



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



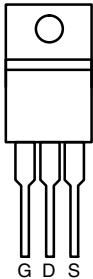
RoHS COMPLIANT HALOGEN FREE

PRODUCT SUMMARY	
V _{DS} (V)	60
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.009
R _{DS(on)} (Ω) at V _{GS} = 4.5 V	0.013
I _D (A)	50
Configuration	Single

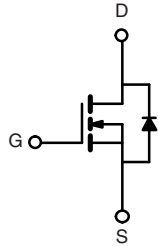
FEATURES

- TrenchFET® Power MOSFET
- 100 % R_g and UIS Tested
- AEC-Q101 Qualified^d
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

TO-220



Top View



N-Channel MOSFET

ORDERING INFORMATION	
Package	TO-220
Lead (Pb)-free and Halogen-free	SQP50N06-09L-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	50	A
	T _C = 125 °C		49	
Continuous Source Current (Diode Conduction) ^a		I _S	50	
Pulsed Drain Current ^b		I _{DM}	200	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	48	
Single Pulse Avalanche Energy		E _{AS}	115	
Maximum Power Dissipation ^b	T _C = 25 °C	P _D	136	W
	T _C = 125 °C		45	
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}	50	°C/W
Junction-to-Case (Drain)		R _{thJC}	1.1	

Notes

- Package limited.
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR-4 material).
- Parametric verification ongoing.



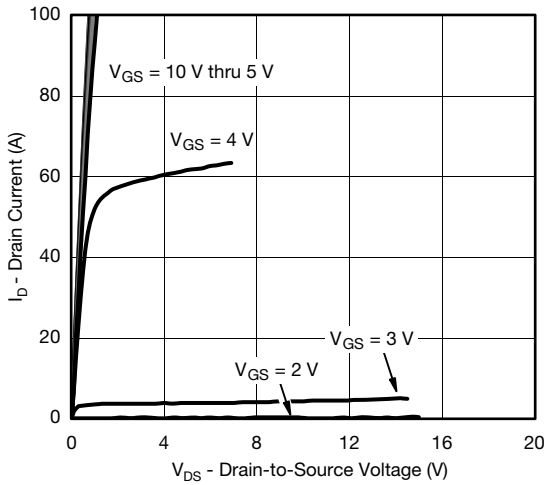
SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		60	-	-	V
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		1.5	2.0	2.5	
Gate-Source 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	-	-	1	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	50	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V	I _D = 20 A	-	0.0071	0.0090	Ω
		V _{GS} = 10 V	I _D = 20 A, T _J = 125 °C	-	-	0.0160	
		V _{GS} = 10 V	I _D = 20 A, T _J = 175 °C	-	-	0.0190	
		V _{GS} = 4.5 V	I _D = 10 A	-	0.0094	0.0130	
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 20 A		-	62	-	S
Dynamic^b							
Input Capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = 25 V, f = 1 MHz	-	2451	3065	pF
Output Capacitance	C _{oss}			-	435	545	
Reverse Transfer Capacitance	C _{rss}			-	192	240	
Total Gate Charge ^c	Q _g	V _{GS} = 10 V	V _{DS} = 30 V, I _D = 50 A	-	48	72	nC
Gate-Source Charge ^c	Q _{gs}			-	7.1	-	
Gate-Drain Charge ^c	Q _{gd}			-	13.5	-	
Gate Resistance	R _g	f = 1 MHz		0.85	1.7	2.6	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 30 V, R _L = 0.6 Ω I _D ≅ 50 A, V _{GEN} = 10 V, R _g = 1 Ω		-	10	15	ns
Rise Time ^c	t _r			-	11	17	
Turn-Off Delay Time ^c	t _{d(off)}			-	27	41	
Fall Time ^c	t _f			-	8	12	
Source-Drain Diode Ratings and Characteristics^b							
Pulsed Current ^a	I _{SM}			-	-	200	A
Forward Voltage	V _{SD}	I _F = 20 A, V _{GS} = 0 V		-	0.82	1.5	V

Notes

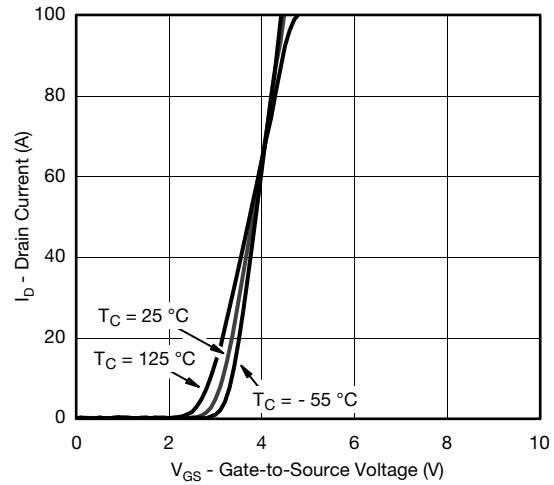
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

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.

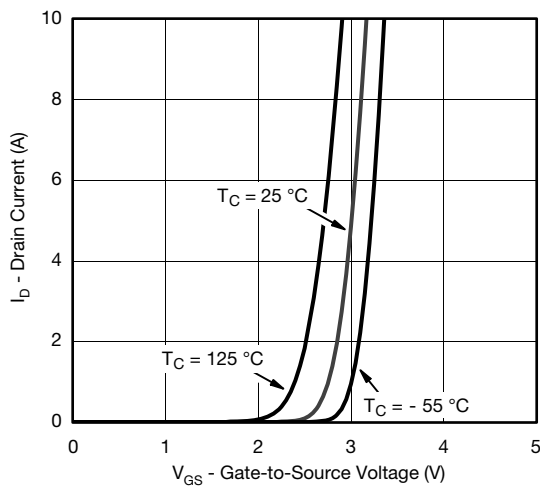
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



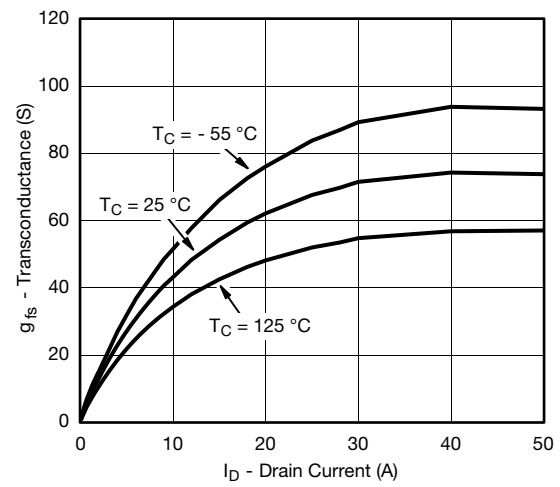
Output Characteristics



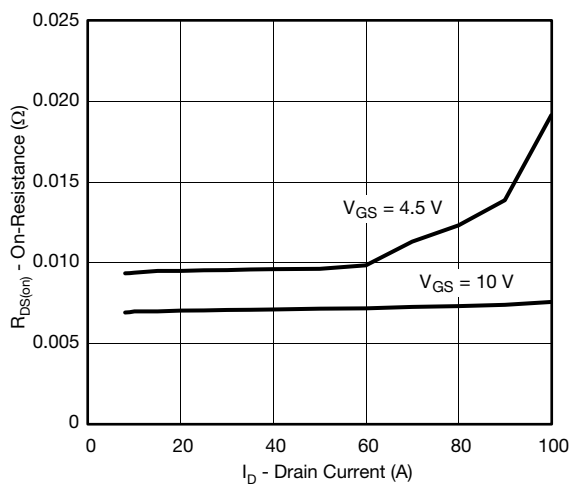
Transfer Characteristics



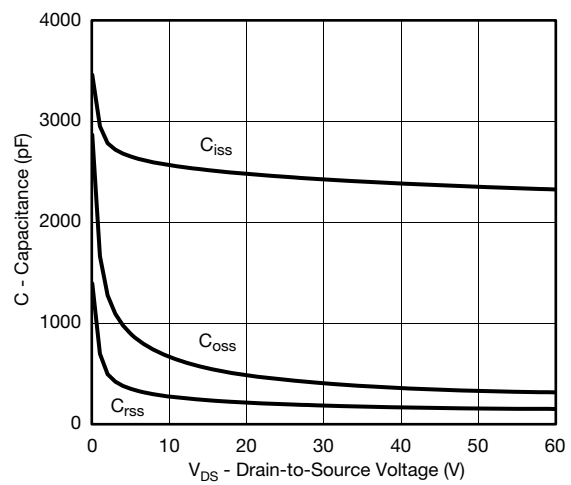
Transfer Characteristics



Transconductance



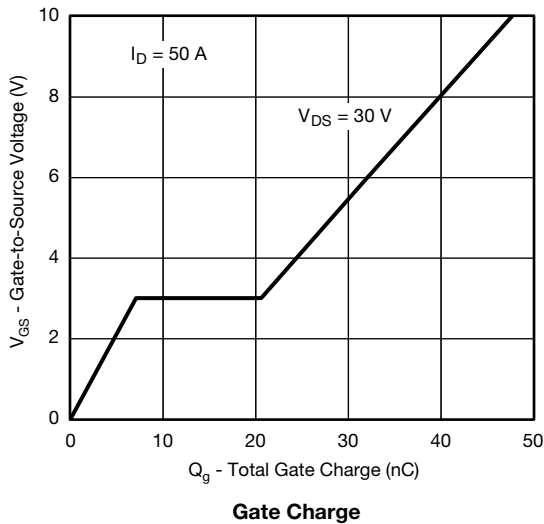
On-Resistance vs. Drain Current



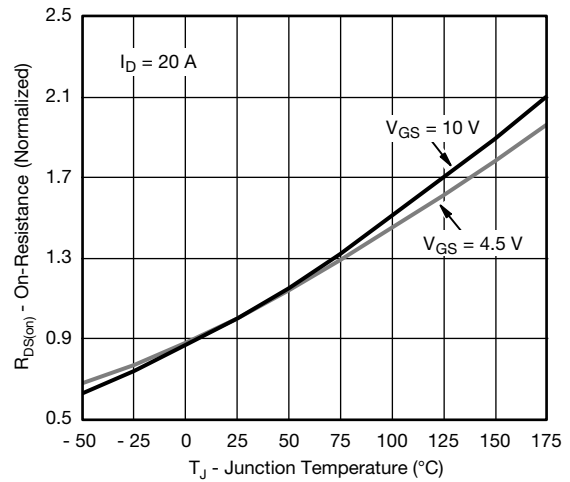
Capacitance



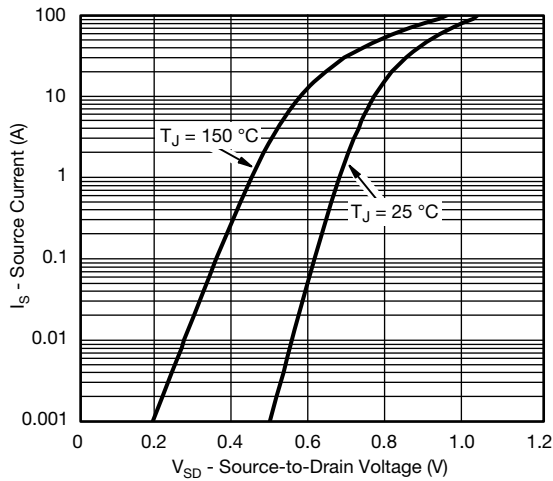
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



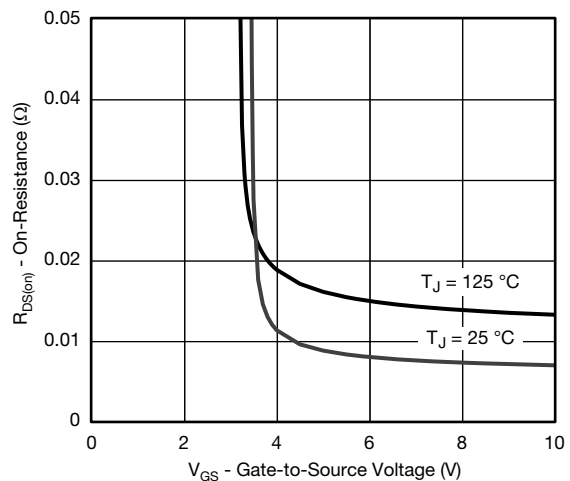
Gate Charge



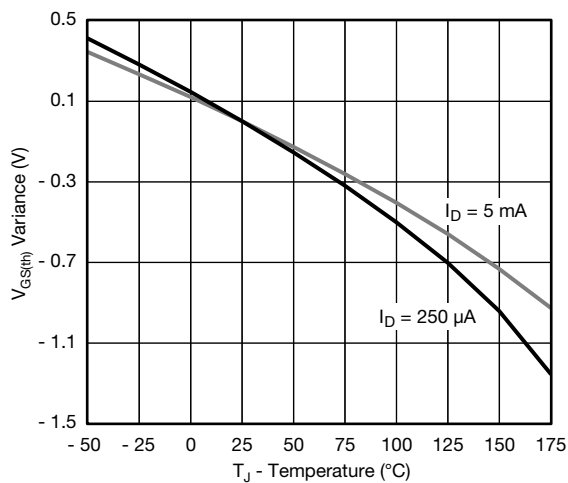
On-Resistance vs. Junction Temperature



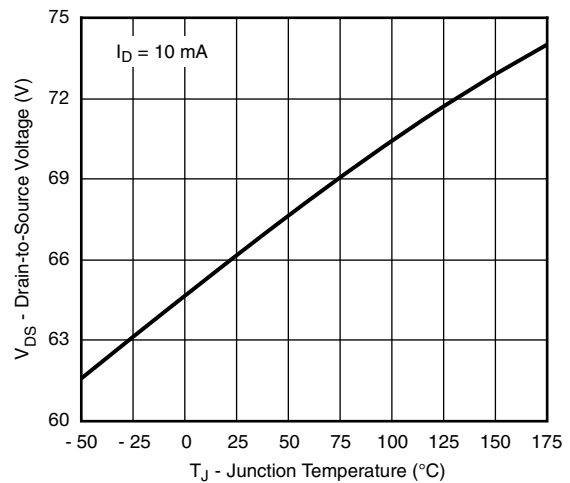
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



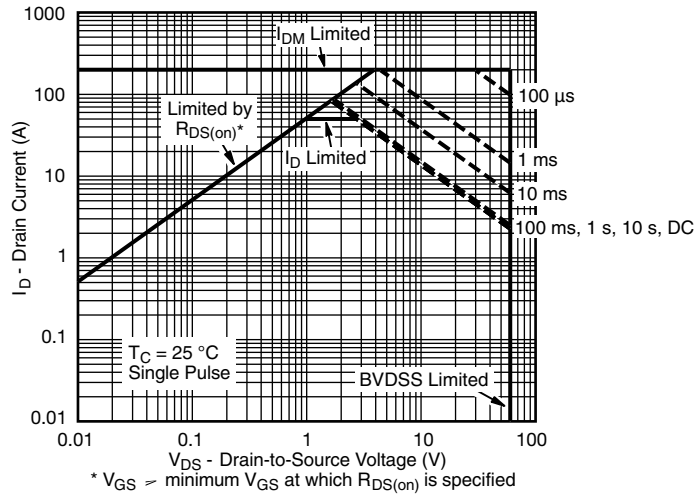
Threshold Voltage



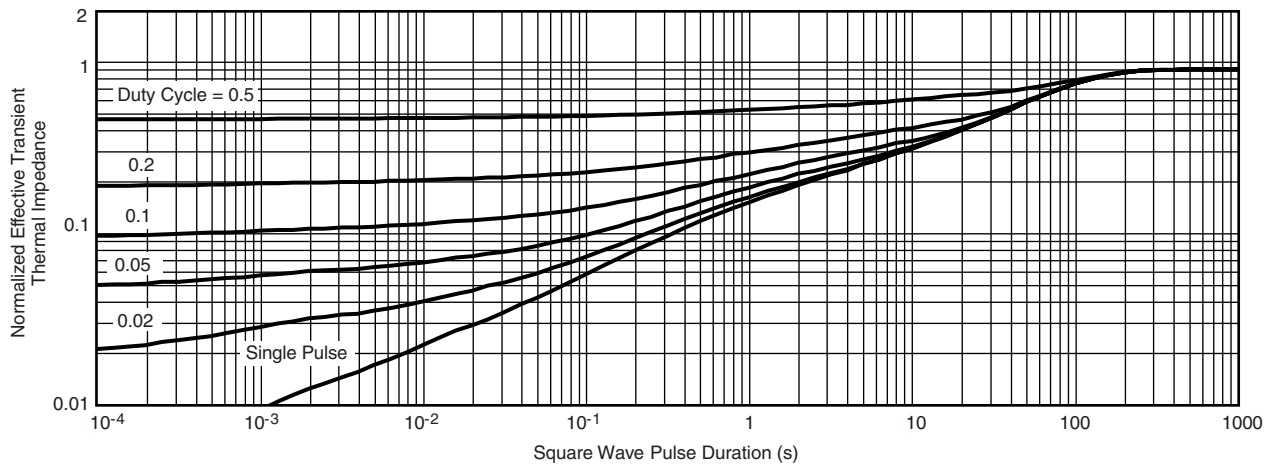
Drain Source Breakdown vs. Junction Temperature



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



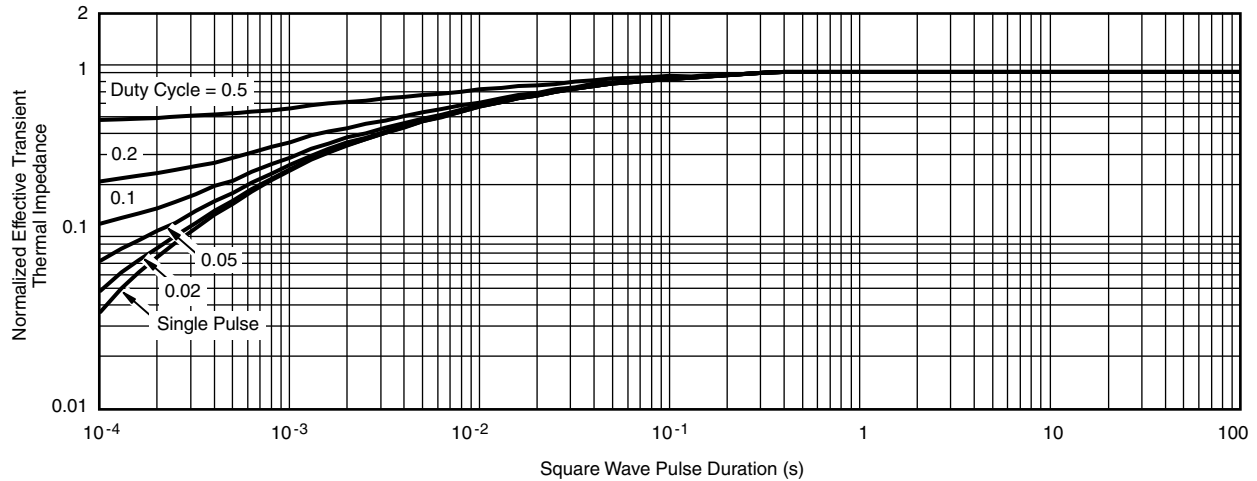
Safe Operating Area



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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