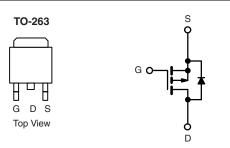


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Automotive P-Channel 40 V (D-S) 175 °C MOSFET

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



P-Channel MOSFET

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- AEC-Q101 Qualifiedd
- 100 % Rq and UIS Tested
- Compliant to RoHS Directive 2002/95/EC





ORDERING INFORMATION	
Package	TO-263
Lead (Pb)-free and Halogen-free	SQM120P04-04L-GE3

ABSOLUTE MAXIMUM RATING	S (T _C = 25 °C, unles	ss otherwise noted	<u>d</u>)		
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-Source Voltage		V_{DS}	- 40	V	
Gate-Source Voltage		V_{GS}	± 20	V	
Continuous Drain Currenta	T _C = 25 °C	1	- 120		
Continuous Drain Current	T _C = 125 °C	I _D	- 120		
Continuous Source Current (Diode Conduction) ^a		I _S	- 120	Α	
Pulsed Drain Current ^b		I _{DM}	- 330		
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	- 80		
Single Pulse Avalanche Energy	L = 0.1 MH	E _{AS}	320	mJ	
Maximum Dawar Dissipationh	n Power Dissipation ^b $ \frac{T_C = 25 \text{ °C}}{T_C = 125 \text{ °C}} $ PD		375	14/	
Maximum Power Dissipation			125	W	
Operating Junction and Storage Temperatu	re Range	T _J , T _{stg}	- 55 to + 175	°C	

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient P	CB Mount ^c	R _{thJA}	40	°C/W
Junction-to-Case (Drain)		R _{thJC}	0.40	C/VV

Notes

- a. Package limited.
- b. Pulse test; pulse width \leq 300 μ s, duty cycle \leq 2 %.
- c. When mounted on 1" square PCB (FR-4 material).
- d. Parametric verification ongoing.



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SPECIFICATIONS ($T_C = 25$ °C,	unless otherw	/ise noted)					
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} :	= 0, I _D = - 250 μA	- 40	-	-	V
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} =	V _{GS} , I _D = - 250 μA	- 1.5	- 2.0	- 2.5	V
Gate-Source Leakage	I _{GSS}	V _{DS} =	$0 \text{ V}, \text{ V}_{GS} = \pm 20 \text{ V}$	ı	-	± 100	nA
		$V_{GS} = 0 V$	V _{DS} = - 40 V	-	-	- 1.0	
Zero Gate Voltage Drain Current	I _{DSS}	$V_{GS} = 0 V$	V _{DS} = - 40 V, T _J = 125 °C	-	-	- 50	μA
		$V_{GS} = 0 V$	V _{DS} = - 40 V, T _J = 175 °C	-	-	- 250	
On-State Drain Current ^a	I _{D(on)}	V _{GS} = - 10 V	V _{DS} ≤ - 5 V	- 120	-	-	Α
		V _{GS} = - 10 V	I _D = - 30 A	-	0.0034	0.0040	
Drain-Source On-State Resistance ^a	Б	V _{GS} = - 10 V	I _D = - 30 A, T _J = 125 °C	-	-	0.0059	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = - 10 V	I _D = - 30 A, T _J = 175 °C	-	-	0.0070	Ω
		V _{GS} = - 4.5 V	I _D = - 20 A	-	0.0050	0.0060	
Forward Transconductance ^b	9 _{fs}	V _{DS} =	- 15 V, I _D = - 30 A	-	97	-	S
Dynamic ^b							
Input Capacitance	C _{iss}			-	11 183	13 980	
Output Capacitance	C _{oss}	$V_{GS} = 0 V$	V _{DS} = - 20 V, f = 1 MHz	-	1614	2020	pF
Reverse Transfer Capacitance	C _{rss}			-	1294	1620	
Total Gate Charge ^c	Qg			-	220	330	
Gate-Source Charge ^c	Q _{gs}	V _{GS} = - 10 V	$V_{DS} = -20 \text{ V}, I_{D} = -110 \text{ A}$	-	34	-	nC
Gate-Drain Charge ^c	Q_{gd}			-	56	-	7
Gate Resistance	R_g		f = 1 MHz	1.2	2.5	3.7	Ω
Turn-On Delay Time ^c	t _{d(on)}			-	17	26	
Rise Time ^c	t _r	V _{DD} = -20 V, n _L = 0.10 \(\)2		23	- ns		
Turn-Off Delay Time ^c	t _{d(off)}			168			
Fall Time ^c	t _f			-	45	68]
Source-Drain Diode Ratings and Chara	cteristics ^b	•			•		
Pulsed Current ^a	I _{SM}			-	-	- 330	Α
Forward Voltage	V _{SD}	I _F =	- 100 A, V _{GS} = 0	=	- 0.95	- 1.5	V

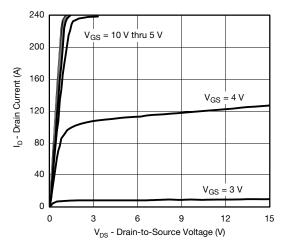
Notes

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

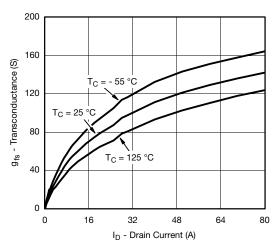
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



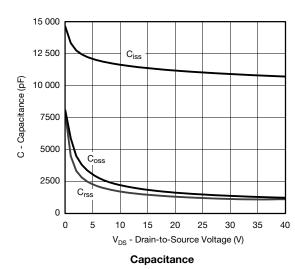
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)

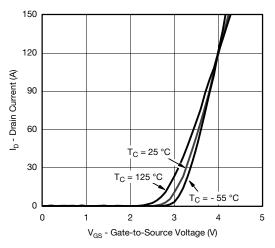


Output Characteristics

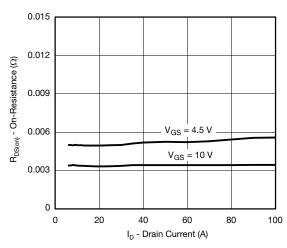


Transconductance

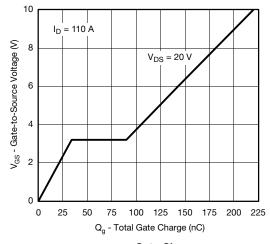




Transfer Characteristics

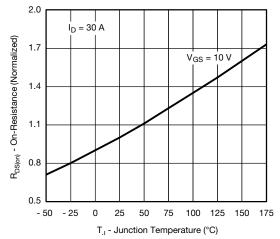


On-Resistance vs. Drain Current

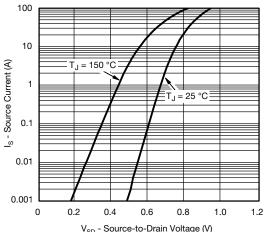




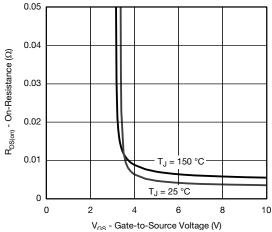
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



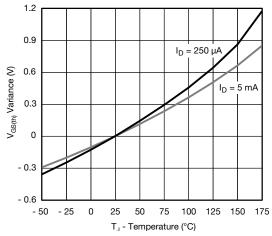
On-Resistance vs. Junction Temperature



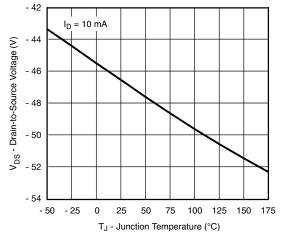
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



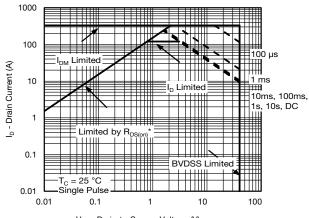
Threshold Voltage



Drain Source Breakdown vs. Junction Temperature

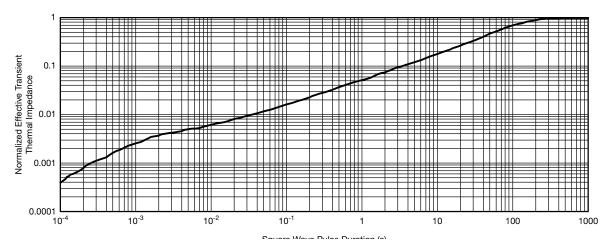


THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



 $V_{DS} \text{ - Drain-to-Source Voltage (V)} \\ \text{* } V_{GS} \text{ > minimum } V_{GS} \text{ at which } R_{DS(on)} \text{ is specified}$

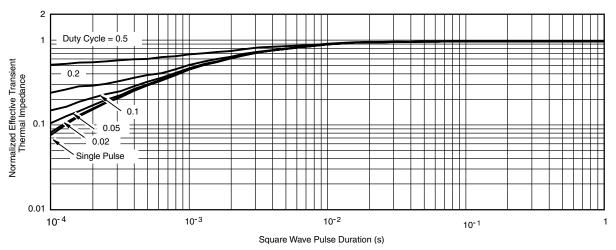
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

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THERMAL RATINGS (T_A = 25 °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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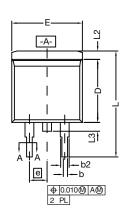
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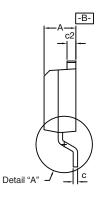


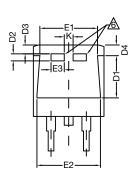
TO-263 (D²PAK): 3-LEAD

VERSION 1: FACILITY CODE = T

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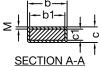








DETAIL A (ROTATED 90°)



<u>_</u>	b	1	<u> </u>
< T		10	ပ
SI	FCTION	1 A-A	Ŧ

Notes

- 1. Plane B includes maximum features of heat sink tab and plastic.
- 2. No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- 3. Pin-to-pin coplanarity max. 4 mils.
- 4. *: Thin lead is for SUB, SYB. Thick lead is for SUM, SYM, SQM.
- 5. Use inches as the primary measurement.

6. This feature is for thick lead.

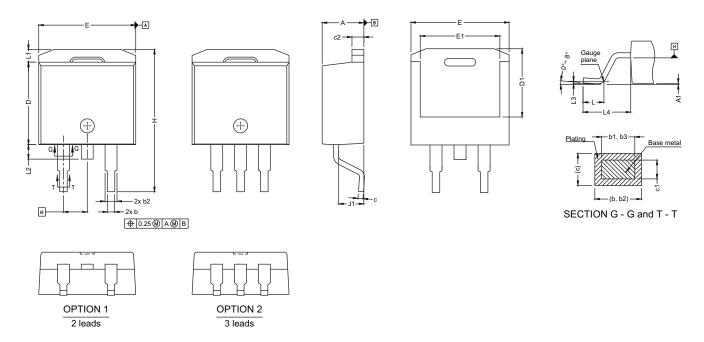
		INC	HES	MILLIMETERS		
DIM.		MIN.	MAX.	MIN.	MAX.	
А		0.160	0.190	4.064	4.826	
	b	0.020	0.039	0.508	0.990	
	b1	0.020	0.035	0.508	0.889	
	b2	0.045	0.055	1.143	1.397	
c*	Thin lead	0.013	0.018	0.330	0.457	
C	Thick lead	0.023	0.028	0.584	0.711	
c1	Thin lead	0.013	0.017	0.330	0.431	
CI	Thick lead	0.023	0.027	0.584	0.685	
	c2	0.045	0.055	1.143	1.397	
	D	0.340	0.380	8.636	9.652	
	D1 0.22		0.240	5.588	6.096	
	D2	0.038	0.042	0.965	1.067	
	D3	0.045	0.055	1.143	1.397	
	D4	0.044	0.052	1.118	1.321	
	E	0.380	0.410	9.652	10.414	
	<u>E1</u>	0.245	-	6.223	-	
	E2	0.355	0.375	9.017	9.525	
	E3	0.072	0.078	1.829	1.981	
	е	0.100) BSC	2.54	BSC	
K		0.045	0.055	1.143	1.397	
	L	0.575	0.625	14.605	15.875	
	L1	0.090	0.110	2.286	2.794	
L2		0.040	0.055	1.016	1.397	
	L3	0.050	0.070	1.270	1.778	
	L4	0.010	BSC	0.254	BSC	
	М	-	0.002	-	0.050	



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VERSION 2: FACILITY CODE = N



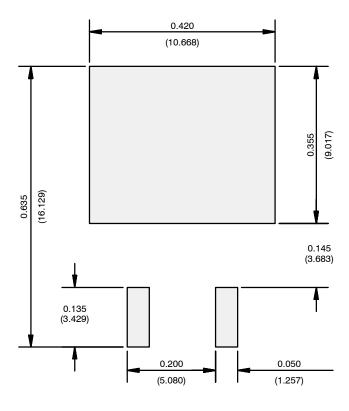
DIM.	MIN.	MAX.
A	4.36	4.56
A1	0	0.25
b	0.70	0.90
b1	0.51	0.89
b2	1.20	1.46
b3	1.17	1.37
С	0.38	0.694
c1	0.38	0.534
c2	1.19	1.34
D	8.60	9.00
D1	6.9	7.5
E	10.15	10.55
E1	8.1	8.7
е	2.54	BSC
Н	15.0	15.6
L	1.9	2.5
L1	-	1.65
L2	-	1.78
L3	0.25	5 typ.
L4	4.78	5.28
J1	2.56	2.96

DWG: 5843





RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads Dimensions in Inches/(mm)

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