

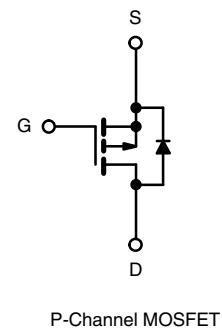
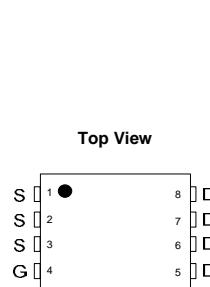
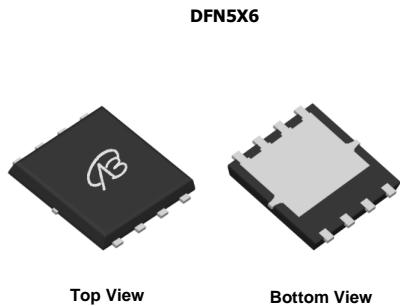
VBQA2403 Datasheet

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

PRODUCT SUMMARY			
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
- 40	0.003 at $V_{GS} = - 10$ V	- 150	205 nC

FEATURES

- TrenchFET® Power 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 ($T_J = 175$ °C)	I_D	- 150		
		- 120 ^a		
		39 ^{b, c}		A
		33 ^{b, c}		
Pulsed Drain Current	I_{DM}	450		
Continuous Source-Drain Diode Current	I_S	110		
		10 ^{b, c}		mJ
Avalanche Current	I_{AS}	75		
Single-Pulse Avalanche Energy	E_{AS}	281		
		425		
Maximum Power Dissipation	P_D	282		W
		15 ^{b, c}		
		10.5 ^{b, c}		
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175		
Soldering Recommendations (Peak Temperature) ^{d, e}		260		

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	8	10	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	0.33	0.4	

Notes:

a. Package limited.

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

c. $t = 10$ s.

d. Maximum under Steady State conditions is 40 °C/W.

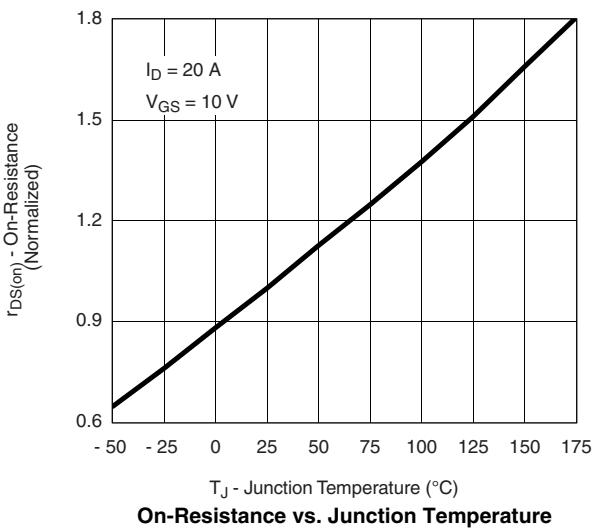
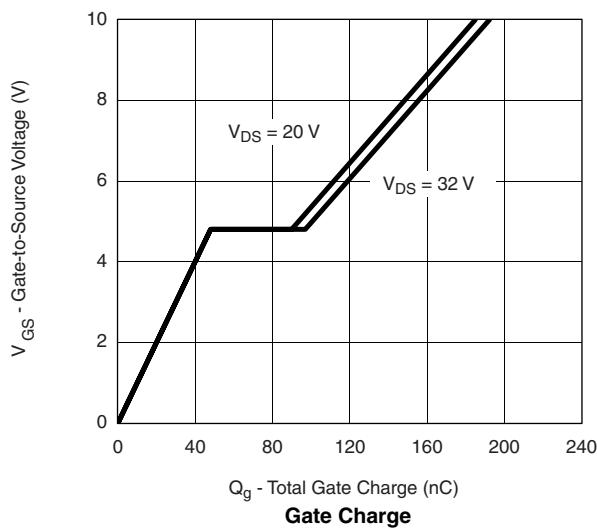
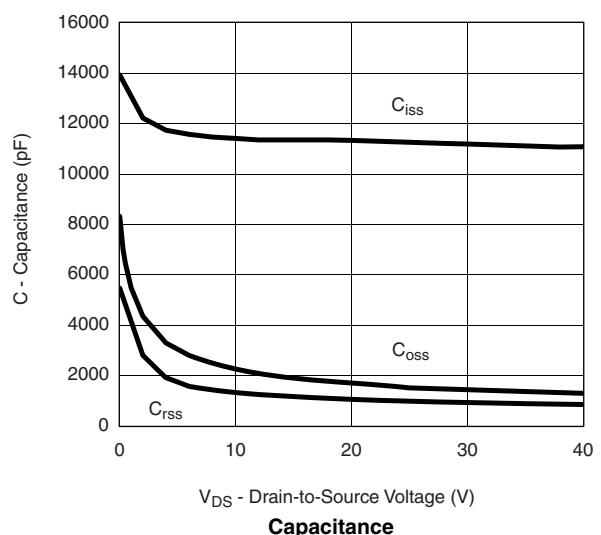
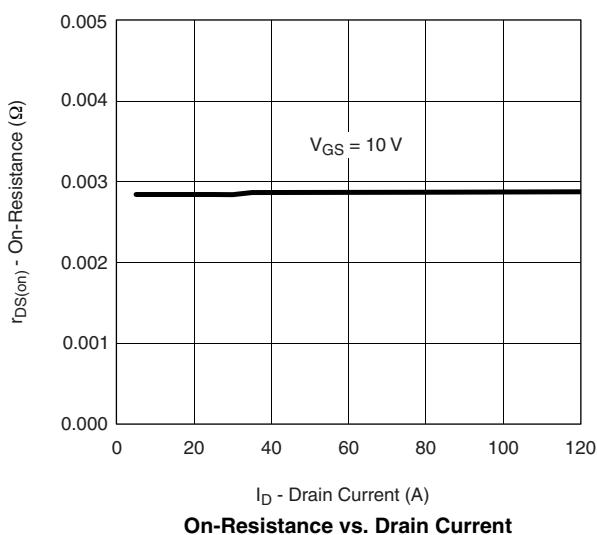
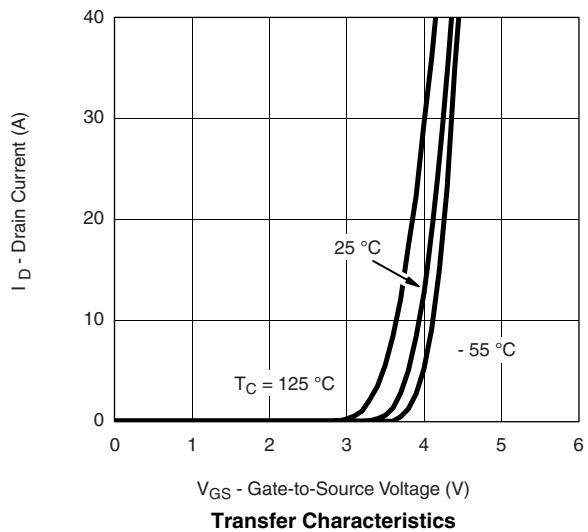
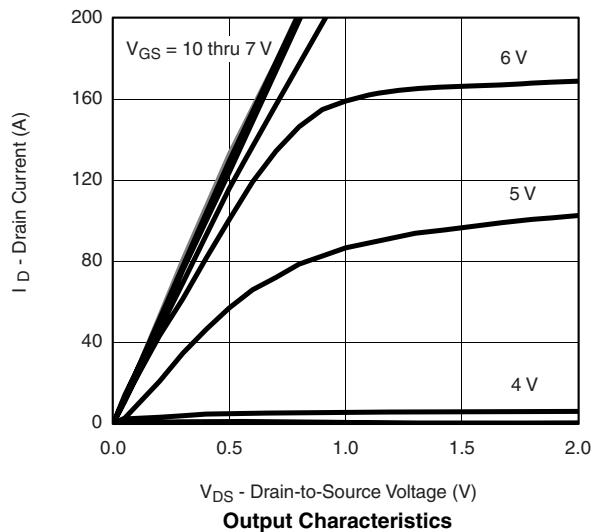
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted

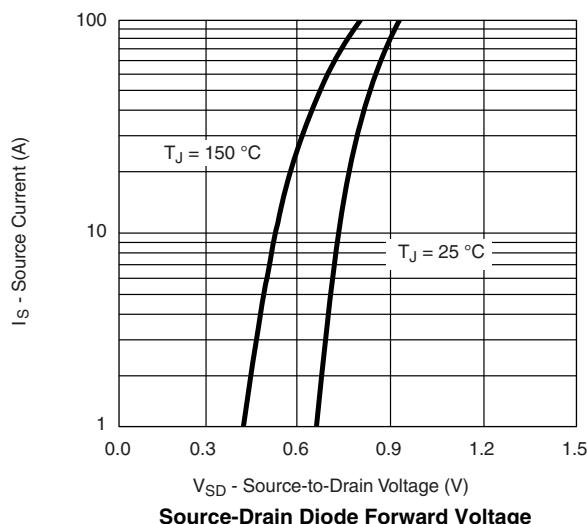
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = -250 \mu\text{A}$	- 40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250 \mu\text{A}$		- 40		$\text{mV}/^\circ\text{C}$
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			- 5.5		
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = -250 \mu\text{A}$	- 2	- 3	- 4	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}	$V_{DS} = -40 \text{ V}$, $V_{GS} = 0 \text{ V}$			- 1	μA
		$V_{DS} = -40 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 55^\circ\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(\text{on})}$	$V_{DS} \geq 5 \text{ V}$, $V_{GS} = -10 \text{ V}$	- 120			A
Drain-Source On-State Resistance ^a	$r_{DS(\text{on})}$	$V_{GS} = -10 \text{ V}$, $I_D = -20 \text{ A}$		0.003		Ω
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15 \text{ V}$, $I_D = -20 \text{ A}$		75		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -25 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$		8900		pF
Output Capacitance	C_{oss}			1610		
Reverse Transfer Capacitance	C_{rss}			1100		
Total Gate Charge	Q_g	$V_{DS} = -20 \text{ V}$, $V_{GS} = -10 \text{ V}$, $I_D = -110 \text{ A}$		205	315	nC
Gate-Source Charge	Q_{gs}			58		
Gate-Drain Charge	Q_{gd}			52		
Gate Resistance	R_g		$f = 1 \text{ MHz}$	4.0		Ω
Turn-On Delay Time	$t_{d(\text{on})}$	$V_{DD} = -20 \text{ V}$, $R_L = 0.18 \Omega$ $I_D \equiv -110 \text{ A}$, $V_{GEN} = -10 \text{ V}$, $R_g = 1 \Omega$		25	40	ns
Rise Time	t_r			290	440	
Turn-Off Delay Time	$t_{d(\text{off})}$			60	80	
Fall Time	t_f			35	55	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$			- 150	A
Pulse Diode Forward Current ^a	I_{SM}				- 450	
Body Diode Voltage	V_{SD}	$I_S = -20 \text{ A}$		- 0.8	- 1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -20 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$		20	60	ns
Body Diode Reverse Recovery Charge	Q_{rr}			130	200	
Reverse Recovery Fall Time	t_a			37		ns
Reverse Recovery Rise Time	t_b			33		

Notes:

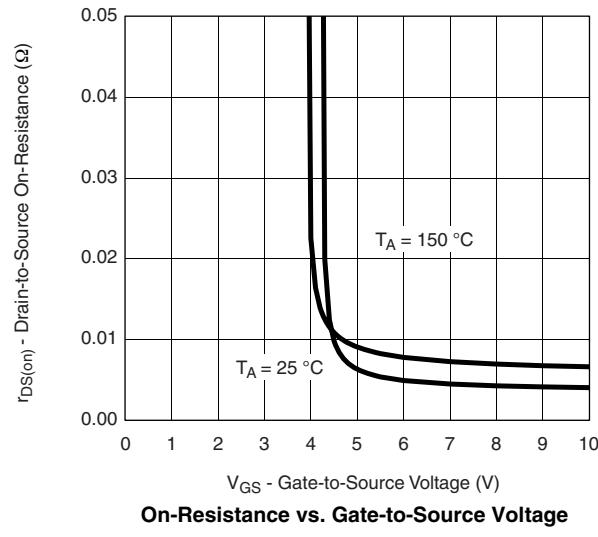
- a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

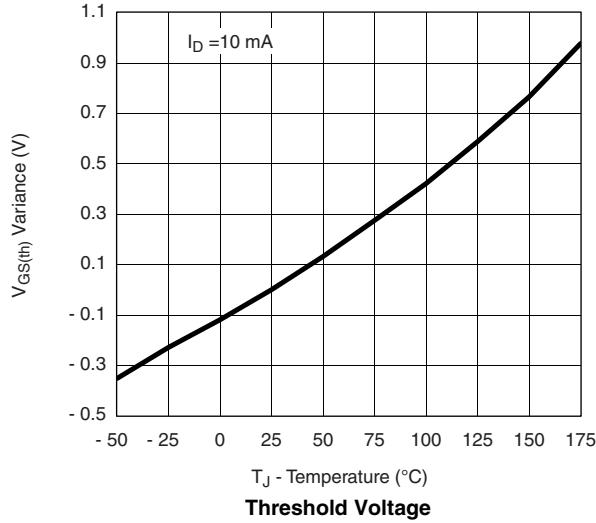
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


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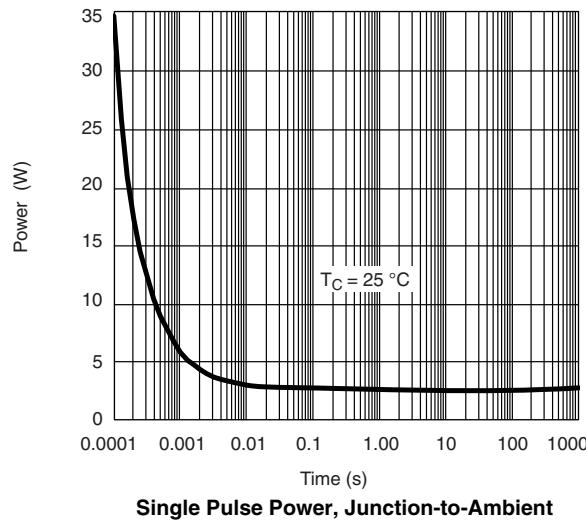
Source-Drain Diode Forward Voltage



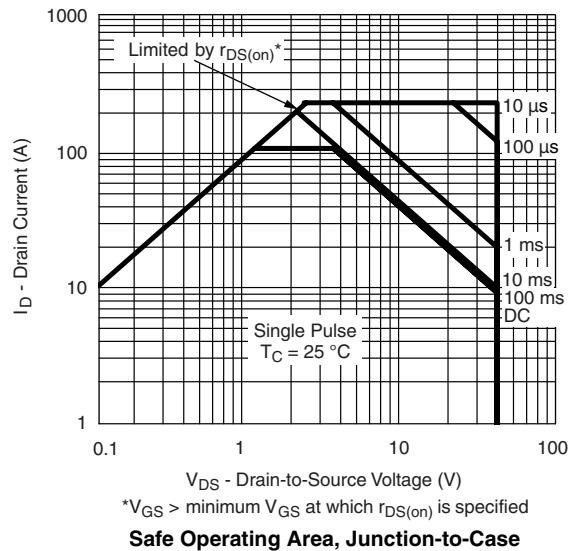
On-Resistance vs. Gate-to-Source Voltage



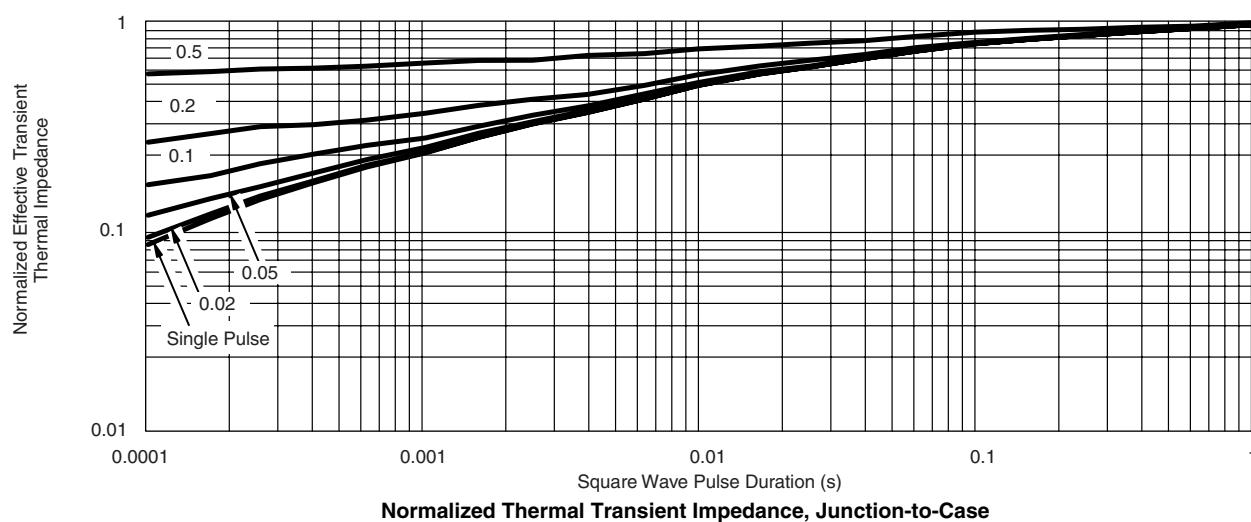
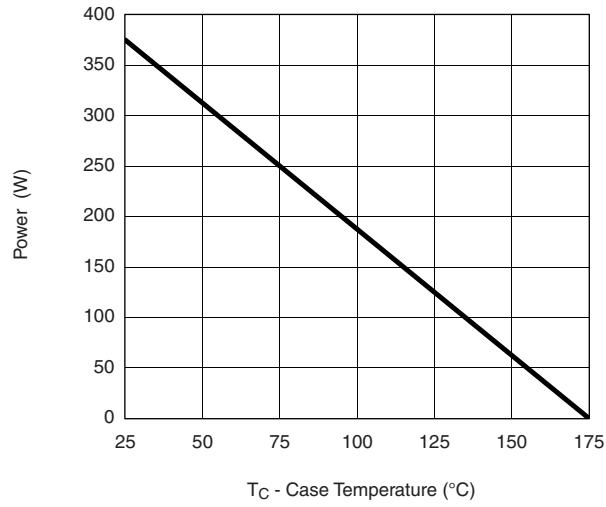
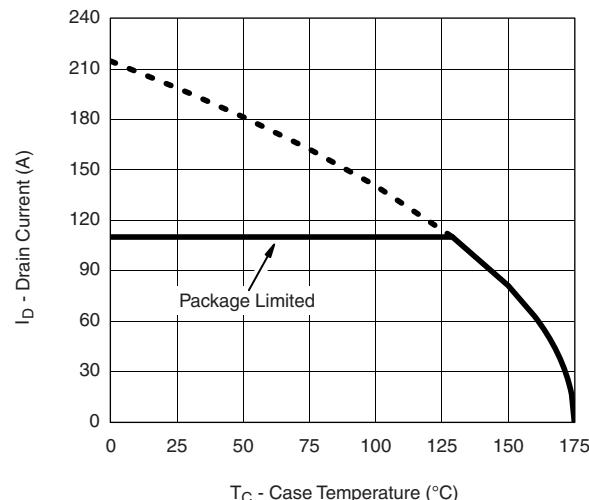
Threshold Voltage



Single Pulse Power, Junction-to-Ambient

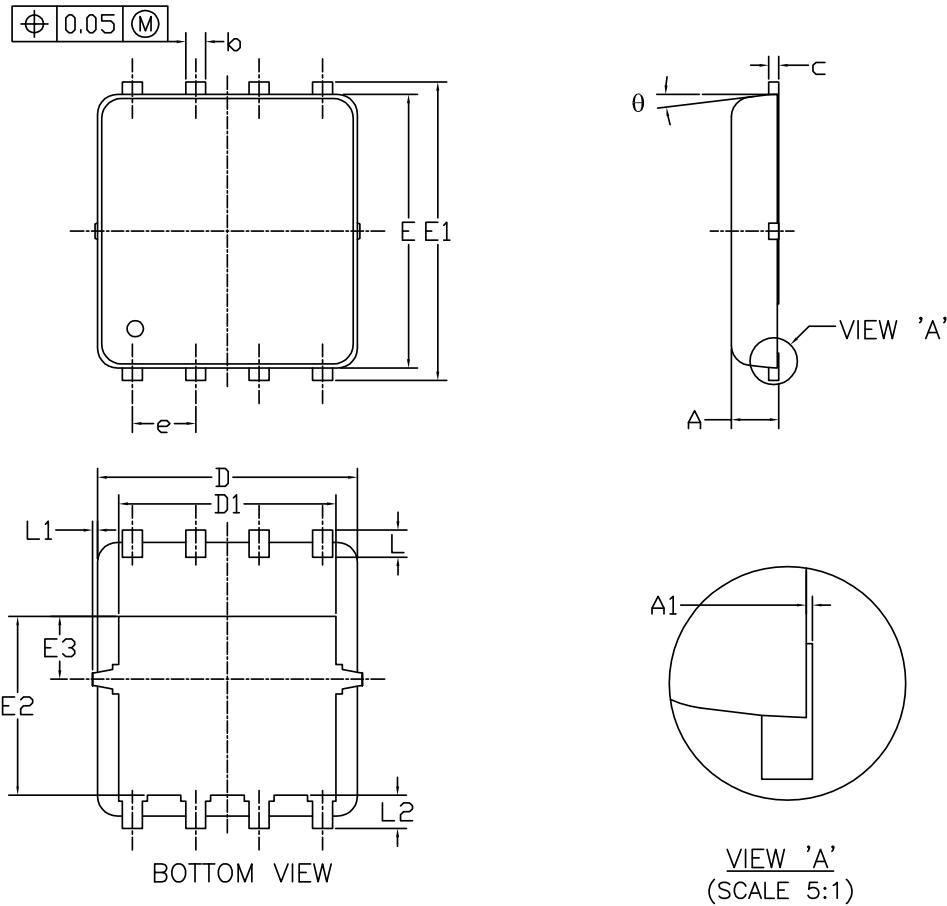


* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Case

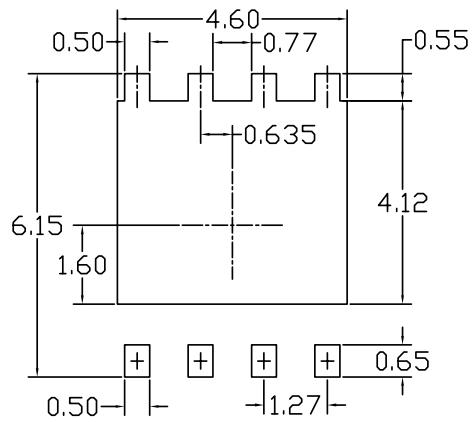
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


* The power dissipation P_D is based on $T_{J(\max)} = 175$ °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.

DFN5x6_8L_EP1_P PACKAGE OUTLINE



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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