Automotive
Dual N-Channel 20 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	20
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.415
$R_{DS(on)}$ (Ω) at V_{GS} = 2.5 V	0.600
I_D (A)	0.78
Configuration	Dual

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Compliant to RoHS Directive 2002/95/EC

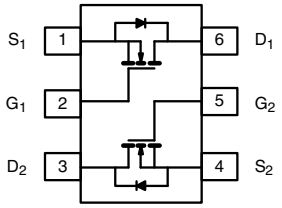
AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

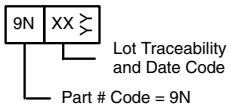
HALOGEN FREE

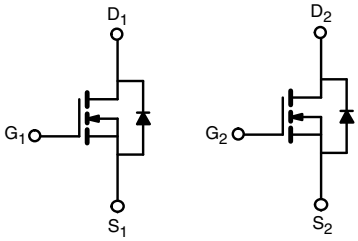
SOT-363
SC-70 (6-LEADS)



Top View

Marking Code





N-Channel MOSFET N-Channel MOSFET

ORDERING INFORMATION	
Package	SC-70
Lead (Pb)-free and Halogen-free	SQ1902EL-T1-GE3

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	± 12	
Continuous Drain Current	T_C = 25 °C	I_D	0.78	A
	T_C = 125 °C		0.45	
Continuous Source Current (Diode Conduction)		I_S	0.54	
Pulsed Drain Current[a]		I_{DM}	3.0	
Maximum Power Dissipation[a]	T_C = 25 °C	P_D	0.43	W
	T_C = 125 °C		0.14	
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[b]	R_{thJA}	460	°C/W
Junction-to-Foot (Drain)		R_{thJF}	350	

Notes

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

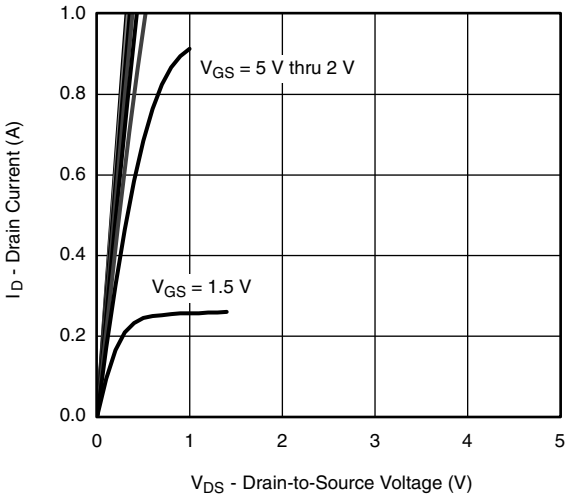
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA		20	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		0.6	1.0	1.5	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 12 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V	V_{DS} = 20 V	-	-	1.0	µA
		V_{GS} = 0 V	V_{DS} = 20 V, T_J = 125 °C	-	-	50	
		V_{GS} = 0 V	V_{DS} = 20 V, T_J = 175 °C	-	-	150	
On-State Drain Current[a]	$I_{D(on)}$	V_{GS} = 4.5 V	V_{DS} ≥ 5 V	0.8	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 4.5 V	I_D = 0.66 A	-	0.345	0.415	Ω
		V_{GS} = 4.5 V	I_D = 0.66 A, T_J = 125 °C	-	-	0.594	
		V_{GS} = 4.5 V	I_D = 0.66 A, T_J = 175 °C	-	-	0.698	
		V_{GS} = 2.5 V	I_D = 0.4 A	-	0.482	0.600	
Forward Transconductance[b]	g_{fs}	V_{DS} = 10 V, I_D = 1 A		-	1.1	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 10 V, f = 1 MHz	-	61	77	pF
Output Capacitance	C_{oss}			-	20	25	
Reverse Transfer Capacitance	C_{rss}			-	11	14	
Total Gate Charge[c]	Q_g	V_{GS} = 4.5 V	V_{DS} = 10 V, I_D = 1.2 A	-	0.83	1.25	nC
Gate-Source Charge[c]	Q_{gs}			-	0.12	-	
Gate-Drain Charge[c]	Q_{gd}			-	0.23	-	
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 10 V, R_L = 20 Ω I_D ≅ 0.5 A, V_{GEN} = 4.5 V, R_g = 1 Ω		-	4	6	ns
Rise Time[c]	t_r			-	10	15	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	6	9	
Fall Time[c]	t_f			-	6	9	
Source-Drain Diode Ratings and Characteristics[b]							
Pulsed Current[a]	I_{SM}			-	-	3.0	A
Forward Voltage	V_{SD}	I_F = 0.5 A, V_{GS} = 0 V		-	0.85	1.2	V

Notes

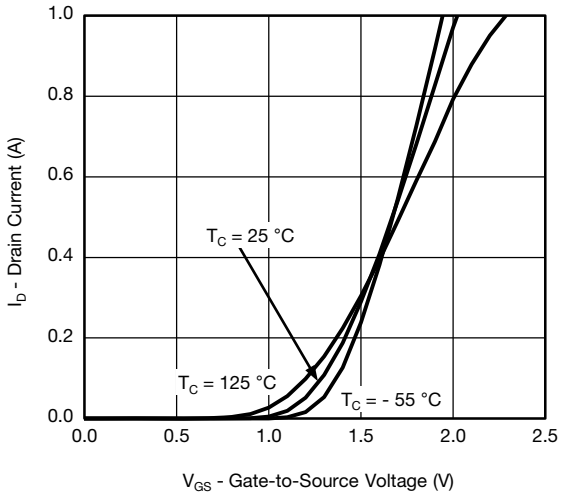
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

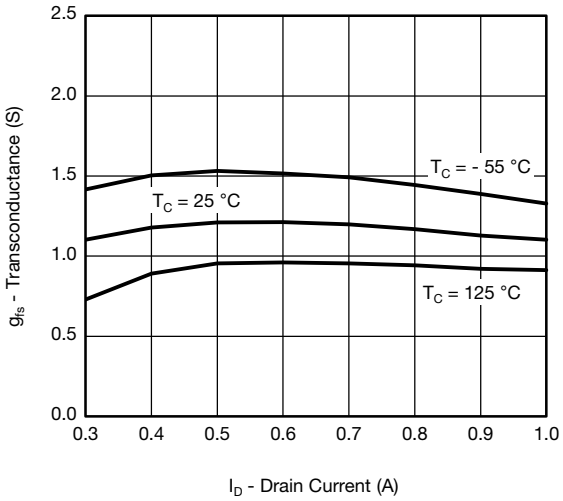
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



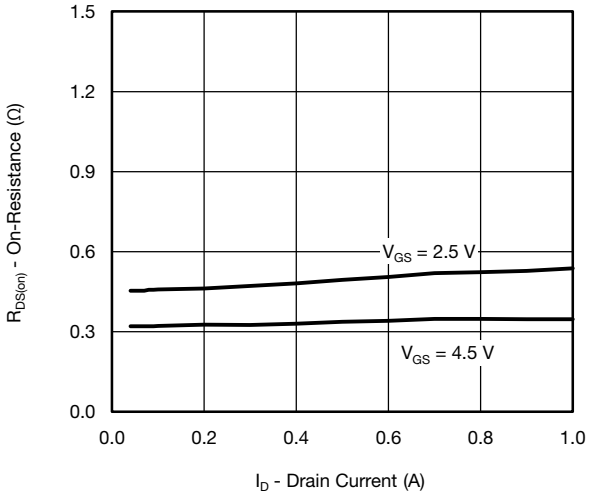
Output Characteristics



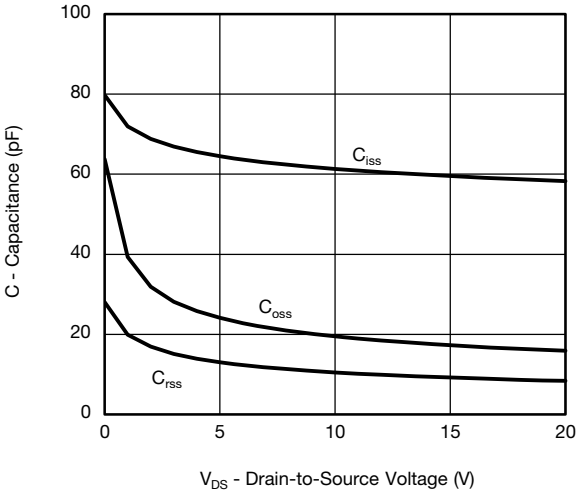
Transfer Characteristics



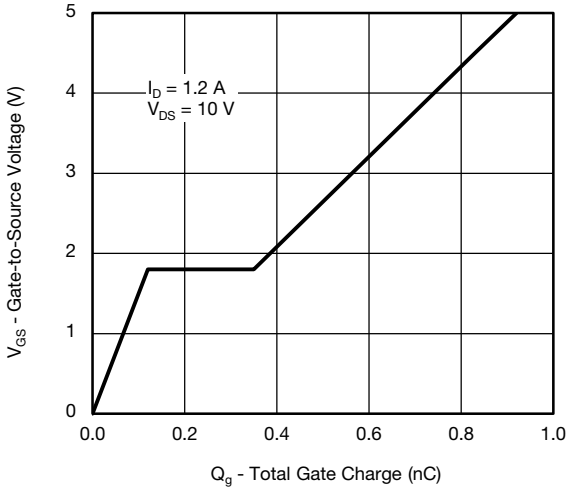
Transconductance



On-Resistance vs. Drain Current

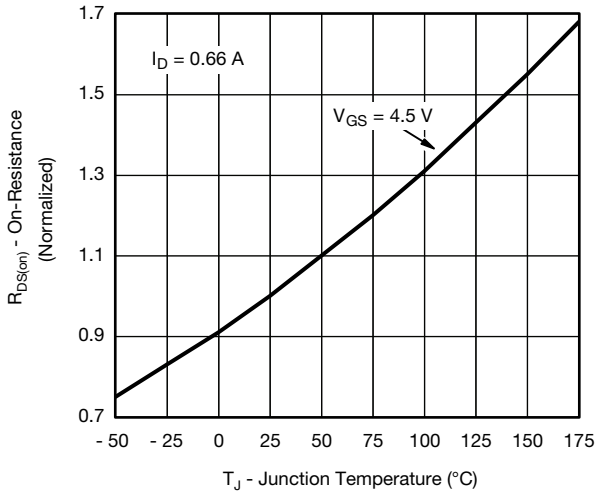


Capacitance

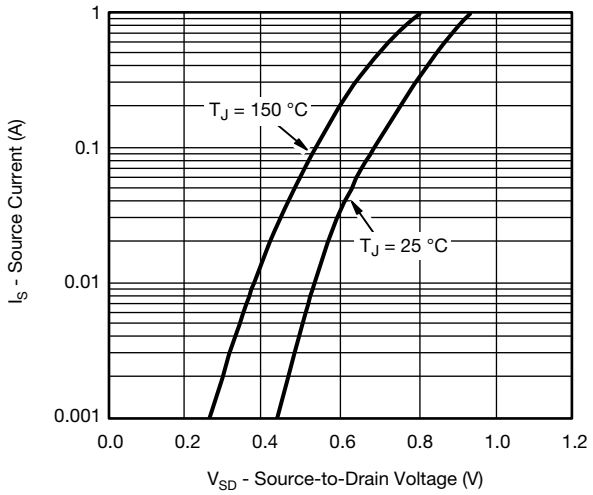


Gate Charge

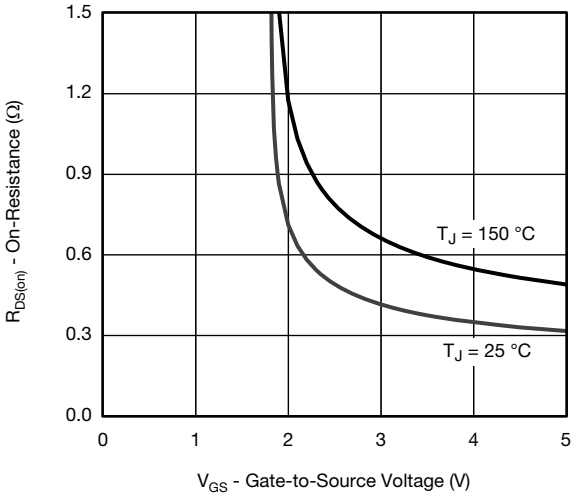
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



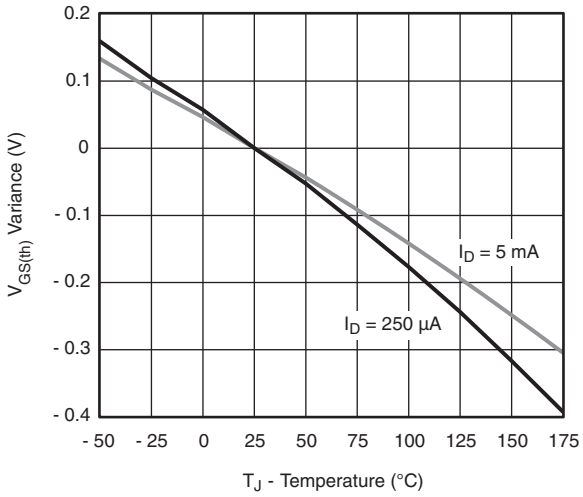
On-Resistance vs. Junction Temperature



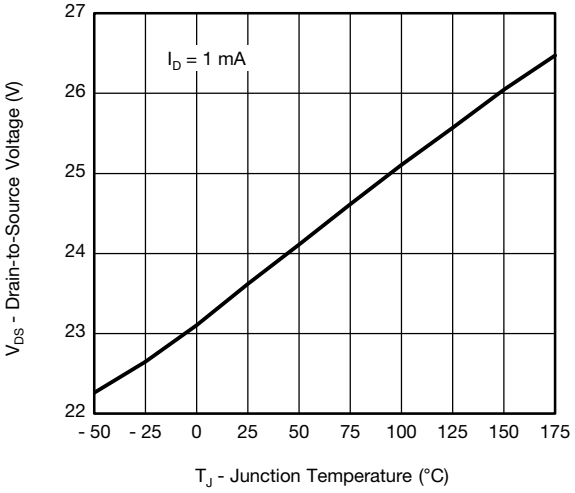
Source-Drain Diode Forward Voltage



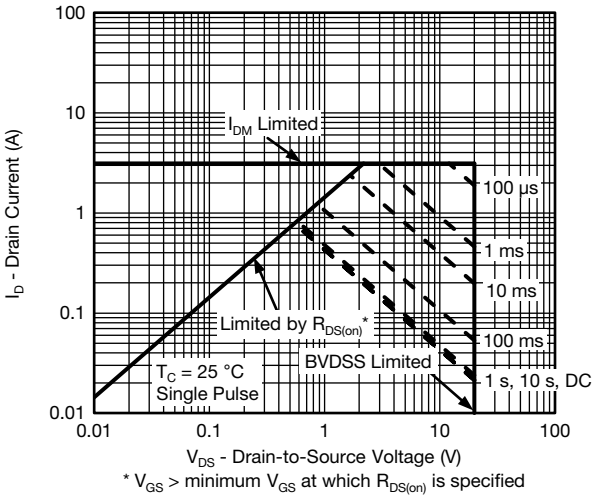
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



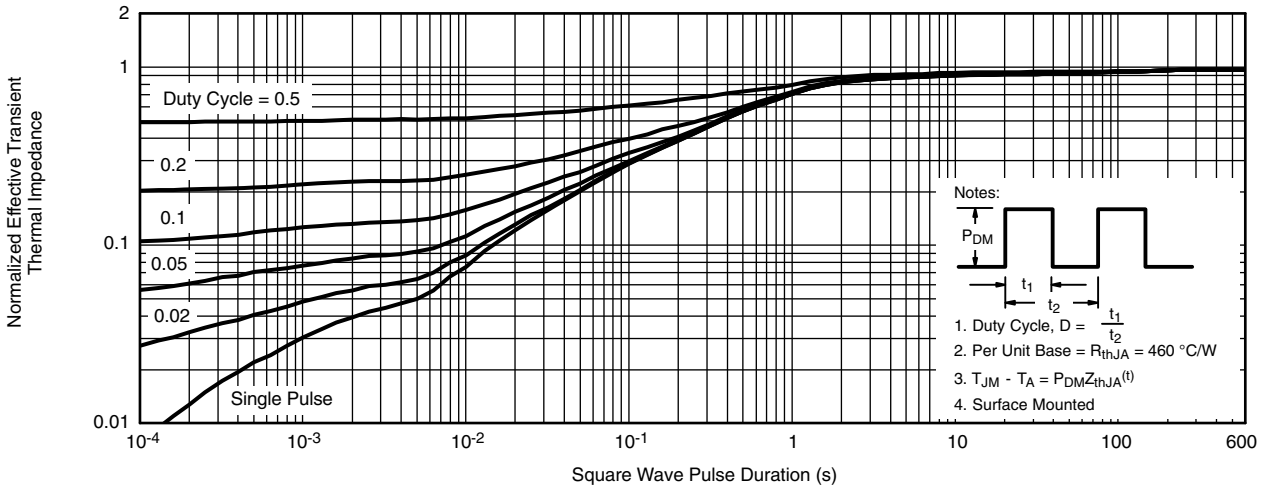
Drain Source Breakdown vs. Junction Temperature



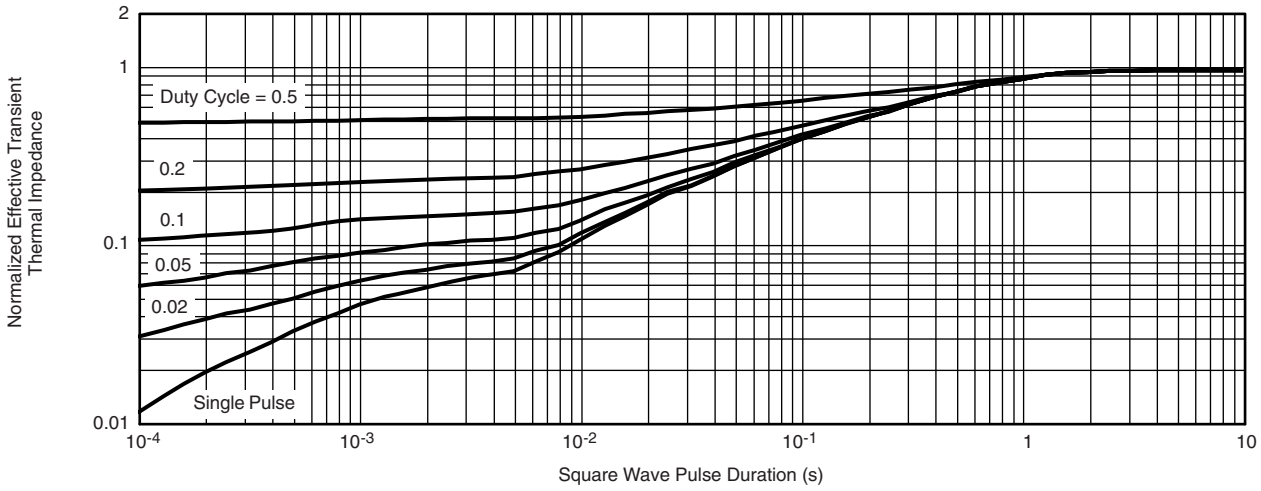
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Foot (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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