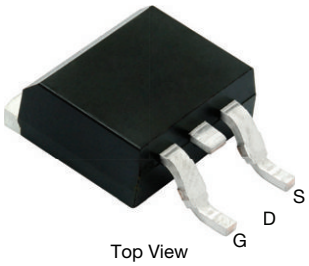
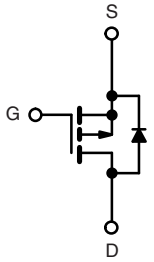
Automotive P-Channel 60 V (D-S) 175 °C MOSFET

TO-263



Top View



P-Channel MOSFET

FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- 100 % R_g and UIS tested
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

RoHS COMPLIANT
HALOGEN FREE

PRODUCT SUMMARY	
V_{DS} (V)	-60
$R_{DS(on)}$ (Ω) at V_{GS} = -10 V	0.0058
$R_{DS(on)}$ (Ω) at V_{GS} = -4.5 V	0.0110
I_D (A)	-120
Configuration	Single

ORDERING INFORMATION	
Package	TO-263
Lead (Pb)-free and Halogen-free	SQM50063EL_GE3

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	-60	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current	T_C = 25 °C [a]	I_D	-120	A
	T_C = 125 °C		-85	
Continuous Source Current (Diode Conduction) [a]		I_S	-120	
Pulsed Drain Current [b]		I_{DM}	-480	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	-60	
Single Pulse Avalanche Energy		E_{AS}	180	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	230	W
	T_C = 125 °C		76	
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 [c]	R_{thJA}	40	°C/W
Junction-to-Case (Drain)		R_{thJC}	0.65	

Notes

a. Package limited
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
c. When mounted on 1" square PCB (FR4 material)

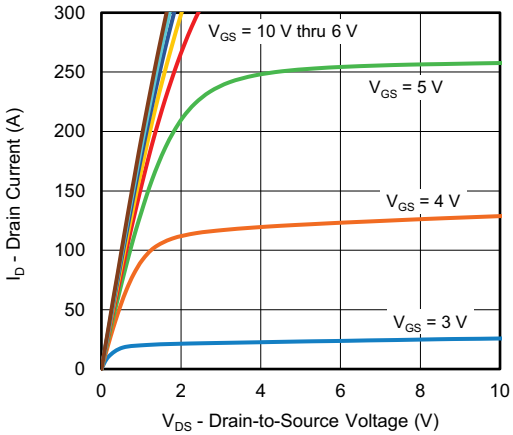
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = -250 μA		-60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250 μA		-1.5	-2.0	-2.5	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V	V_{DS} = -60 V	-	-	-10	μA
		V_{GS} = 0 V	V_{DS} = -60 V, T_J = 125 °C	-	-	-50	
		V_{GS} = 0 V	V_{DS} = -60 V, T_J = 175 °C	-	-	-250	
On-State Drain Current [a]	$I_{D(on)}$	V_{GS} = -10 V	V_{DS} ≤ -5 V	-120	-	-	A
Drain-Source On-State Resistance [a]	$R_{DS(on)}$	V_{GS} = -10 V	I_D = -30 A	-	0.0045	0.0058	Ω
		V_{GS} = -10 V	I_D = -30 A, T_J = 125 °C	-	-	0.0089	
		V_{GS} = -10 V	I_D = -30 A, T_J = 175 °C	-	-	0.0107	
		V_{GS} = -4.5 V	I_D = -20 A	-	0.0078	0.0110	
Forward Transconductance [b]	g_{fs}	V_{DS} = -15 V, I_D = -30 A		-	85	-	S
Dynamic [b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = -25 V, f = 1 MHz	-	6943	9725	pF
Output Capacitance	C_{oss}			-	3393	4750	
Reverse Transfer Capacitance	C_{rss}			-	139	195	
Total Gate Charge [c]	Q_g	V_{GS} = -10 V	V_{DS} = -30 V, I_D = -110 A	-	98	150	nC
Gate-Source Charge [c]	Q_{gs}			-	33	-	
Gate-Drain Charge [c]	Q_{gd}			-	11	-	
Gate Resistance	R_g	f = 1 MHz		1.2	2.55	3.9	Ω
Turn-On Delay Time [c]	$t_{d(on)}$	V_{DD} = -30 V, R_L = 0.27 Ω I_D ≅ -110 A, V_{GEN} = -10 V, R_g = 1 Ω		-	15	23	ns
Rise Time [c]	t_r			-	10	15	
Turn-Off Delay Time [c]	$t_{d(off)}$			-	51	80	
Fall Time [c]	t_f			-	14	22	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed Current [a]	I_{SM}			-	-	-480	A
Forward Voltage	V_{SD}	I_F = -100 A, V_{GS} = 0 V		-	-0.95	-1.5	V
Body diode reverse recovery time	t_{rr}	I_F = -85 A, di/dt = 100 A/μs		-	52	104	ns
Body diode reverse recovery charge	Qrr			-	44	88	nC
Reverse recovery fall time	t_a			-	26	-	ns
Reverse recovery rise time	t_b			-	26	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-1.6	-	A

Notes

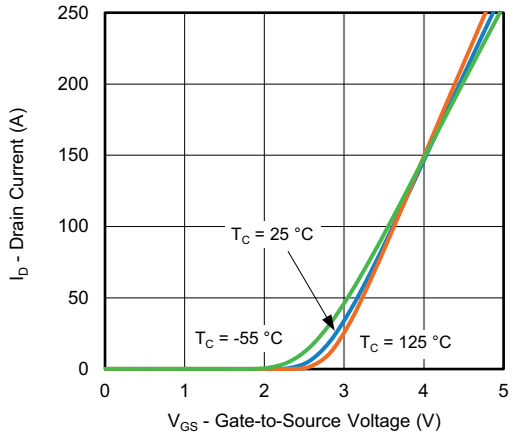
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

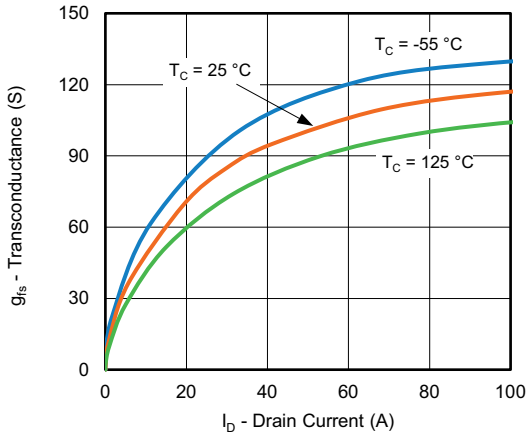
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



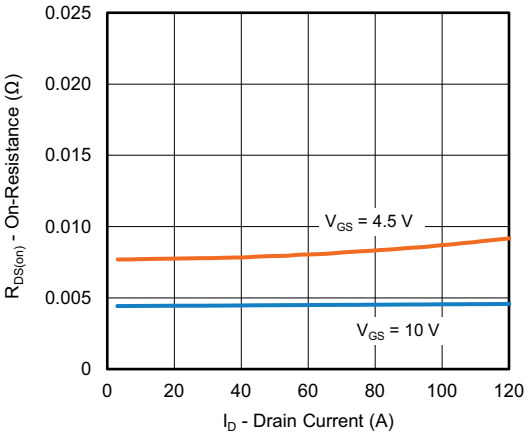
Output Characteristics



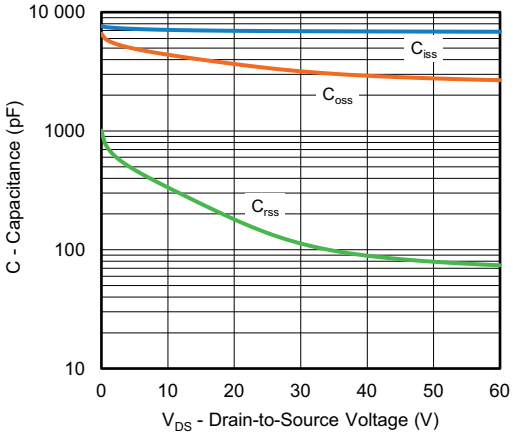
Transfer Characteristics



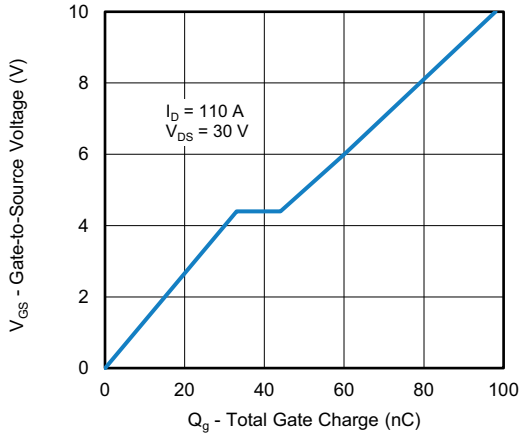
Transconductance



On-Resistance vs. Drain Current

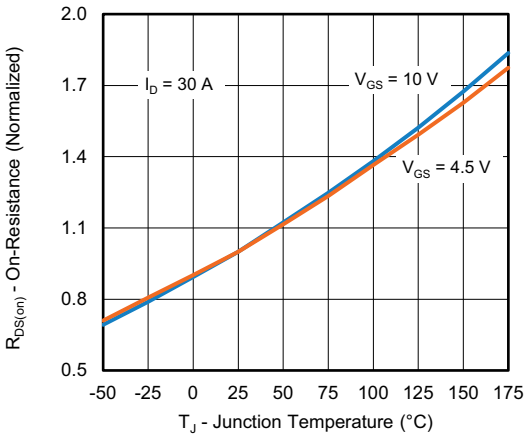


Capacitance

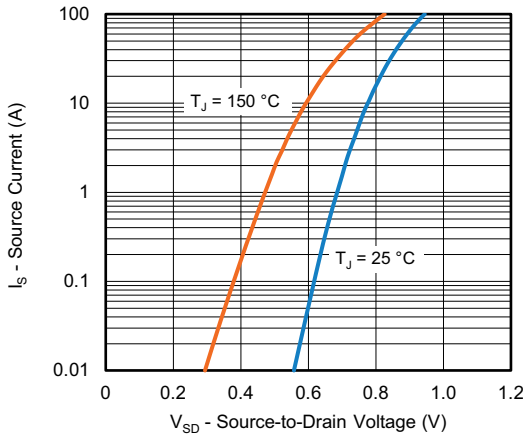


Gate Charge

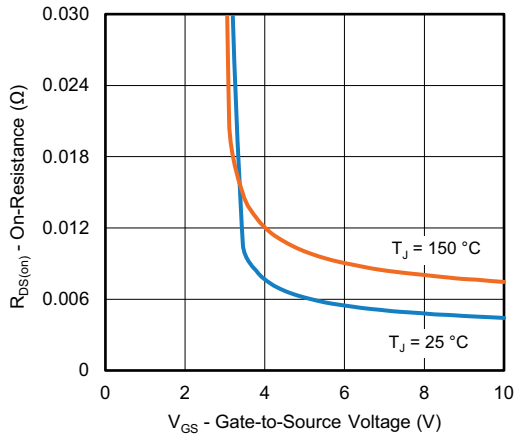
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



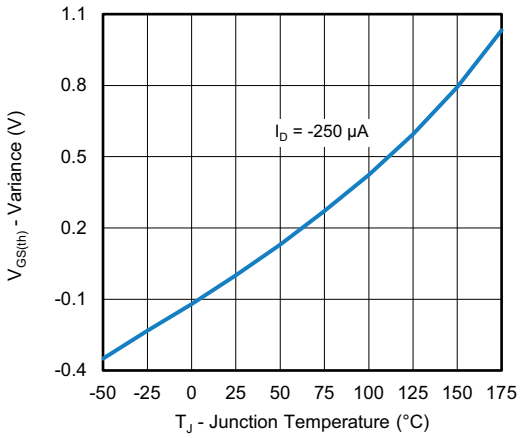
On-Resistance vs. Junction Temperature



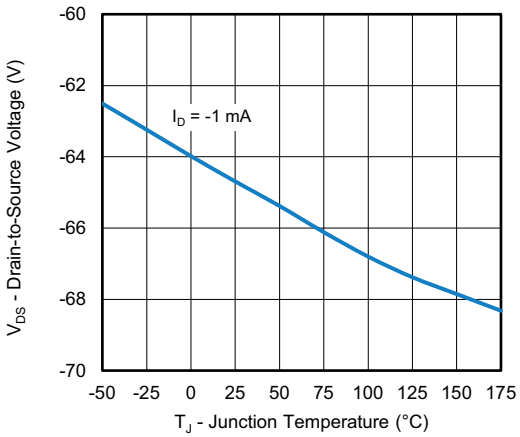
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

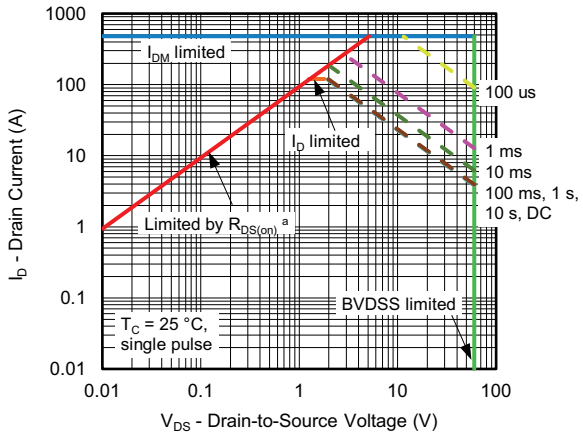


Threshold Voltage

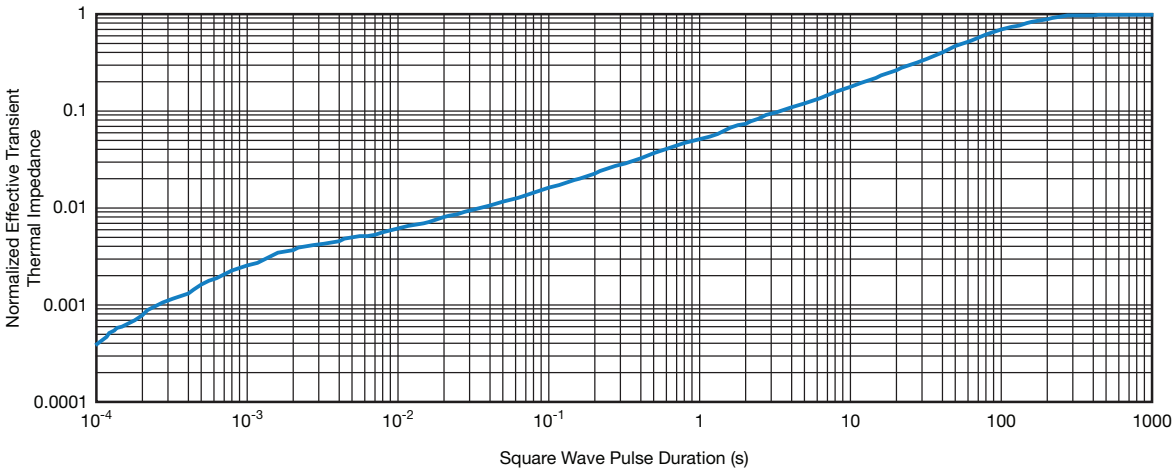


Drain Source Breakdown vs. Junction Temperature

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

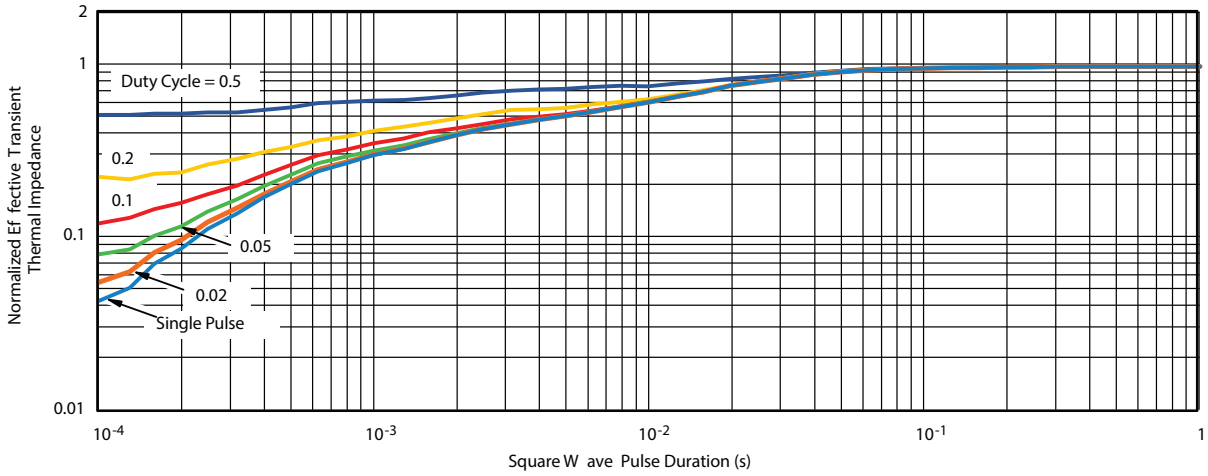


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

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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