RU40180M-VB Datasheet

N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
40	0.0025 at V_{GS} = 10 V	120	38 nC
	0.0028 at V_{GS} = 6.5 V	105	

FEATURES

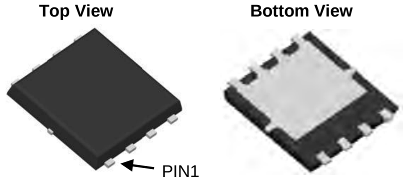
- **Halogen-free According to IEC 61249-2-21 Definition**
- Trench Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested

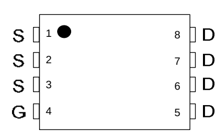
RoHS
COMPLIANT

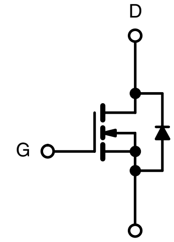
APPLICATIONS

- Synchronous Rectification
- Secondary Side DC/DC

DFN5X6







N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	120	A
	T_C = 70 °C		80	
	T_A = 25 °C		33[b, c]	
	T_A = 70 °C		26[b, c]	
Pulsed Drain Current		I_{DM}	360	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	100	
	T_A = 25 °C		4.9[b, c]	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	40	
Single Pulse Avalanche Energy		E_{AS}	80	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	83	W
	T_C = 70 °C		53	
	T_A = 25 °C		5.4[b, c]	
	T_A = 70 °C		3.4[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)[d, e]			260	

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[b, f]	t ≤ 10 s	R_{thJA}	18	23	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	1.0	1.5	

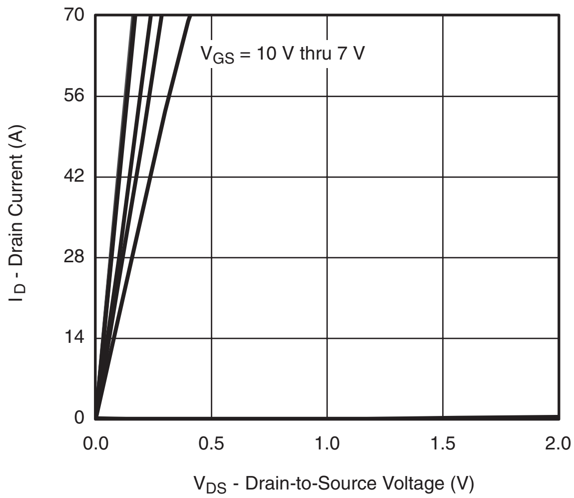
Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Maximum under steady state conditions is 90 °C/W.
e. Calculated based on maximum junction temperature. Package limitation current is 80 A.

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	40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		43		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA	2.0		4.0	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} = 40 V, V_{GS} = 0 V			1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 55 °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq 5$ V, V_{GS} = 10 V	100			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.0025		Ω
		V_{GS} =6.5 V, I_D = 20 A		0.0028		
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		102		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1 MHz		4750		pF
Output Capacitance	C_{oss}			610		
Reverse Transfer Capacitance	C_{rss}			275		
Total Gate Charge	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 20 A		78	117	nC
		V_{DS} = 20 V, V_{GS} = 4.5 V, I_D = 20 A		38	57	
Gate-Source Charge	Q_{gs}			13		
Gate-Drain Charge	Q_{gd}			11		
Gate Resistance	R_g	f = 1 MHz	0.2	0.7	1.4	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 2 Ω $I_D \cong$ 10 A, V_{GEN} = 10 V, R_g = 1 Ω		14	25	ns
Rise Time	t_r			9	18	
Turn-Off Delay Time	$t_{d(off)}$			41	65	
Fall Time	t_f			9	18	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 20 V, R_L = 2 Ω $I_D \cong$ 10 A, V_{GEN} = 4.5 V, R_g = 1 Ω		33	42	
Rise Time	t_r			22	35	
Turn-Off Delay Time	$t_{d(off)}$			42	65	
Fall Time	t_f			13	25	
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}			60		
Body Diode Voltage	V_{SD}	I_S = 5 A		0.75	1.1	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 10 A, dI/dt = 100 A/µs, T_J = 25 °C		40	60	ns
Body Diode Reverse Recovery Charge	Q_{rr}			48	72	nC
Reverse Recovery Fall Time	t_a			24		ns
Reverse Recovery Rise Time	t_b			16		

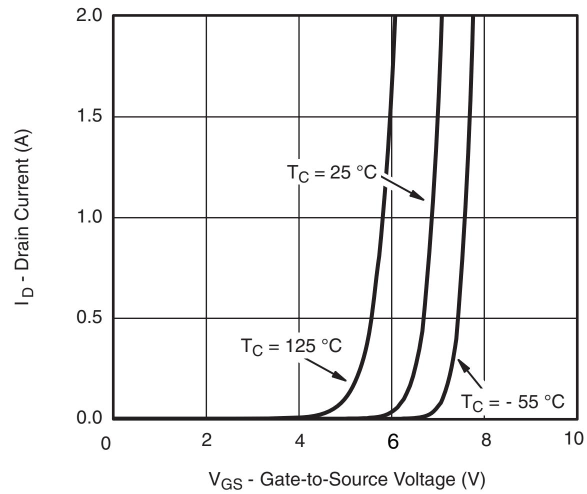
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

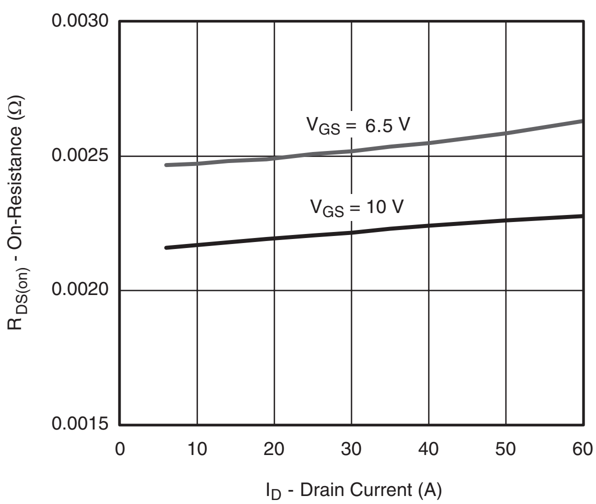
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



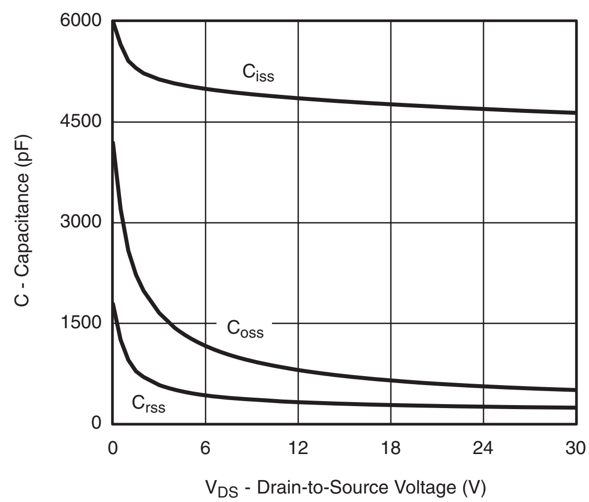
Output Characteristics



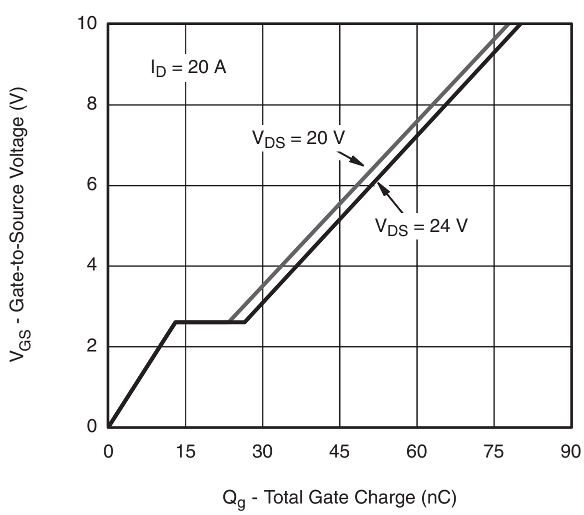
Transfer Characteristics



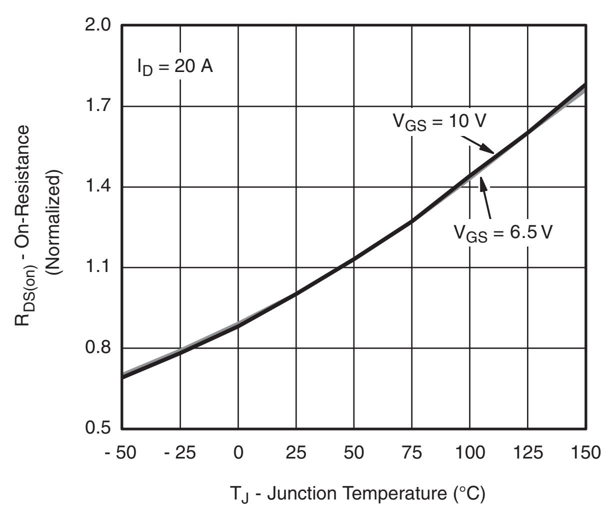
On-Resistance vs. Drain Current



Capacitance

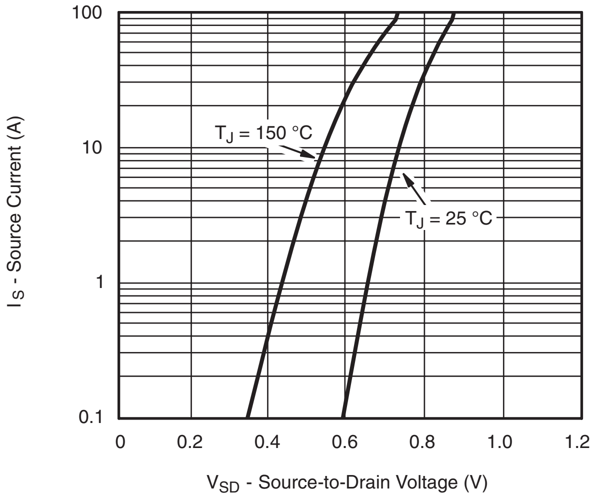


Gate Charge

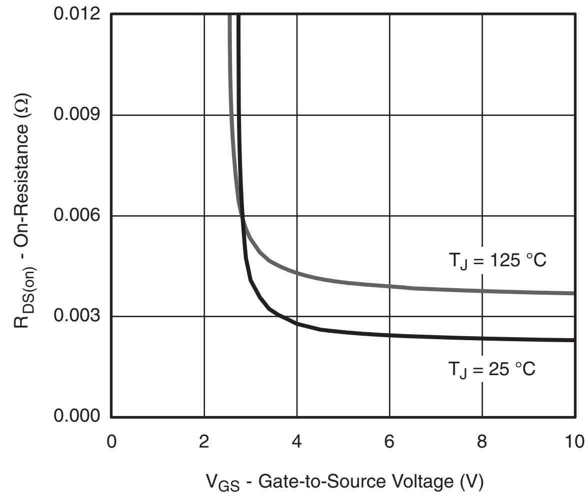


On-Resistance vs. Junction Temperature

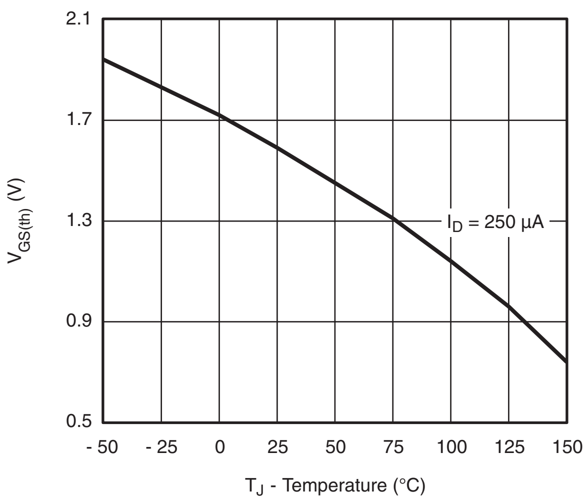
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



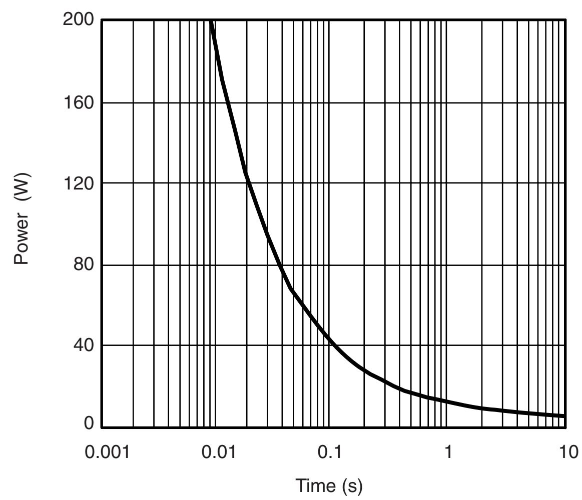
Source-Drain Diode Forward Voltage



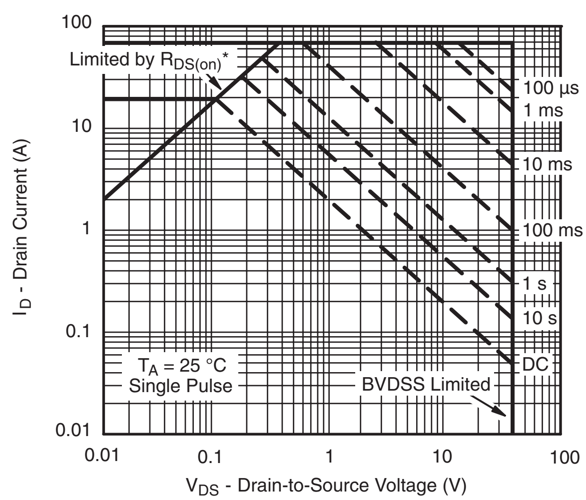
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



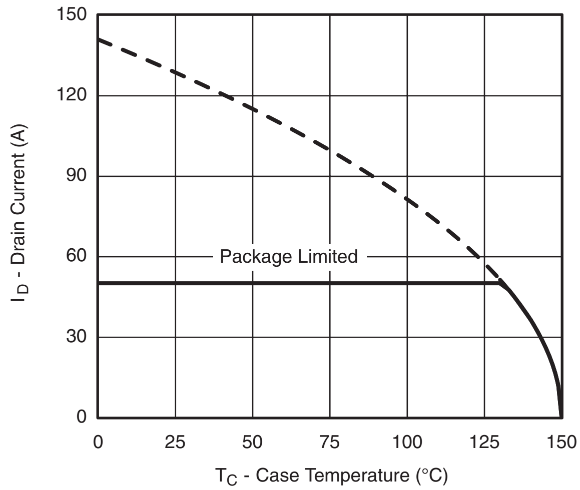
Single Pulse Power, Junction-to-Ambient



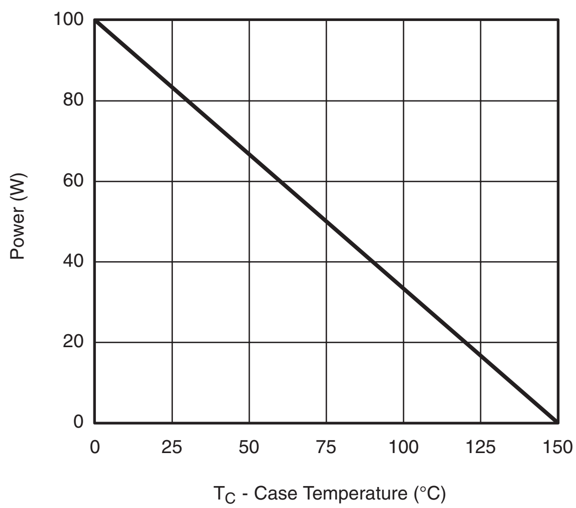
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

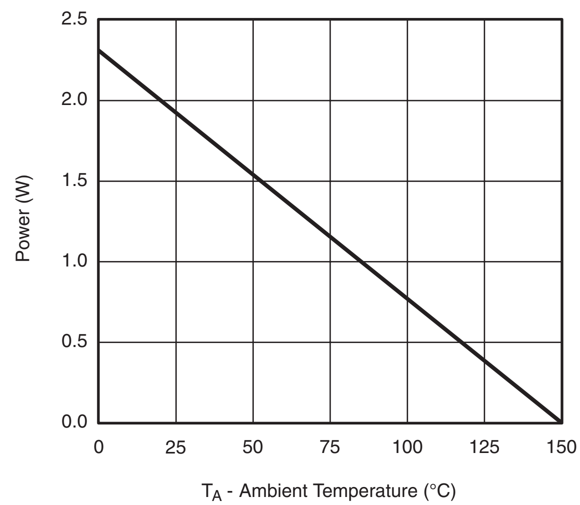
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



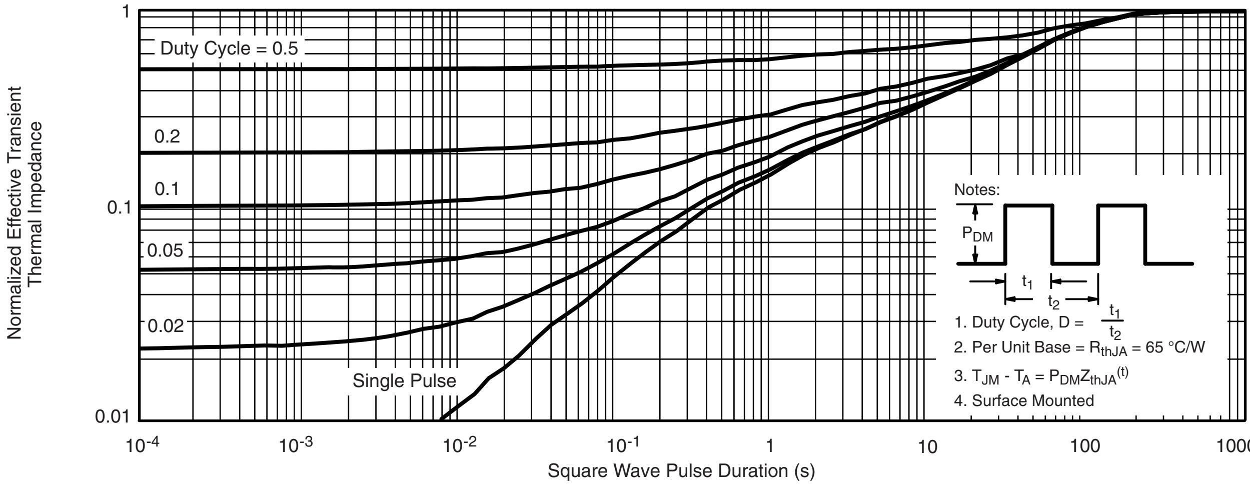
Power, Junction-to-Case



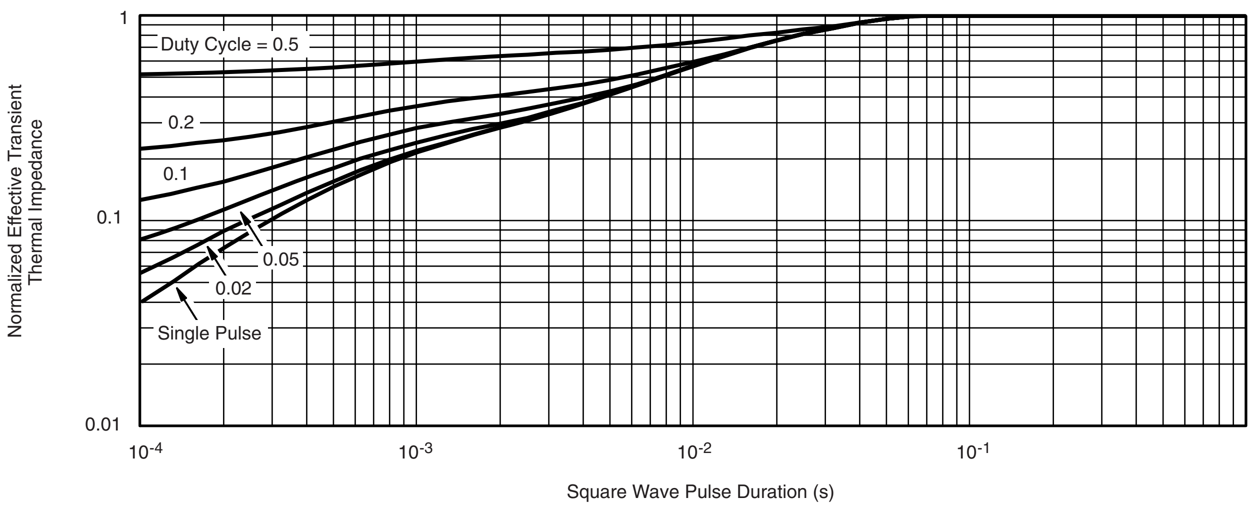
Power, Junction-to-Ambient

* 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

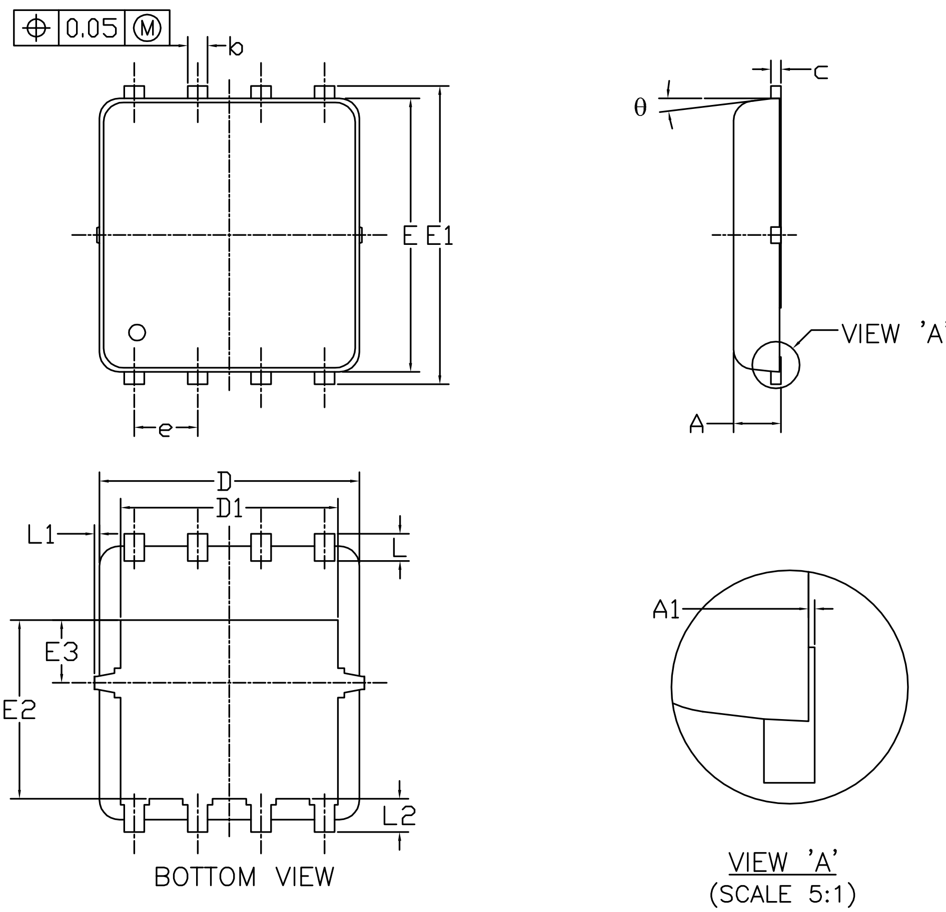


Normalized Thermal Transient Impedance, Junction-to-Ambient

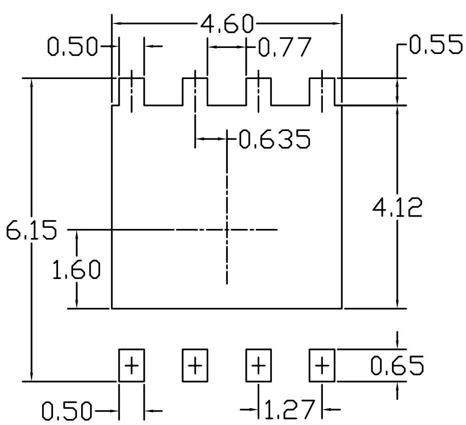


Normalized Thermal Transient Impedance, Junction-to-Case

DFN5x6_8L_EP1_P PACKAGE OUTLIN



RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	0.95	1.00	0.033	0.037	0.039
A1	0.00	---	0.05	0.000	---	0.002
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.15	0.20	0.25	0.006	0.008	0.010
D	5.10	5.20	5.30	0.201	0.205	0.209
D1	4.25	4.35	4.45	0.167	0.171	0.175
E	5.45	5.55	5.65	0.215	0.219	0.222
E1	5.95	6.05	6.15	0.234	0.238	0.242
E2	3.525	3.625	3.725	0.139	0.143	0.147
E3	1.175	1.275	1.375	0.046	0.050	0.054
e	1.27 BSC			0.050 BSC		
L	0.45	0.55	0.65	0.018	0.022	0.026
L1	0	---	0.15	0	---	0.006
L2	0.68 REF			0.027 REF		
θ	0°	---	10°	0°	---	10°

NOTE
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
   MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
2. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

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