

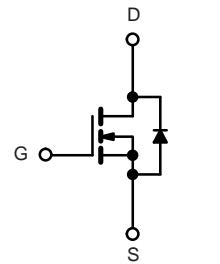
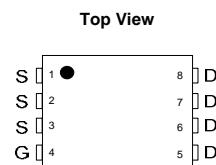
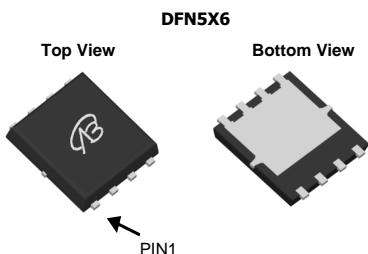
# VBGQA1602 Datasheet

## N-Channel 60V (D-S) MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>
60	0.002 at $V_{GS} = 10$ V	180
	0.003 at $V_{GS} = 4.5$ V	170

**FEATURES**

- 150 °C Junction Temperature
- SGT technology Power MOSFET
- Material categorization:



N-Channel MOSFET

**ABSOLUTE MAXIMUM RATINGS** ( $T_C = 25$  °C, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_J = 150$ °C) <sup>b</sup>	$I_D$	180	
		110 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	540	A
Continuous Source Current (Diode Conduction)	$I_S$	88 <sup>a</sup>	
Avalanche Current	$I_{AS}$	78	
Single Avalanche Energy (Duty Cycle $\leq 1$ %)	$E_{AS}$	130	mJ
Maximum Power Dissipation	$P_D$	136	W
		3 <sup>b</sup> , 8.3 <sup>b, c</sup>	
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 <sup>a</sup>	$R_{thJA}$	15	18	°C/W
		40	50	
Maximum Junction-to-Case	$R_{thJC}$	0.85	1.1	

Notes:

- a. Package limited.
- b. Surface mounted on 1" x 1" FR4 board.
- c.  $t \leq 10$  s.

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

Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	60			V
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	1	2	3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 20 \text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0 \text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$			50	
		$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 150^\circ\text{C}$			250	
On-State Drain Current <sup>b</sup>	$I_{D(\text{on})}$	$V_{DS} = 5 \text{ V}$ , $V_{GS} = 10 \text{ V}$	60			A
Drain-Source On-State Resistance <sup>b</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$		0.002		$\Omega$
		$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$ , $T_J = 125^\circ\text{C}$		0.008		
		$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$ , $T_J = 150^\circ\text{C}$		0.010		
		$V_{GS} = 4.5 \text{ V}$ , $I_D = 60 \text{ A}$		0.003		
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 20 \text{ A}$		60		S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 60 \text{ V}$ , $f = 1 \text{ MHz}$		9800		pF
Output Capacitance	$C_{oss}$			470		
Reverse Transfer Capacitance	$C_{rss}$			225		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 60 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 50 \text{ A}$		100	70	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			19		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			13		
Turn-On Delay Time <sup>c</sup>	$t_{d(\text{on})}$	$V_{DD} = 60 \text{ V}$ , $R_L = 0.6 \Omega$ $I_D \geq 50 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 2.5 \Omega$		15	25	ns
Rise Time <sup>c</sup>	$t_r$			15	25	
Turn-Off Delay Time <sup>c</sup>	$t_{d(\text{off})}$			15	30	
Fall Time <sup>c</sup>	$t_f$			13	20	
<b>Source-Drain Diode Ratings and Characteristics</b> ( $T_C = 25^\circ\text{C}$ )						
Pulsed Current	$I_{SM}$				540	A
Diode Forward Voltage	$V_{SD}$	$I_F = 20 \text{ A}$ , $V_{GS} = 0 \text{ V}$		1	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 20 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$		15	25	ns

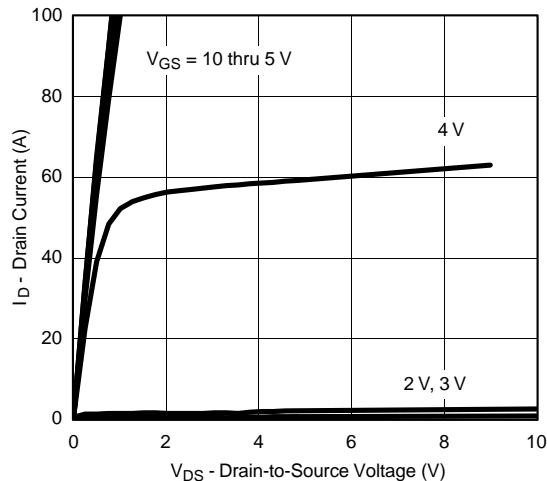
Notes:

a. For design aid only; not subject to production testing.

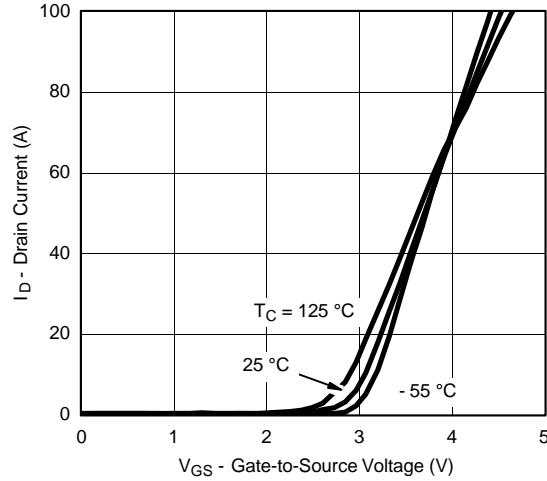
b. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

c. Independent of operating temperature.

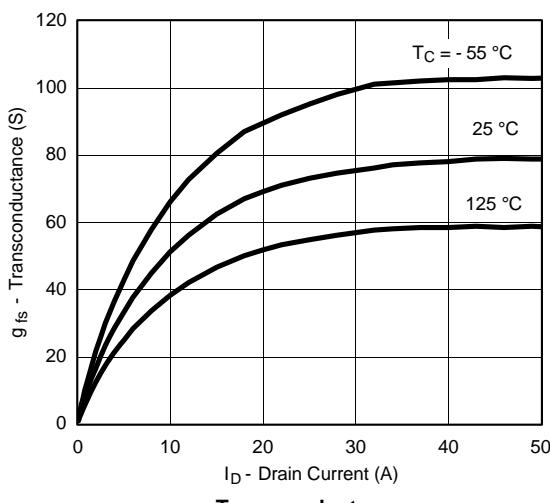
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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


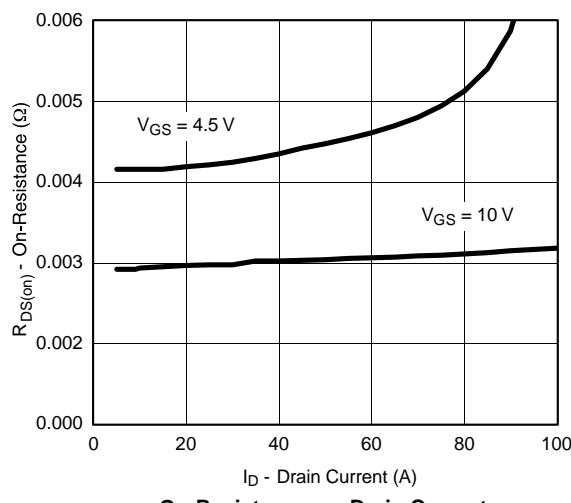
Output Characteristics



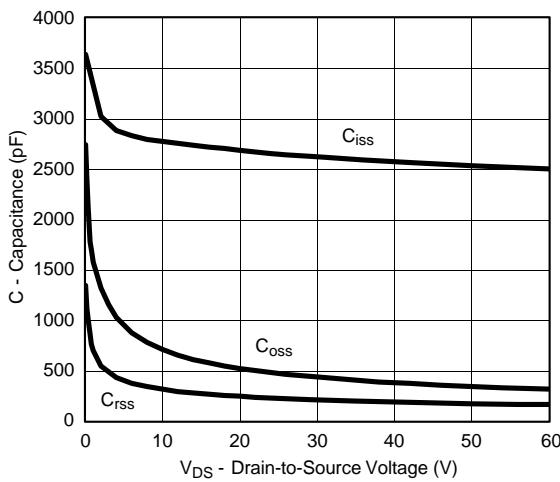
Transfer Characteristics



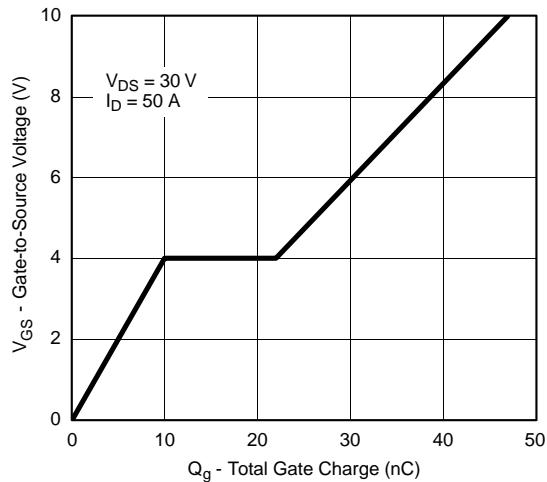
Transconductance



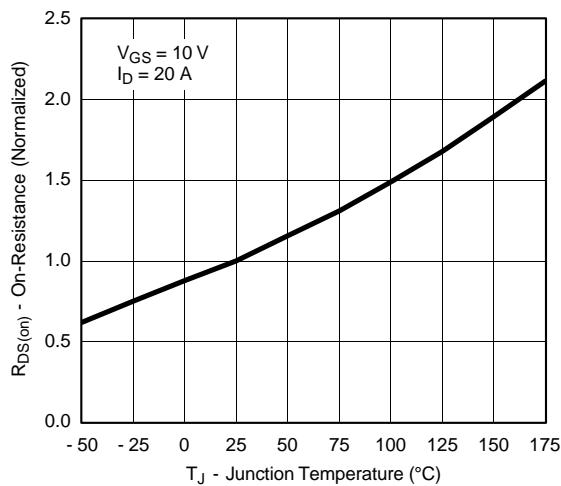
On-Resistance vs. Drain Current



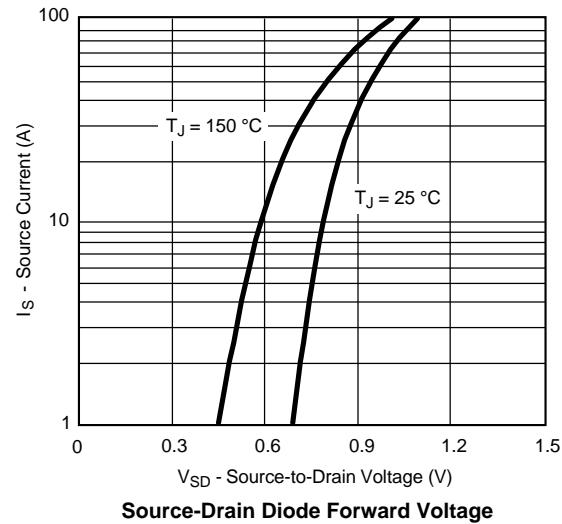
Capacitance



Gate Charge

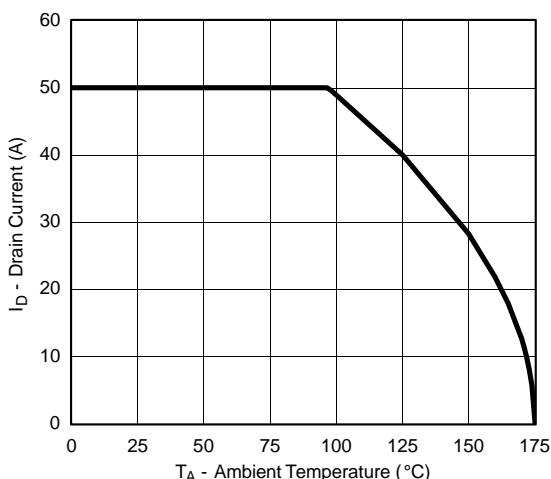
**TYPICAL CHARACTERISTICS** (25 °C unless noted)

On-Resistance vs. Junction Temperature

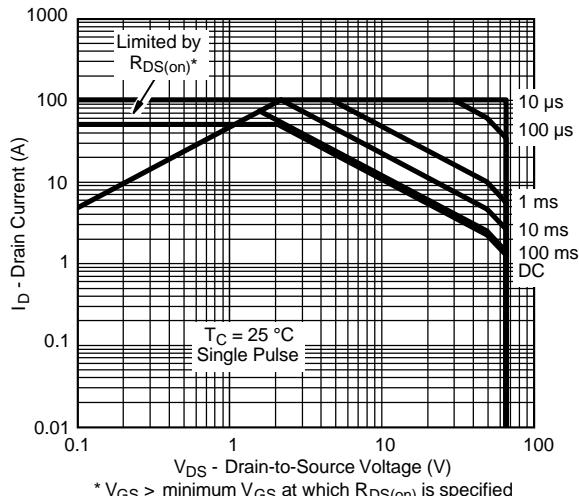


Source-Drain Diode Forward Voltage

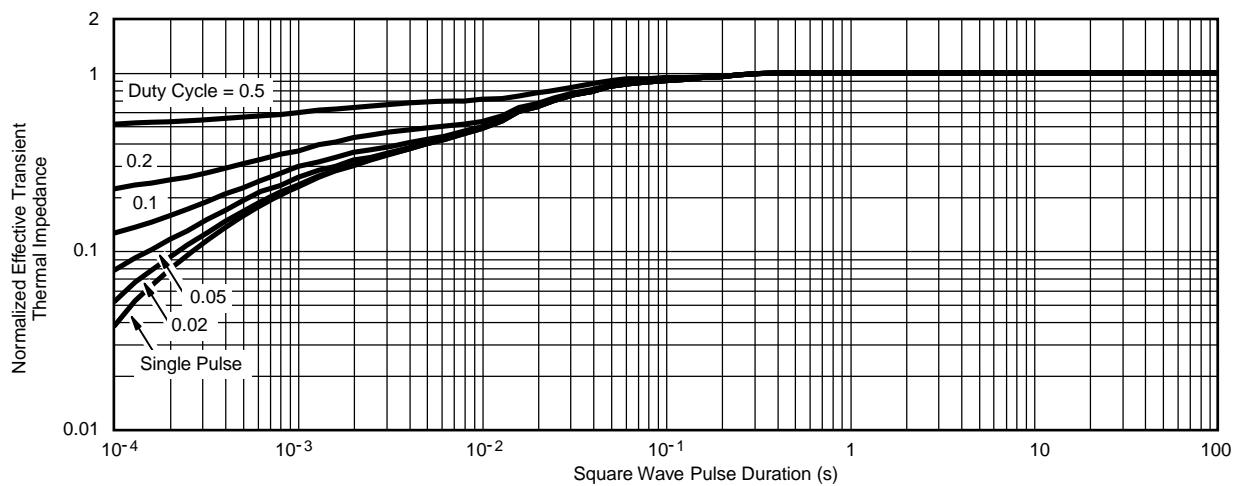
## THERMAL RATINGS



Maximum Drain Current vs. Ambient Temperature

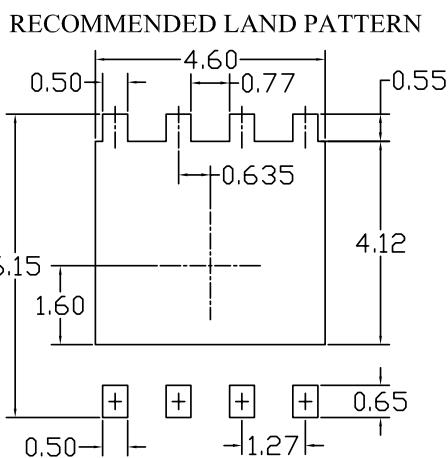
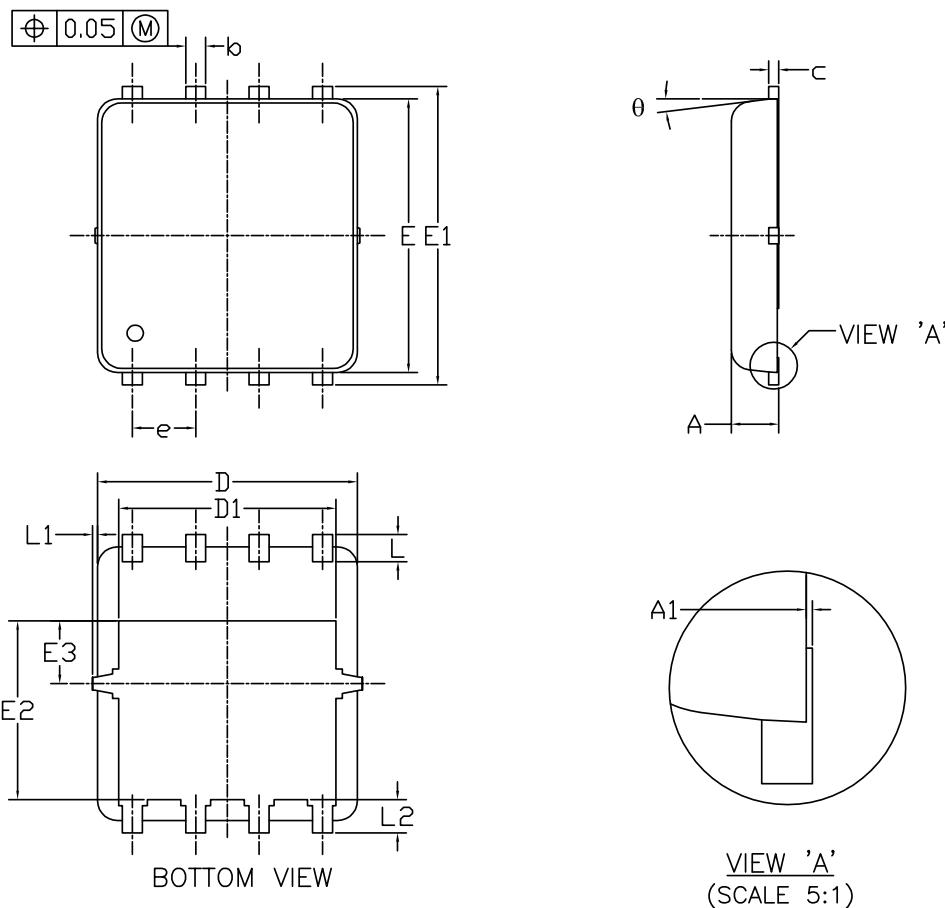


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

## DFN5x6\_8L\_EP1\_P PACKAGE OUTLIN



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°

UNIT: mm

## 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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