

## Automotive P-Channel 40 V (D-S) 175 °C MOSFET

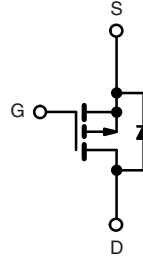
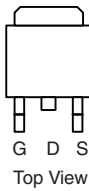
 AUTOMOTIVE  
GRADE

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

PRODUCT SUMMARY	
$V_{DS}$ (V)	- 40
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -10$ V	0.0040
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.0060
$I_D$ (A)	- 120
Configuration	Single

### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- AEC-Q101 Qualified<sup>d</sup>
- 100 %  $R_g$  and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

**TO-263**


P-Channel MOSFET

ORDERING INFORMATION	
Package	TO-263
Lead (Pb)-free and Halogen-free	SQM110P04-04L-GE3

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °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 <sup>a</sup>	$T_C = 25$ °C	$I_D$	- 120	A
	$T_C = 125$ °C		- 120	
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	- 120	
Pulsed Drain Current <sup>b</sup>		$I_{DM}$	- 330	
Single Pulse Avalanche Current	L = 0.1 mH	$I_{AS}$	- 80	
Single Pulse Avalanche Energy		$E_{AS}$	320	
Maximum Power Dissipation <sup>b</sup>	$T_C = 25$ °C	$P_D$	375	W
	$T_C = 125$ °C		125	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to + 175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient	PCB Mount <sup>c</sup>	$R_{thJA}$	40	°C/W
Junction-to-Case (Drain)		$R_{thJC}$	0.40	

### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ 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
<b>Static</b>							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0, 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		- 1.5	- 2.0	- 2.5	
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	-	-	- 1.0	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	- 120	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 30 A	-	0.0034	0.0040	Ω
		V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 30 A, T <sub>J</sub> = 125 °C	-	-	0.0059	
		V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 30 A, T <sub>J</sub> = 175 °C	-	-	0.0070	
		V <sub>GS</sub> = - 4.5 V	I <sub>D</sub> = - 20 A	-	0.0050	0.0060	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = - 15 V, I <sub>D</sub> = - 30 A		-	97	-	S
<b>Dynamic<sup>b</sup></b>							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 20 V, f = 1 MHz	-	11 183	13 980	pF
Output Capacitance	C <sub>oss</sub>			-	1614	2020	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	1294	1620	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = - 10 V	V <sub>DS</sub> = - 20 V, I <sub>D</sub> = - 110 A	-	220	330	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			-	34	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	56	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.2	2.5	3.7	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = - 20 V, R <sub>L</sub> = 0.18 Ω I <sub>D</sub> ≅ - 110 A, V <sub>GEN</sub> = - 10 V, R <sub>g</sub> = 1 Ω		-	17	26	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			-	15	23	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	112	168	
Fall Time <sup>c</sup>	t <sub>f</sub>			-	45	68	
<b>Source-Drain Diode Ratings and Characteristics<sup>b</sup></b>							
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	- 330	A
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> = - 100 A, V <sub>GS</sub> = 0		-	- 0.95	- 1.5	V

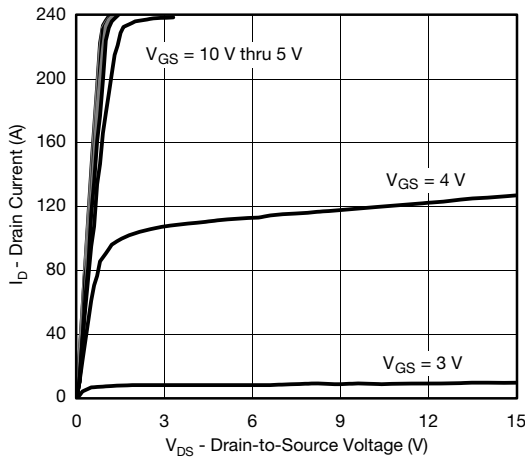
**Notes**

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

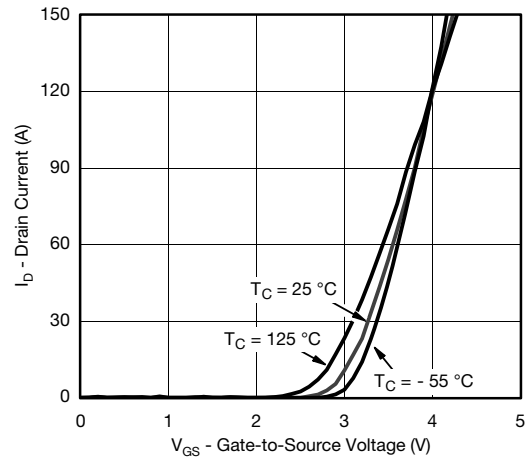
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



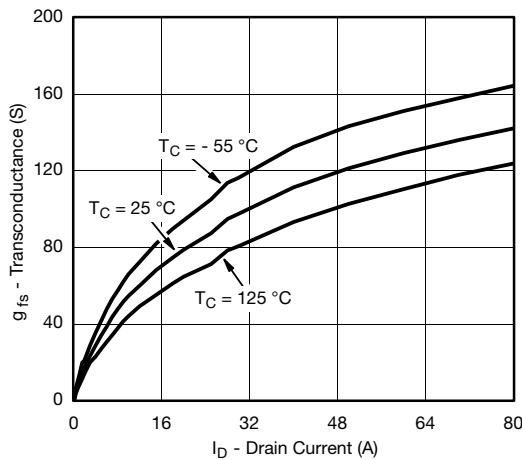
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



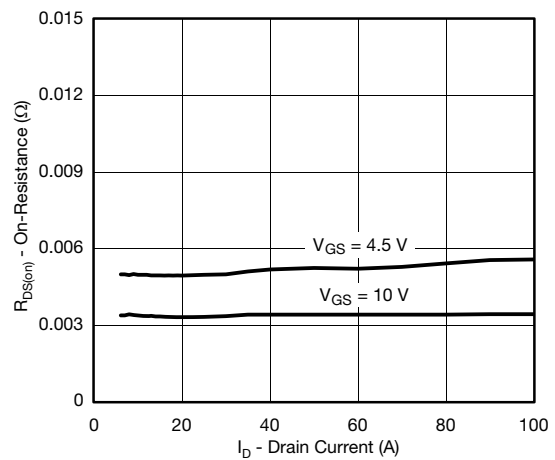
Output Characteristics



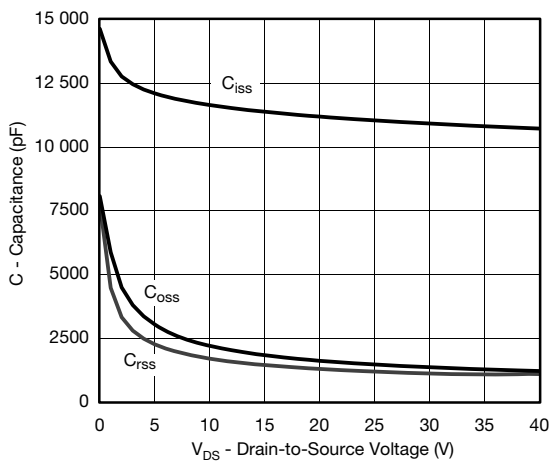
Transfer Characteristics



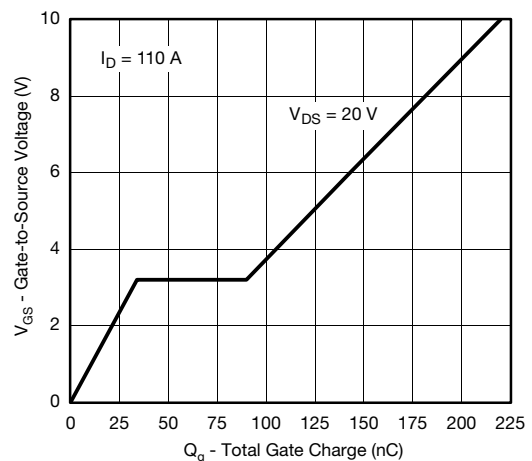
Transconductance



On-Resistance vs. Drain Current



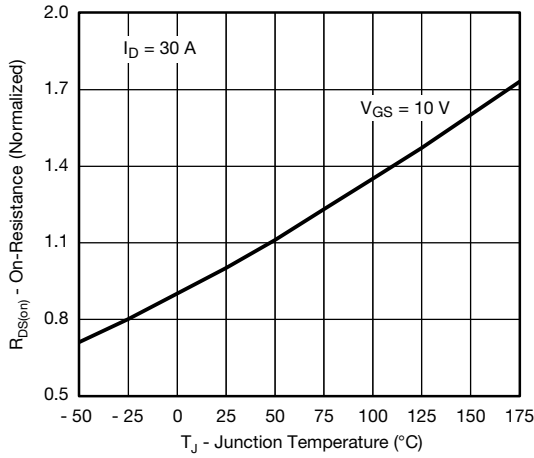
Capacitance



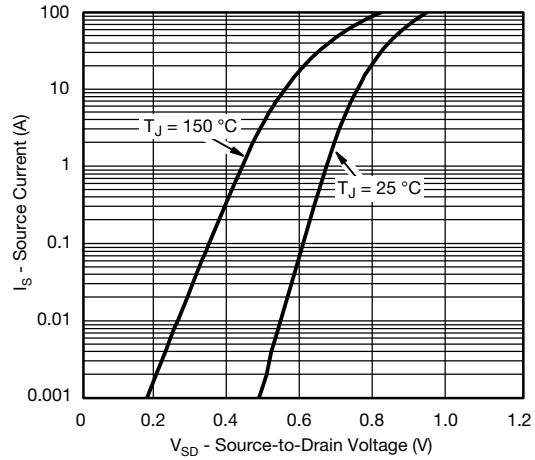
Gate Charge



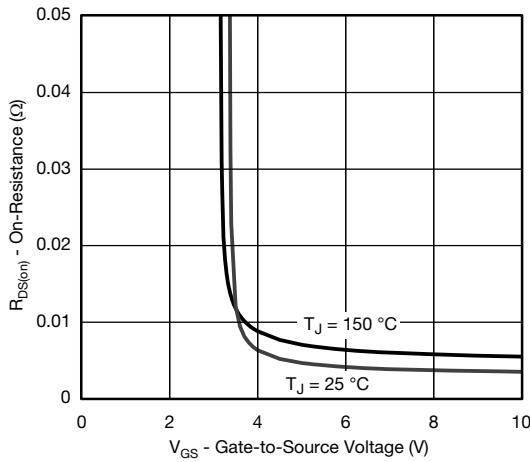
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



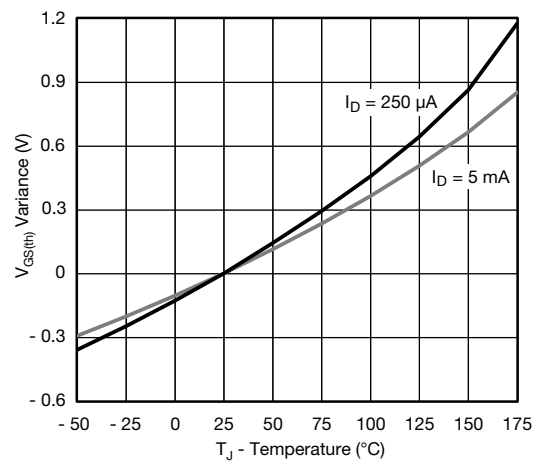
**On-Resistance vs. Junction Temperature**



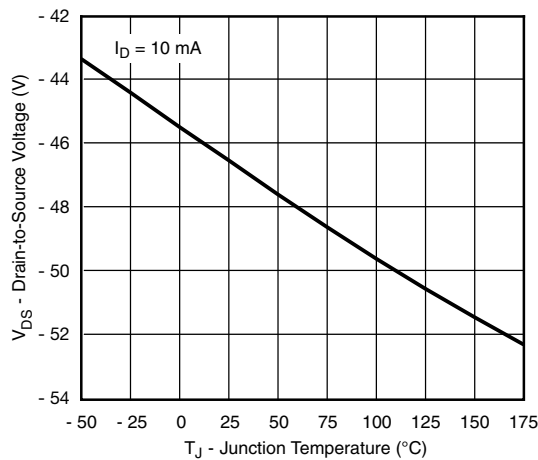
**Source Drain Diode Forward Voltage**



**On-Resistance vs. Gate-to-Source Voltage**



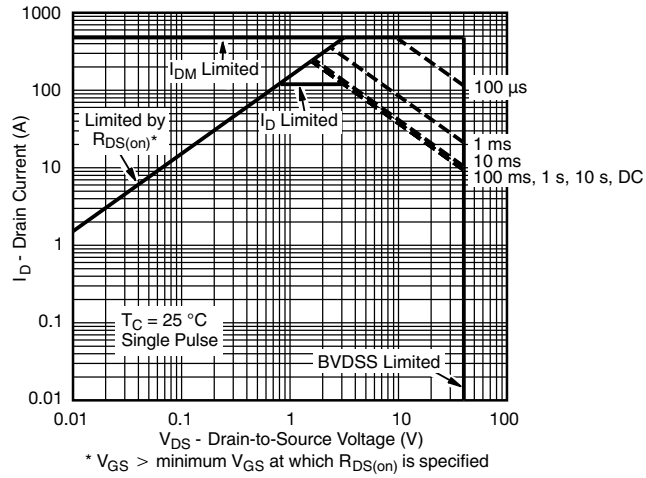
**Threshold Voltage**



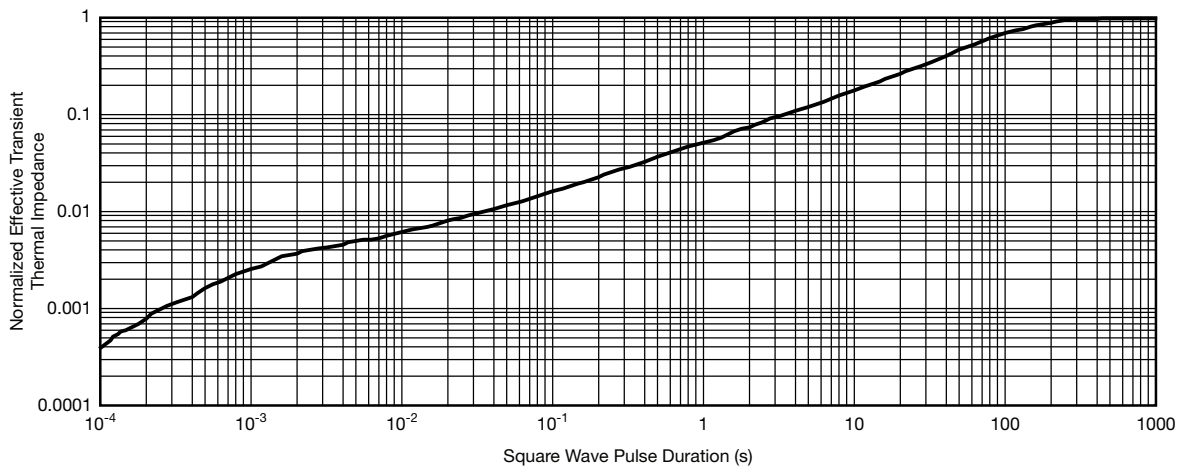
**Drain Source Breakdown vs. Junction Temperature**



**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



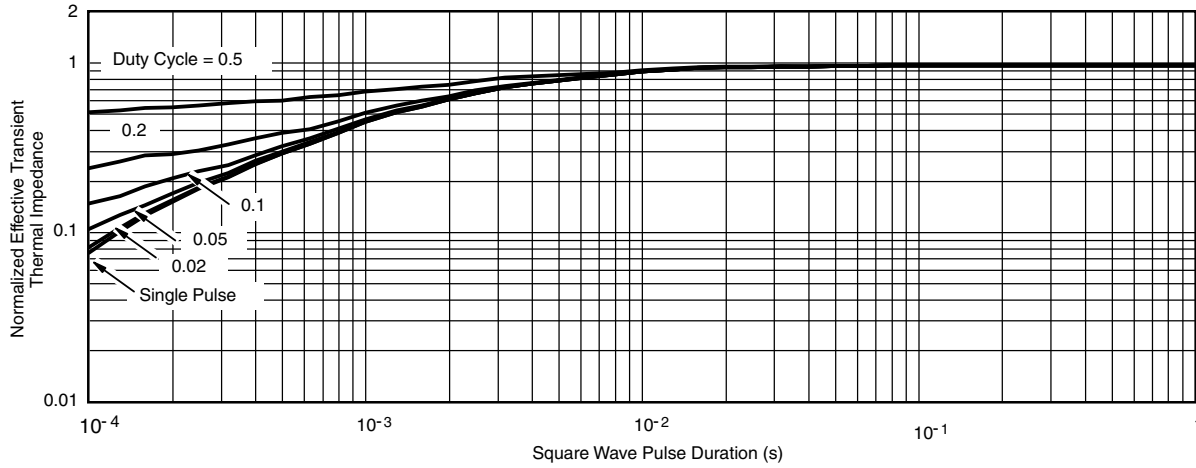
**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



**Normalized Thermal Transient Impedance, Junction-to-Case**

**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)
 are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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