

## SQM40031EL\_GE3-VB Datasheet

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

PRODUCT SUMMARY	
$V_{DS}$ (V)	- 40
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -10$ V	0.006
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.007
$I_D$ (A)	-80
Configuration	Single

#### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- SGT technology Power MOSFET
- Package with Low Thermal Resistance
- 100 %  $R_g$  and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

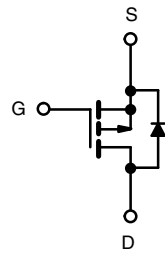


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

TO-263



Top View



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		$V_{DS}$	- 40	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current	$T_C = 25^\circ\text{C}$	$I_D$	-80	A
	$T_C = 125^\circ\text{C}$		-50	
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	-70	
Pulsed Drain Current <sup>b</sup>		$I_{DM}$	-240	
Single Pulse Avalanche Current	L = 0.1 mH	$I_{AS}$	-70	
Single Pulse Avalanche Energy		$E_{AS}$	1345	mJ
Maximum Power Dissipation <sup>b</sup>	$T_C = 25^\circ\text{C}$	$P_D$	250	W
	$T_C = 125^\circ\text{C}$		100	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to + 175	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient	PCB Mount <sup>c</sup>	$R_{thJA}$	50	$^\circ\text{C}/\text{W}$
Junction-to-Case (Drain)		$R_{thJC}$	0.6	

#### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .
- When mounted on 1" square PCB (FR-4 material).
- Parametric verification ongoing.

SPECIFICATIONS (T <sub>C</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA		- 40	-	-	V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA		- 1.0	-	-3.0	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 40 V	-	-	- 1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 40 V, T <sub>J</sub> = 125 °C	-	-	- 50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 40 V, T <sub>J</sub> = 175 °C	-	-	- 250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = - 10 V	V <sub>DS</sub> ≤ - 5 V	- 30	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 20 A	-	0.006	-	Ω
		V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 20 A, T <sub>J</sub> = 125 °C	-	0.006	-	
		V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 20 A, T <sub>J</sub> = 175 °C	-	0.011	-	
		V <sub>GS</sub> = - 4.5 V	I <sub>D</sub> = -20 A	-	0.005	-	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = - 15 V, I <sub>D</sub> = -20 A		-	35	-	S
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 25 V, f = 1 MHz	-	8000	-	pF
Output Capacitance	C <sub>oss</sub>			-	301	-	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	208	-	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = - 10 V	V <sub>DS</sub> = - 50V, I <sub>D</sub> = - 9.2 A	-	96	144	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			-	8.4	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	23.5	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.5	3.13	4.7	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = - 50 V, R <sub>L</sub> = 6.49 Ω I <sub>D</sub> ≅ - 7.7 A, V <sub>GEN</sub> = - 10 V, R <sub>g</sub> = 1.0 Ω		-	11	17	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			-	11	17	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	78	117	
Fall Time <sup>c</sup>	t <sub>f</sub>			-	15	23	
Source-Drain Diode Ratings and Characteristics <sup>b</sup>							
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	- 240	A
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> = - 7.7 A, V <sub>GS</sub> = 0 V		-	- 0.8	- 1.5	V

**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.  
 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 Electrical and Thermal Characteristics

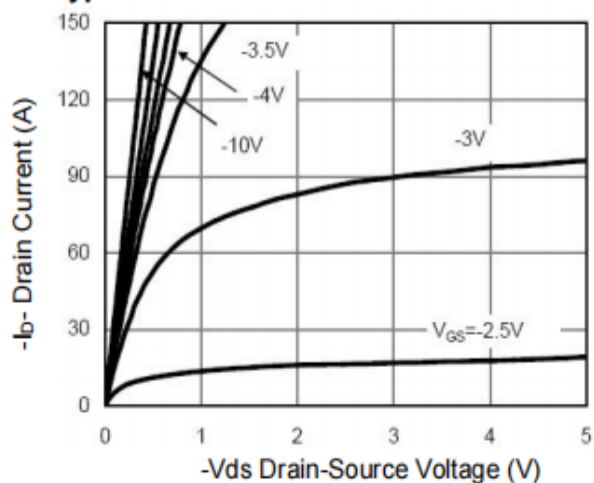


Figure 1 Output Characteristics

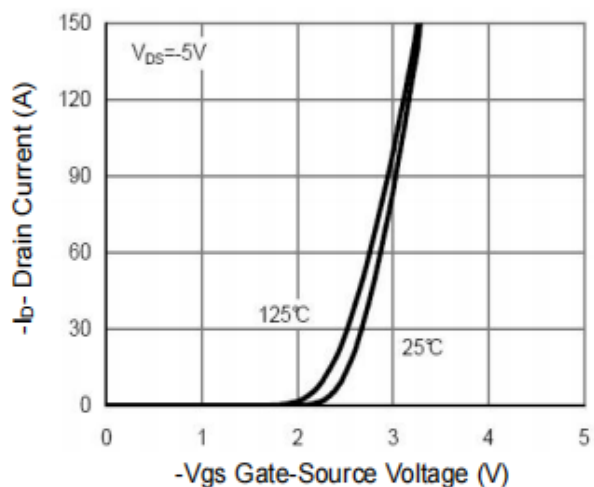


Figure 2 Transfer Characteristics

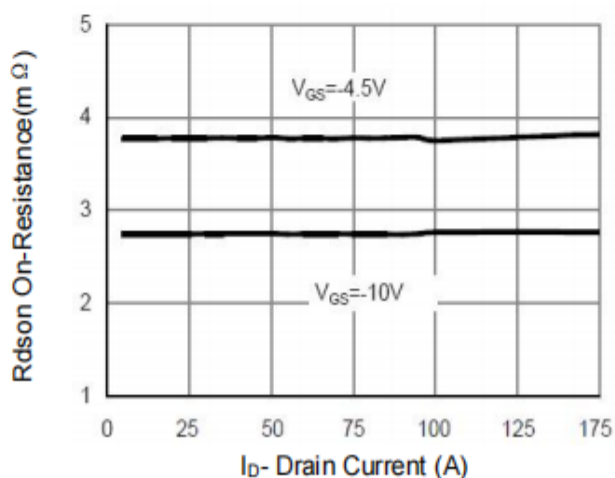


Figure 3 Rdson- Drain Current

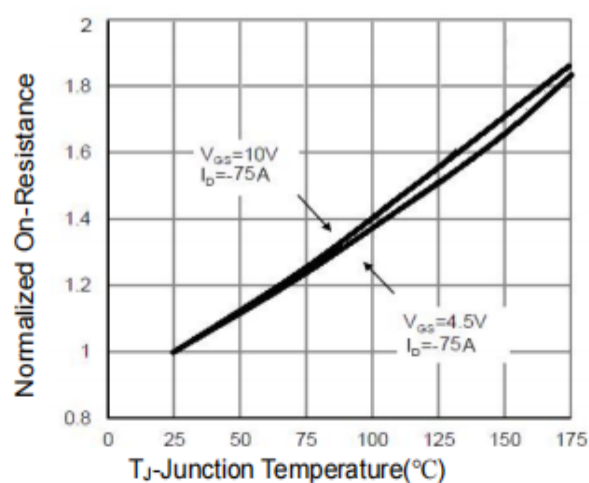


Figure 4 Rdson-Junction Temperature

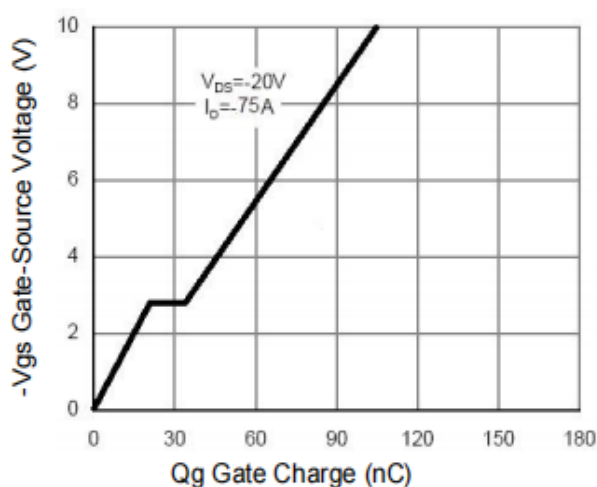


Figure 5 Gate Charge

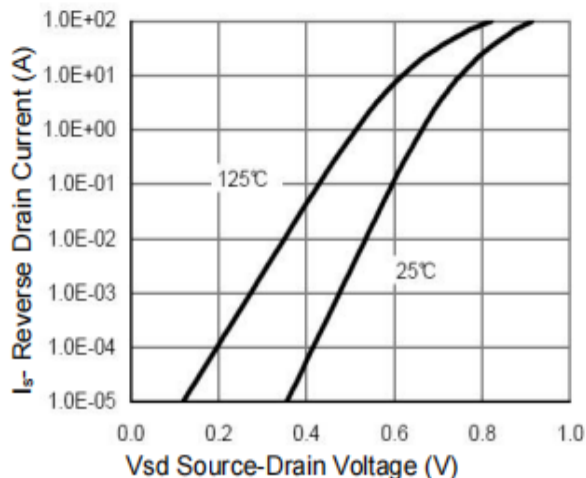


Figure 6 Source- Drain Diode Forward

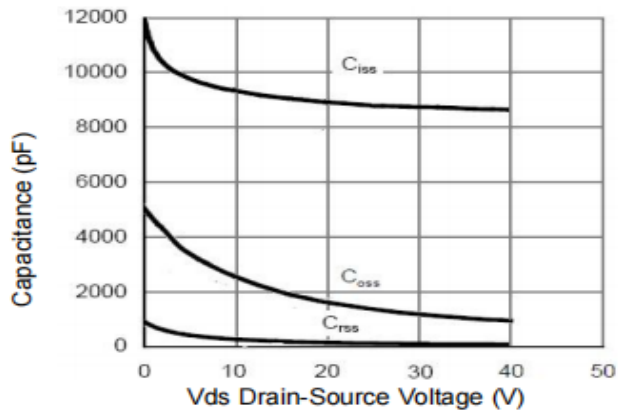


Figure 7 Capacitance vs Vds

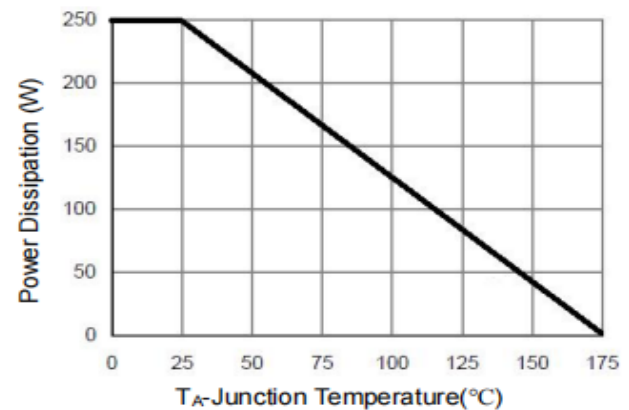


Figure 9 Power De-rating

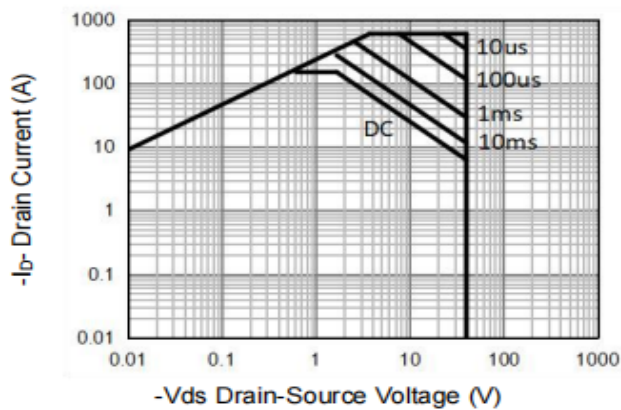


Figure 8 Safe Operation Area (Note 3)

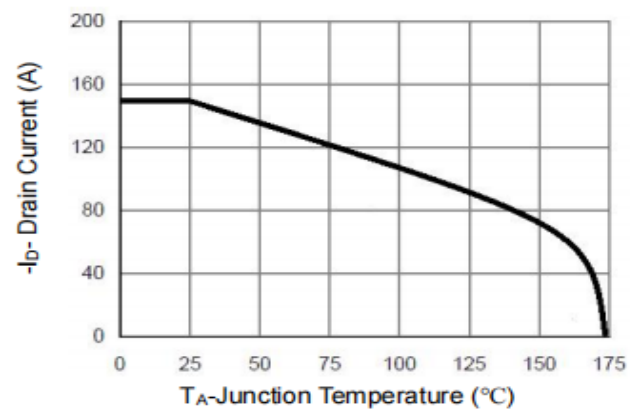


Figure 10 Current De-rating

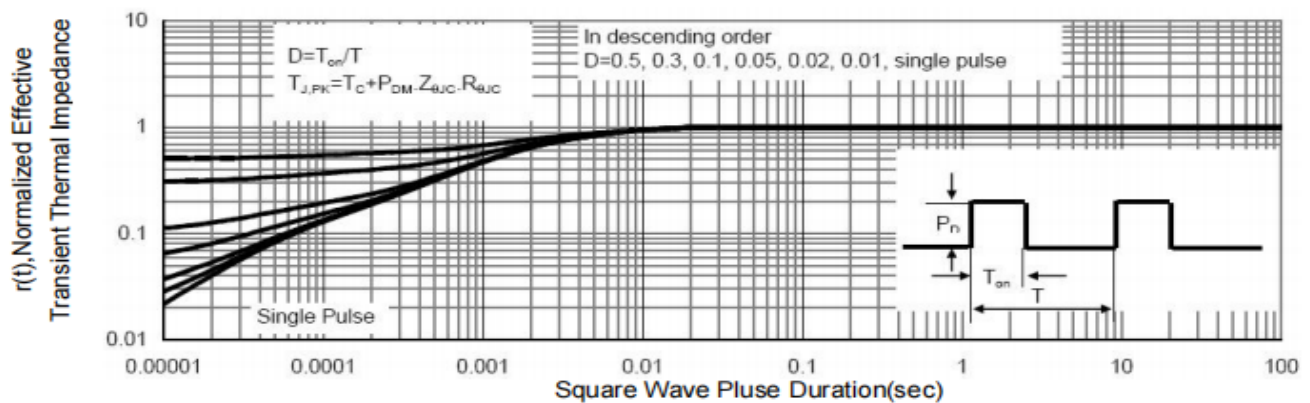
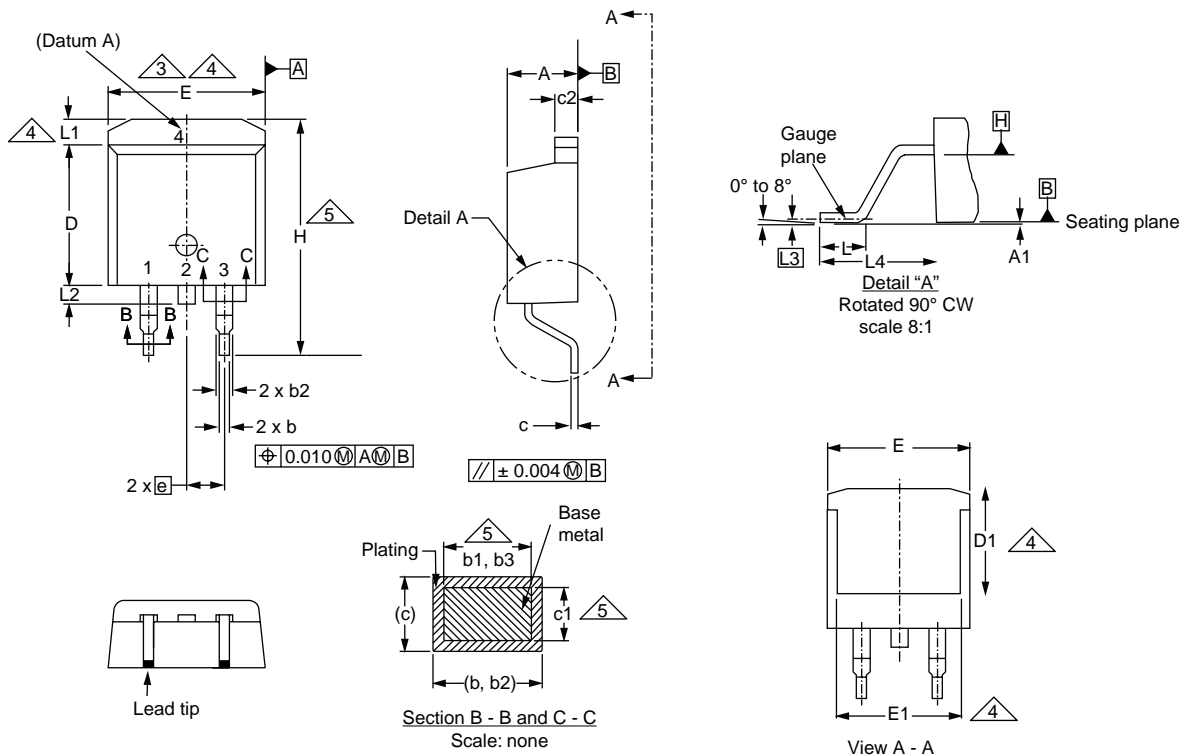


Figure 11 Normalized Maximum Transient Thermal Impedance

**TO-263**

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

ECN: S-82110-Rev. A, 15-Sep-08  
 DWG: 5970

**Notes**

1. Dimensioning and tolerancing per ASME Y14.5M.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

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