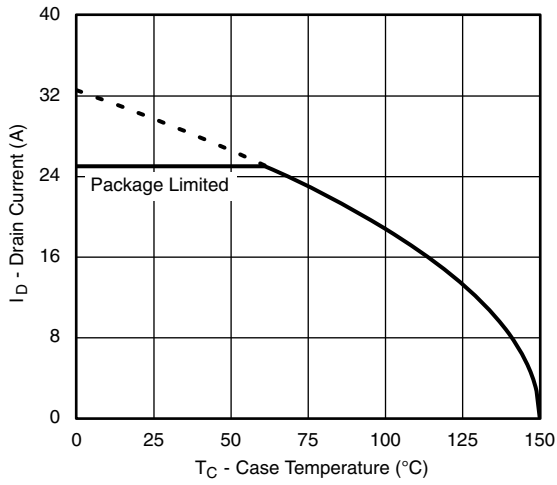
**Single Pulse Power, Junction-to-Ambient**



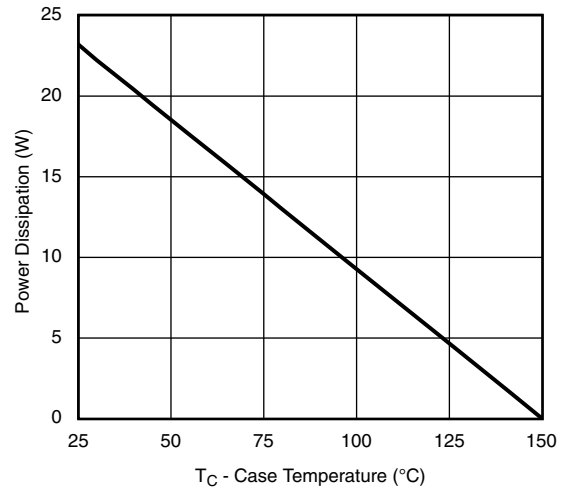
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area, Junction-to-Ambient**

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



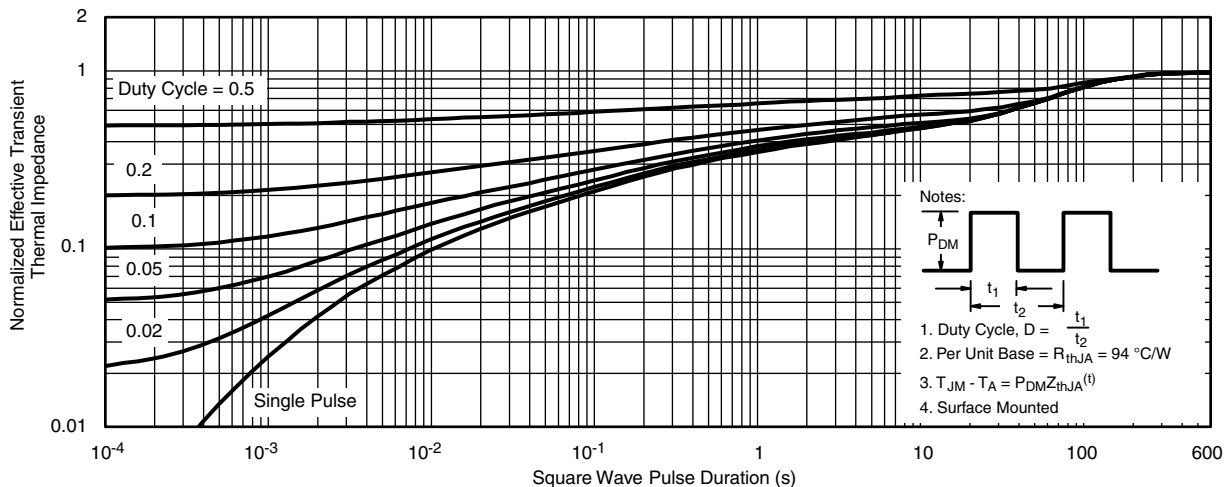
**Current Derating\***



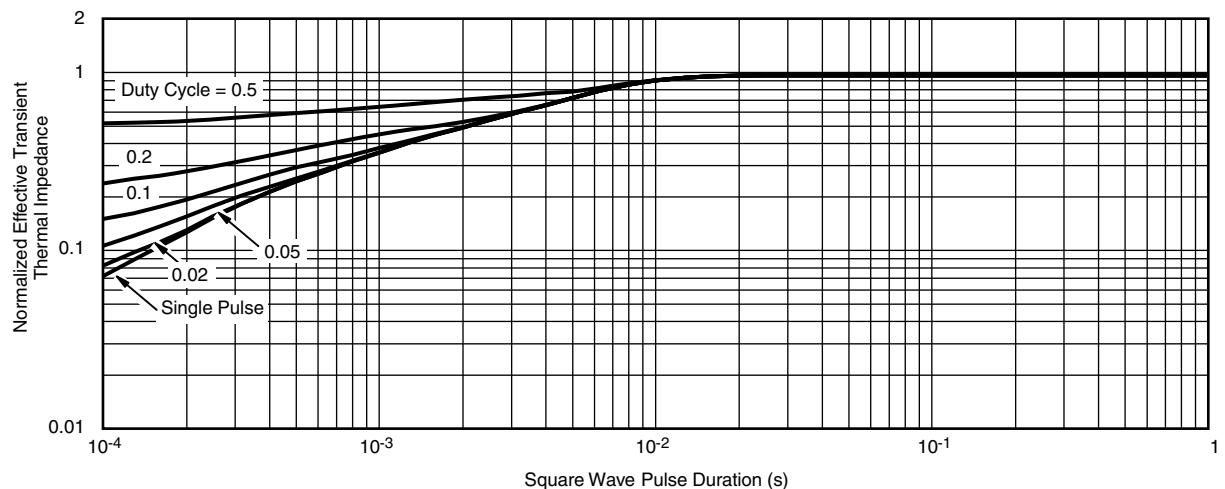
**Power Derating**

\* 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)

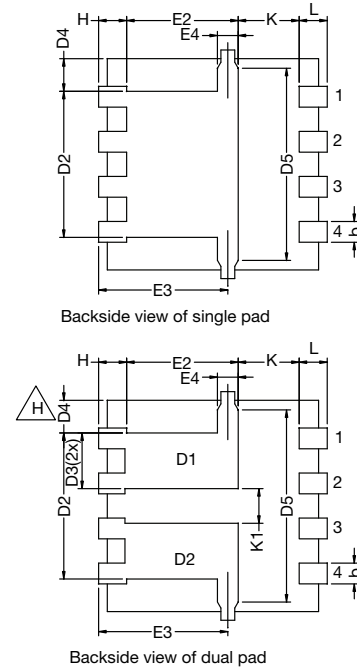
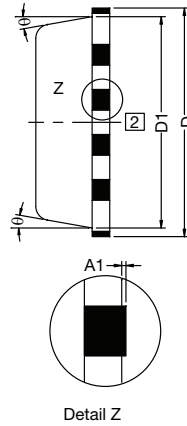
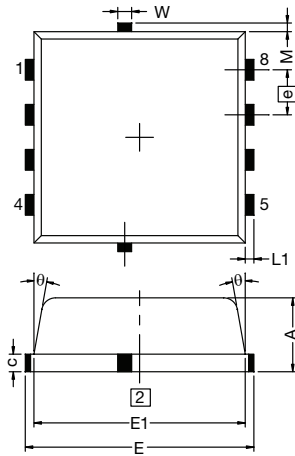


**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**

### DFN3.3X3.3 (Dual)



- Notes**  
 1. Inch will govern  
 2. Dimensions exclusive of mold gate burrs  
 3. Dimensions exclusive of mold flash and cutting burrs

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.97	1.04	1.12	0.038	0.041	0.044
A1	0.00	-	0.05	0.000	-	0.002
b	0.23	0.30	0.41	0.009	0.012	0.016
c	0.23	0.28	0.33	0.009	0.011	0.013
D	3.20	3.30	3.40	0.126	0.130	0.134
D1	2.95	3.05	3.15	0.116	0.120	0.124
D2	1.98	2.11	2.24	0.078	0.083	0.088
D3	0.48	-	0.89	0.019	-	0.035
D4	0.47 typ.			0.0185 typ		
D5	2.3 typ.			0.090 typ		
E	3.20	3.30	3.40	0.126	0.130	0.134
E1	2.95	3.05	3.15	0.116	0.120	0.124
E2	1.47	1.60	1.73	0.058	0.063	0.068
E3	1.75	1.85	1.98	0.069	0.073	0.078
E4	0.034 typ.			0.013 typ.		
e	0.65 BSC			0.026 BSC		
K	0.86 typ.			0.034 typ.		
K1	0.35	-	-	0.014	-	-
H	0.30	0.41	0.51	0.012	0.016	0.020
L	0.30	0.43	0.56	0.012	0.017	0.022
L1	0.06	0.13	0.20	0.002	0.005	0.008
θ	0°	-	12°	0°	-	12°
W	0.15	0.25	0.36	0.006	0.010	0.014
M	0.125 typ.			0.005 typ.		

ECN: S16-2667-Rev. M, 09-Jan-17  
 DWG: 5882

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