

VS3415AC-VB Datasheet

P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
- 20	0.021 at V _{GS} = - 4.5 V	- 12 ^a	23 nC
	0.029 at V _{GS} = - 2.5 V	- 12 ^a	
	0.036 at V _{GS} = - 1.8 V	- 12 ^a	
	0.048 at V _{GS} = - 1.5 V	- 3	

FEATURES

- Trench Power MOSFET
- Thermally Enhanced DFN3X3 Package
- Small Footprint Area
- Low On-Resistance



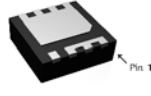
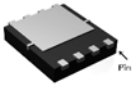
RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load Switch, PA Switch, and Battery Switch for Portable Devices

Pin Description

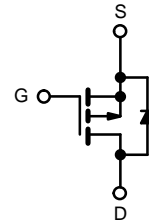
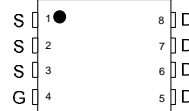
Top View Bottom View Top View Bottom View



DFN3x3-8(punch type)

DFN3x3-8(saw type)

Top View



P-Channel MOSFET

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}	± 12		
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 12 ^a	A
		T _C = 70 °C	- 12 ^a	
		T _A = 25 °C	- 10 ^{b, c}	
		T _A = 70 °C	- 8 ^{b, c}	
Pulsed Drain Current (t = 300 μs)	I _{DM}	- 40		
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	- 12 ^a	
		T _A = 25 °C	- 2.9 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	19	W
		T _C = 70 °C	12	
		T _A = 25 °C	3.5 ^{b, c}	
		T _A = 70 °C	2.2 ^{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 ≤ 5 s	R _{thJA}	28	36	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R _{thJC}	5.3	6.5	

Notes:

a. Package limited.

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

c. t = 5 s.

d. See solder profile The DFN3X3 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.

e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

f. Maximum under steady state conditions is 80 °C/W.

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	- 20			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		- 11		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			2.7		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 0.8		- 1	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = - 12 V, V _{GS} = 0 V			- 1	μA
		V _{DS} = - 12 V, V _{GS} = 0 V, T _J = 55 °C			- 10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≤ - 5 V, V _{GS} = - 4.5 V	- 20			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 4.5 V, I _D = - 6.7 A		0.021		Ω
		V _{GS} = - 2.5 V, I _D = - 6.2 A		0.029		
		V _{GS} = - 1.8 V, I _D = - 2.3 A		0.036		
		V _{GS} = - 1.5 V, I _D = - 1 A		0.048		
Forward Transconductance ^a	g _{fs}	V _{DS} = - 10 V, I _D = - 6.7 A		30		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = - 10 V, V _{GS} = 0 V, f = 1 MHz		1800		pF
Output Capacitance	C _{oss}			450		
Reverse Transfer Capacitance	C _{rss}			390		
Total Gate Charge	Q _g	V _{DS} = - 6 V, V _{GS} = - 8 V, I _D = - 10 A		38	57	nC
Gate-Source Charge	Q _{gs}	V _{DS} = - 6 V, V _{GS} = - 4.5 V, I _D = - 10 A		23	35	
Gate-Drain Charge	Q _{gd}			3		
				6.5		
Gate Resistance	R _g	f = 1 MHz		7		Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 6 V, R _L = 0.75 Ω I _D ≅ - 8 A, V _{GEN} = - 4.5 V, R _g = 1 Ω		20	30	ns
Rise Time	t _r			40	60	
Turn-Off Delay Time	t _{d(off)}			65	100	
Fall Time	t _f			40	60	
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 6 V, R _L = 0.75 Ω I _D ≅ - 8 A, V _{GEN} = - 8 V, R _g = 1 Ω		10	15	
Rise Time	t _r			12	20	
Turn-Off Delay Time	t _{d(off)}			70	105	
Fall Time	t _f			40	60	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			- 12	A
Pulse Diode Forward Current	I _{SM}				40	
Body Diode Voltage	V _{SD}	I _S = - 8 A, V _{GS} = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 8 A, di/dt = 100 A/μs, T _J = 25 °C		40	60	ns
Body Diode Reverse Recovery Charge	Q _{rr}			20	30	nC
Reverse Recovery Fall Time	t _a			14		ns
Reverse Recovery Rise Time	t _b			26		

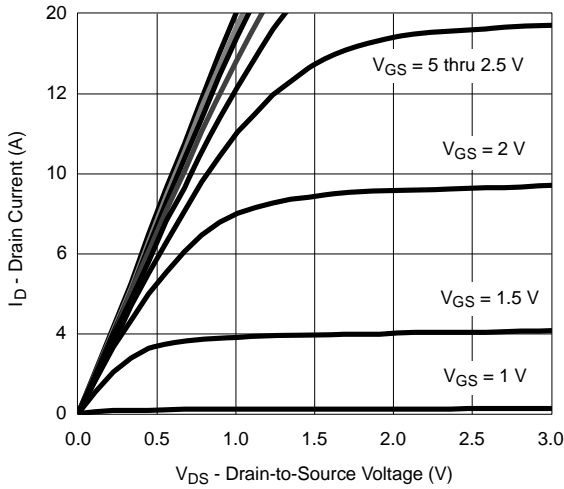
Notes:

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

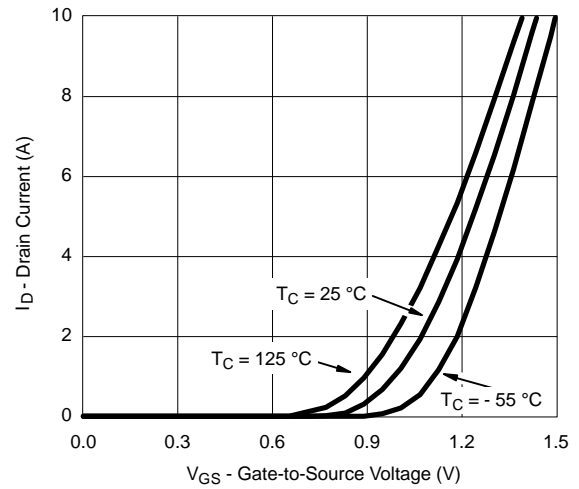
b. Guaranteed by design, not subject to production testing.

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.

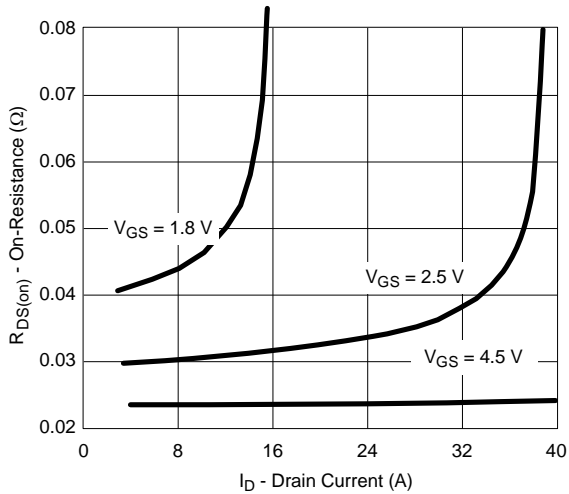
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



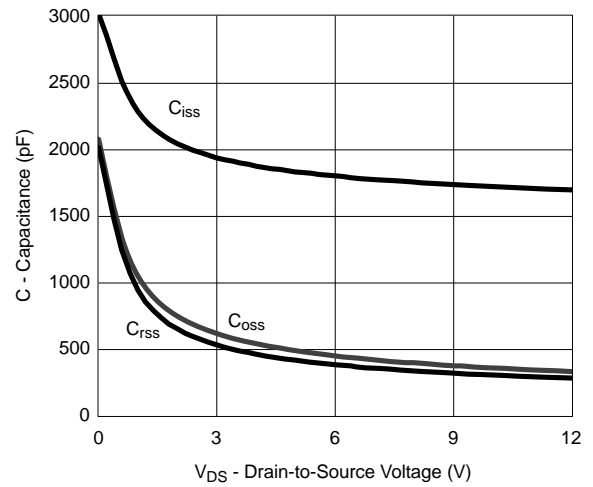
Output Characteristics



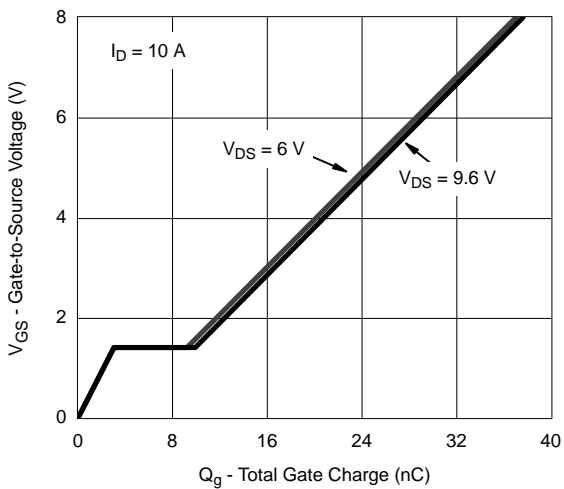
Transfer Characteristics



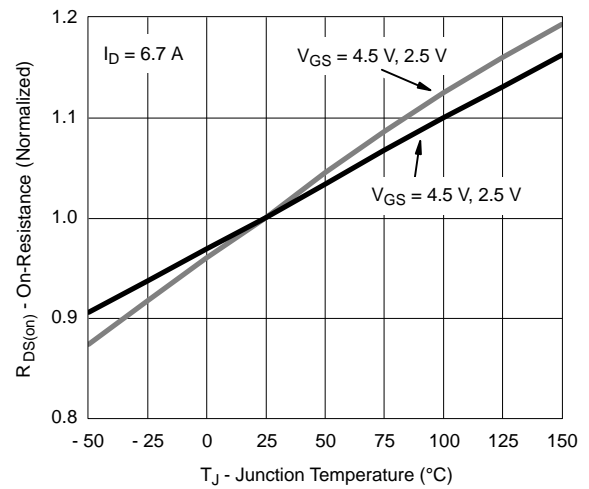
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

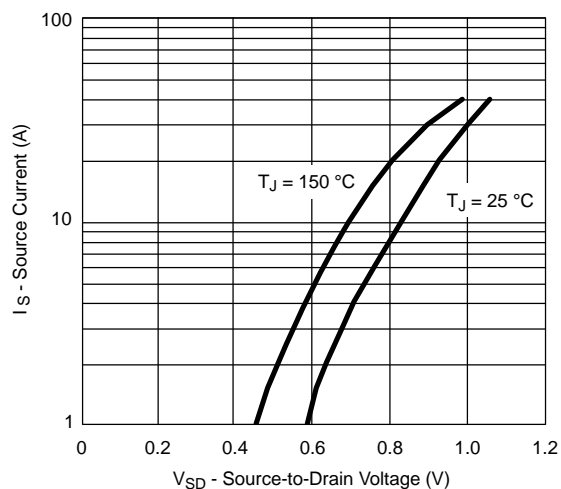


Gate Charge

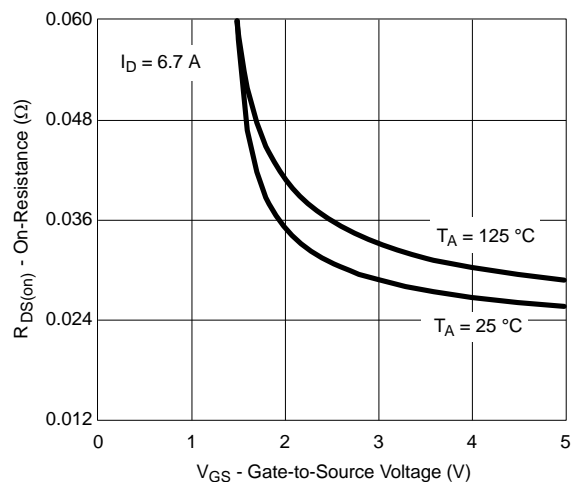


On-Resistance vs. Junction Temperature

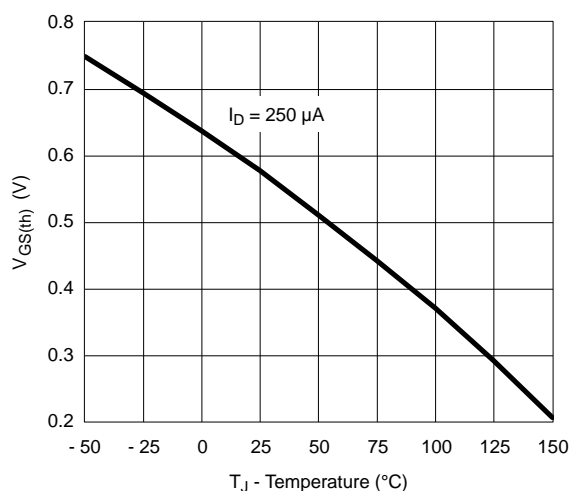
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



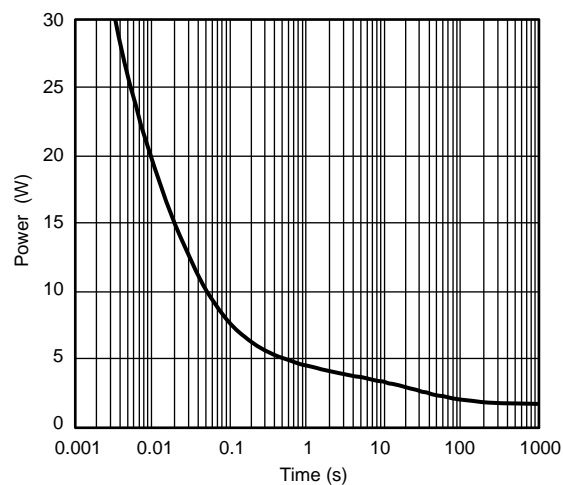
Source-Drain Diode Forward Voltage



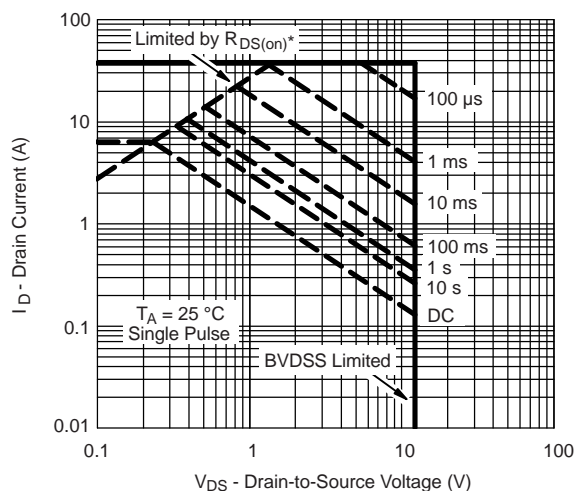
On-Resistance vs. Gate-to-Source Voltage



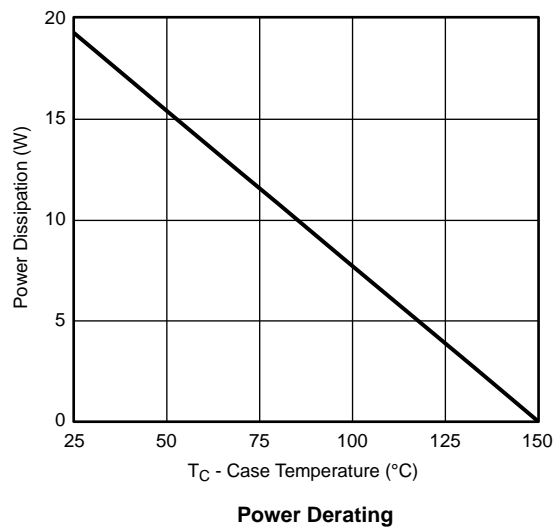
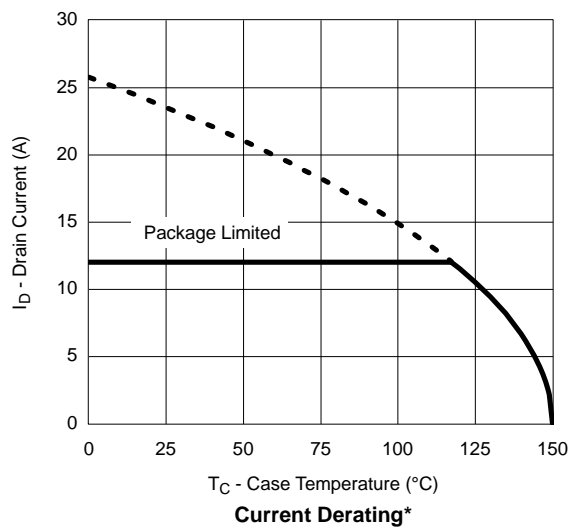
Threshold Voltage



Single Pulse Power, Junction-to-Ambient

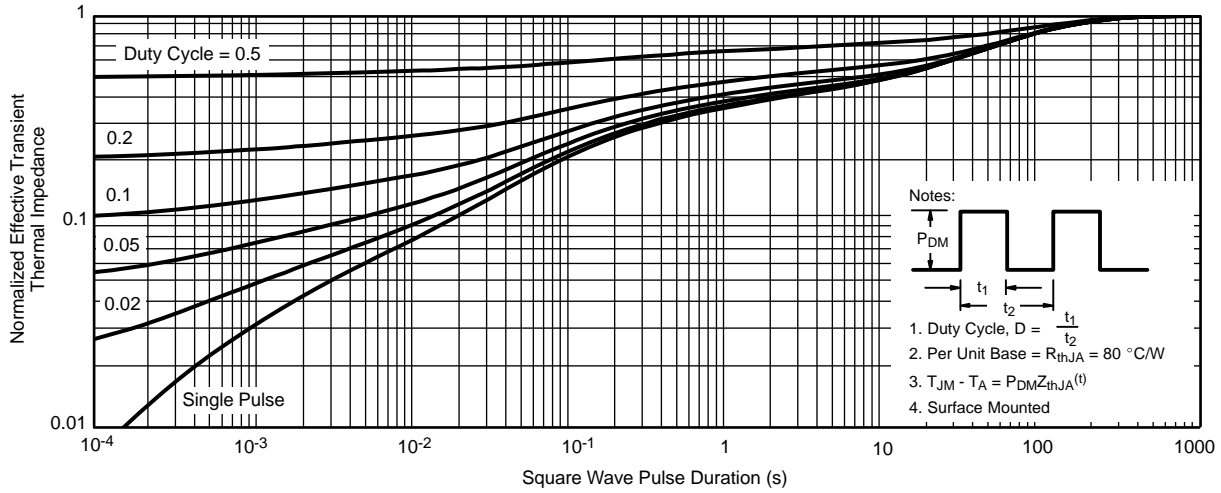


Safe Operating Area, Junction-to-Ambient

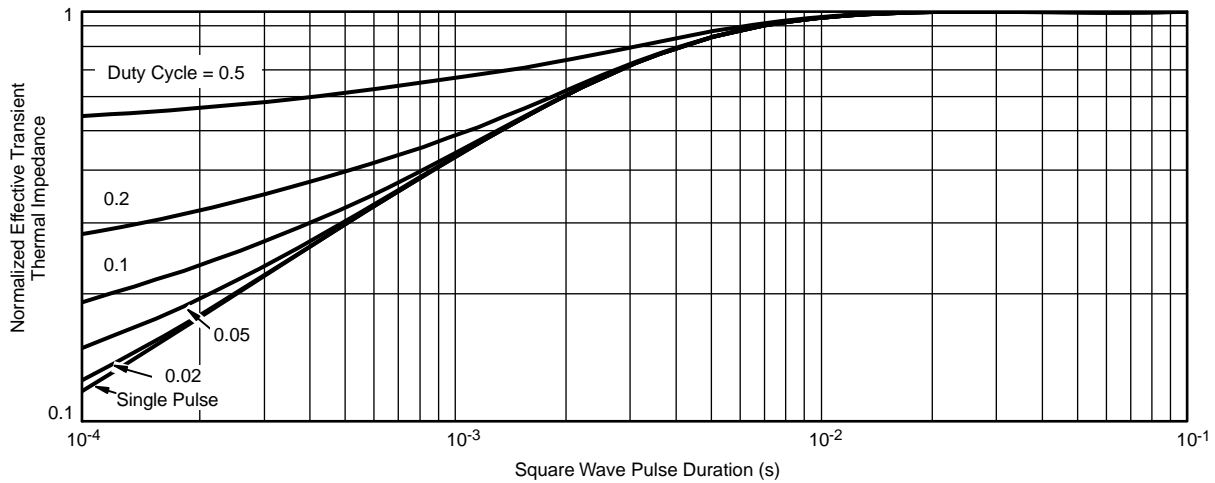
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

* 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)

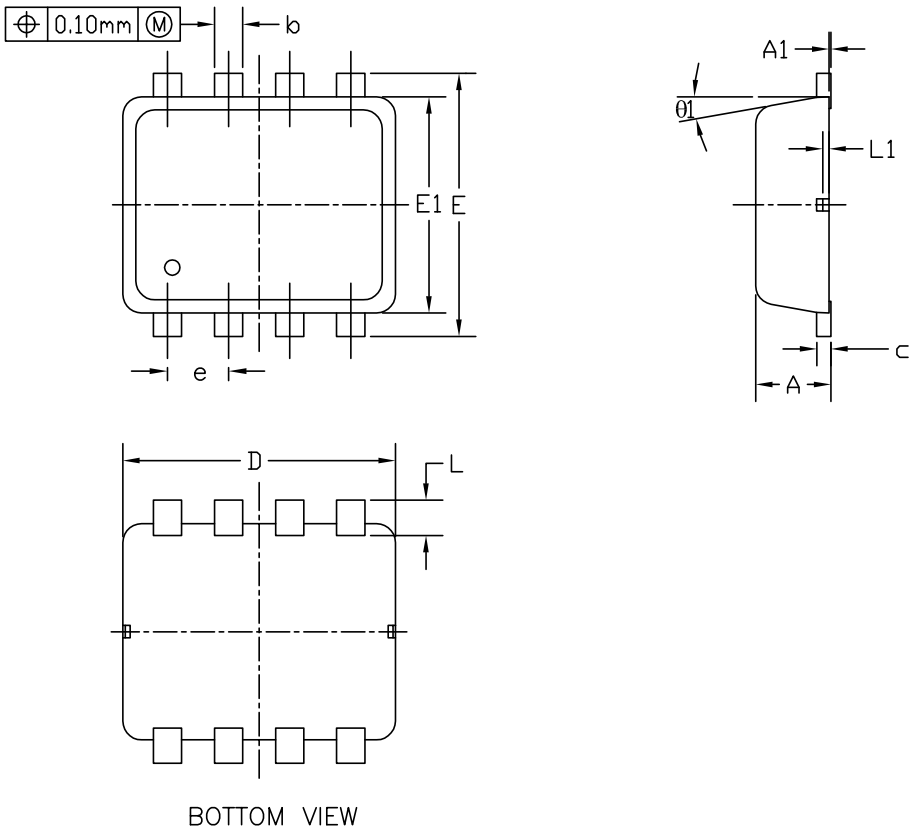


Normalized Thermal Transient Impedance, Junction-to-Ambient



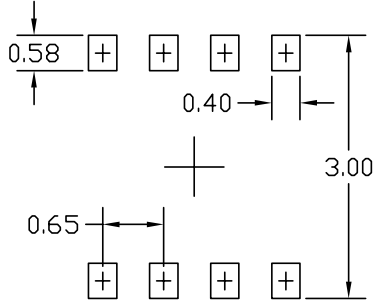
Normalized Thermal Transient Impedance, Junction-to-Case

DFN3x3A_8L_NEP_P PACKAGE OUTLINE



BOTTOM VIEW

RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.80	0.90	0.028	0.031	0.035
A1	0.00	—	0.05	0.000	—	0.002
b	0.24	0.30	0.35	0.009	0.012	0.014
c	0.08	0.15	0.25	0.003	0.006	0.010
D	2.80	2.90	3.00	0.110	0.114	0.118
E	2.70	2.80	2.90	0.106	0.110	0.114
E1	2.20	2.30	2.40	0.0087	0.091	0.095
e	0.65 BSC			0.026 BSC		
L	0.20	0.38	0.45	0.008	0.015	0.018
L1	0.05	—	0.10	0.002	—	0.004
θ1	0°	10°	12°	0°	10°	12°

NOTE

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

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