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

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	1.30
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	1.90
I_D (A)	0.32
Configuration	Single

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- AEC-Q101 Qualified[d]
- ESD Protection 2000 V
- Compliant to RoHS Directive 2002/95/EC

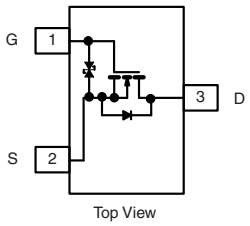
AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

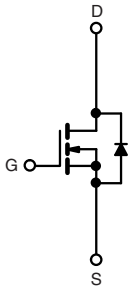
HALOGEN FREE

TO-236
SOT-23



Top View

SQ7002K (8K)*
* Marking Code 8K



N-Channel MOSFET

ORDERING INFORMATION	
Package	SOT-23
Lead (Pb)-free and Halogen-free	SQ7002K-T1-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[a]	T_C = 25 °C	I_D	0.32	A
	T_C = 125 °C		0.24	
Continuous Source Current (Diode Conduction)[a]		I_S	0.32	
Pulsed Drain Current[b]		I_{DM}	0.8	
Maximum Power Dissipation[b]	T_C = 25 °C	P_D	0.5	W
	T_C = 125 °C		0.17	
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}	350	°C/W
Junction-to-Foot (Drain)		R_{thJF}	300	

Notes

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

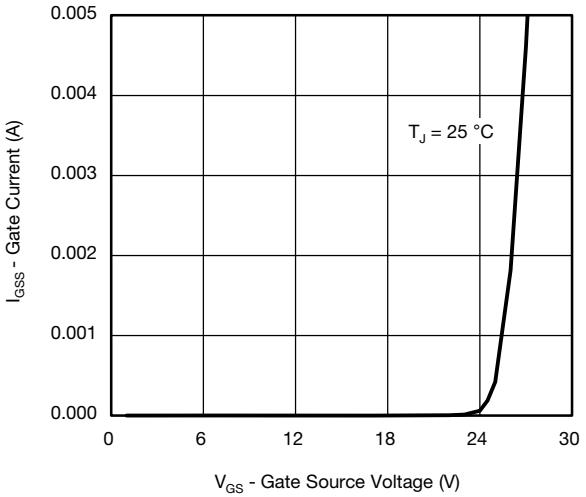
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA		60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		1.0	1.8	2.5	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 50	µA
		V_{DS} = 0 V, V_{GS} = ± 12 V		-	-	± 1	
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	-	-	150	
On-State Drain Current[a]	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} ≥ 5 V	0.5	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 0.5 A	-	1.07	1.30	Ω
		V_{GS} = 10 V	I_D = 0.5 A, T_J = 125 °C	-	-	2.33	
		V_{GS} = 10 V	I_D = 0.5 A, T_J = 175 °C	-	-	2.97	
		V_{GS} = 4.5 V	I_D = 0.2 A	-	1.42	1.90	
Forward Transconductance[b]	g_{fs}	V_{DS} = 10 V, I_D = 0.2 A		-	100	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 30 V, f = 1 MHz	-	19	24	pF
Output Capacitance	C_{oss}			-	4.8	6	
Reverse Transfer Capacitance	C_{rss}			-	2.3	3	
Total Gate Charge[c]	Q_g	V_{GS} = 4.5 V	V_{DS} = 30 V, I_D = 0.25 A	-	0.9	1.4	nC
Gate-Source Charge[c]	Q_{gs}			-	0.3	-	
Gate-Drain Charge[c]	Q_{gd}			-	0.4	-	
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 150 Ω I_D ≅ 0.250 A, V_{GEN} = 4.5 V, R_g = 120 Ω		-	14.6	22	ns
Rise Time[c]	t_r			-	15.3	23	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	8.6	13	
Fall Time[c]	t_f			-	10.6	16	
Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)[b]							
Pulsed Current[a]	I_{SM}			-	-	0.8	A
Forward Voltage	V_{SD}	I_F = 0.2 A, V_{GS} = 0 V		-	0.83	1.2	V

Notes

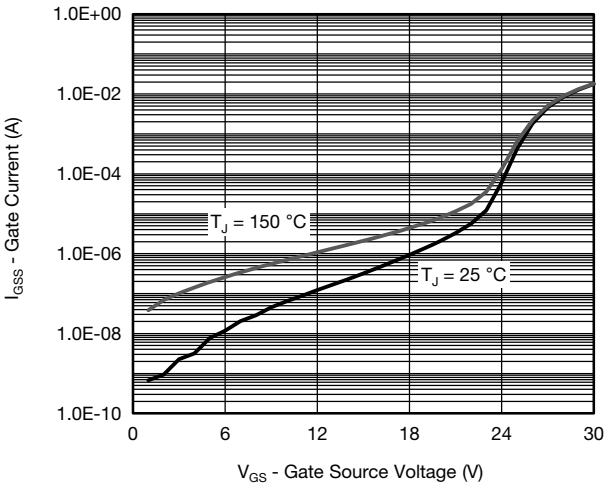
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

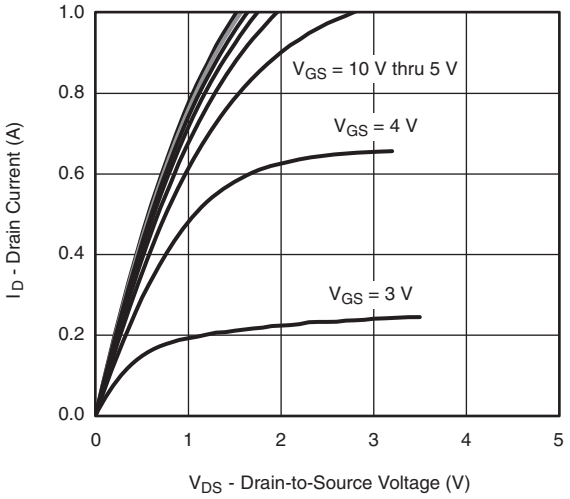
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



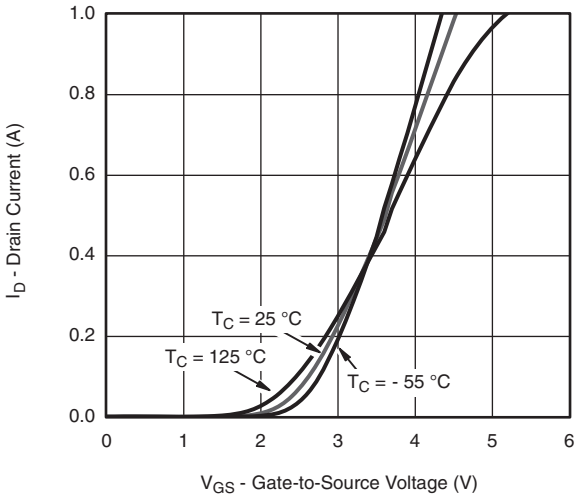
Gate Current vs. Gate-Source Voltage



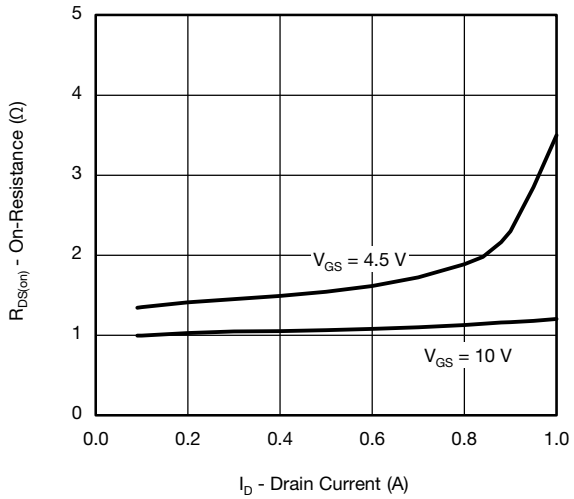
Gate Current vs. Gate-Source Voltage



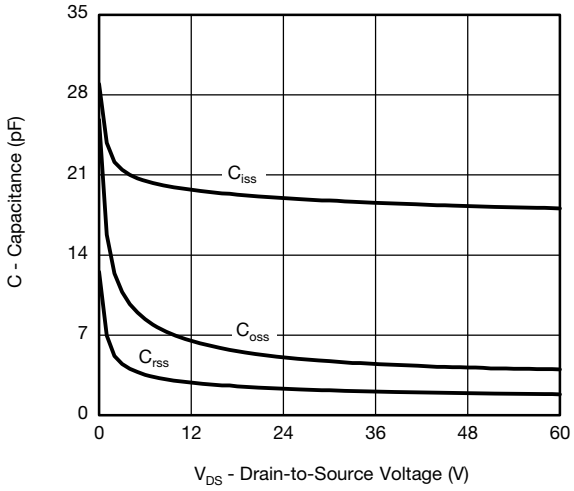
Output Characteristics



Transfer Characteristics

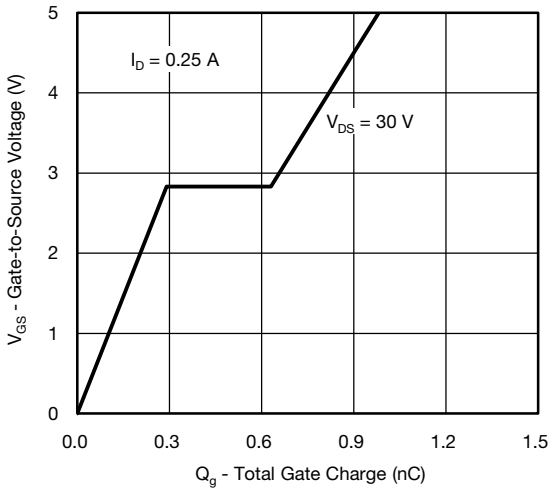


On-Resistance vs. Drain Current

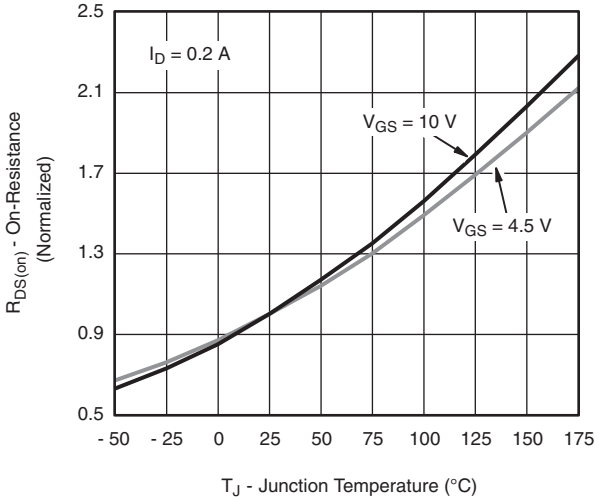


Capacitance

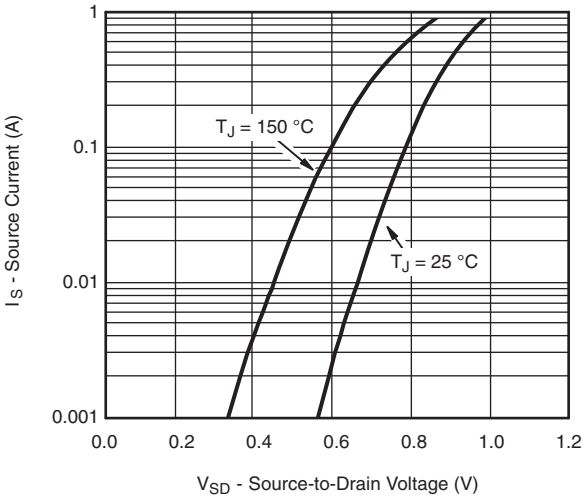
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



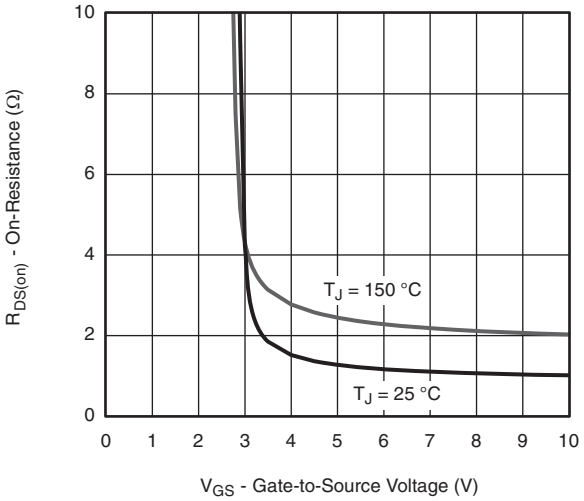
Gate Charge



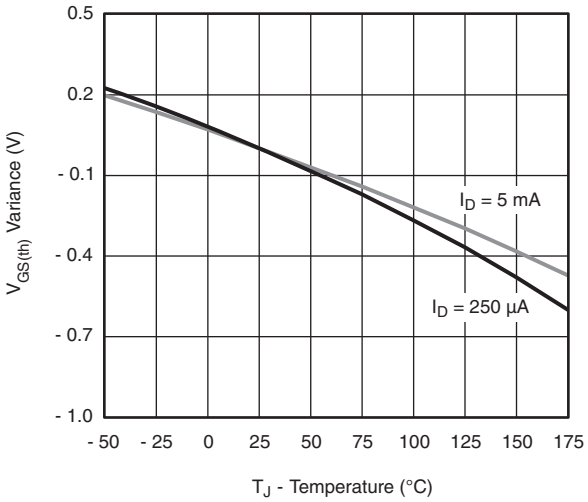
On-Resistance vs. Junction Temperature



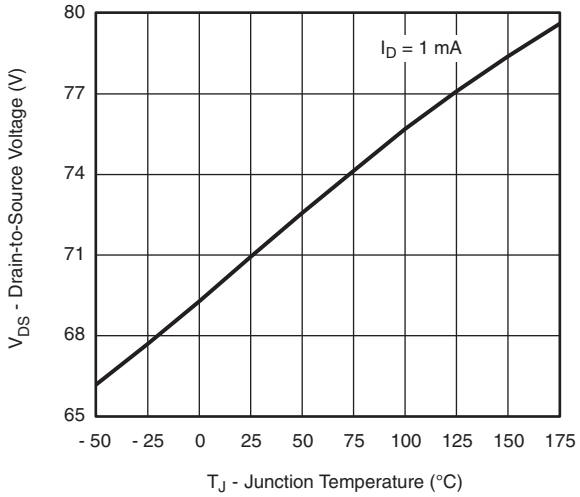
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

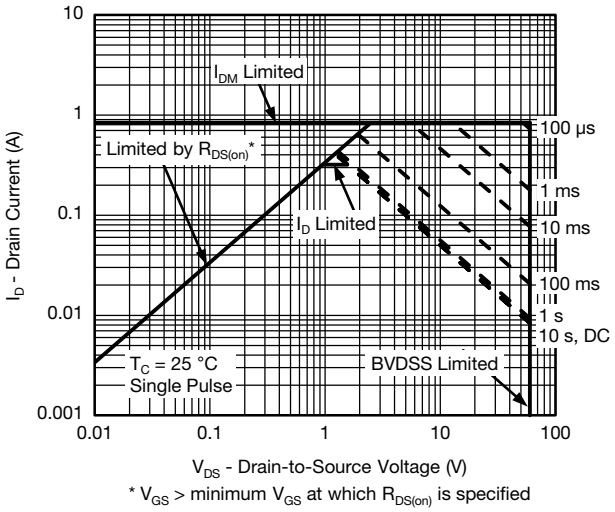


Threshold Voltage

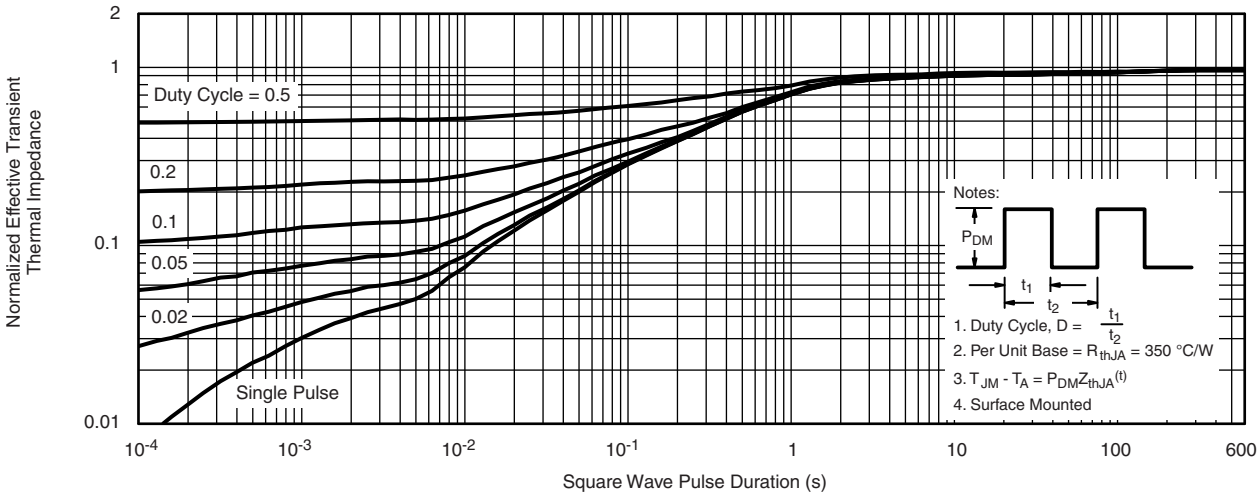


Drain Source Breakdown vs. Junction Temperature

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

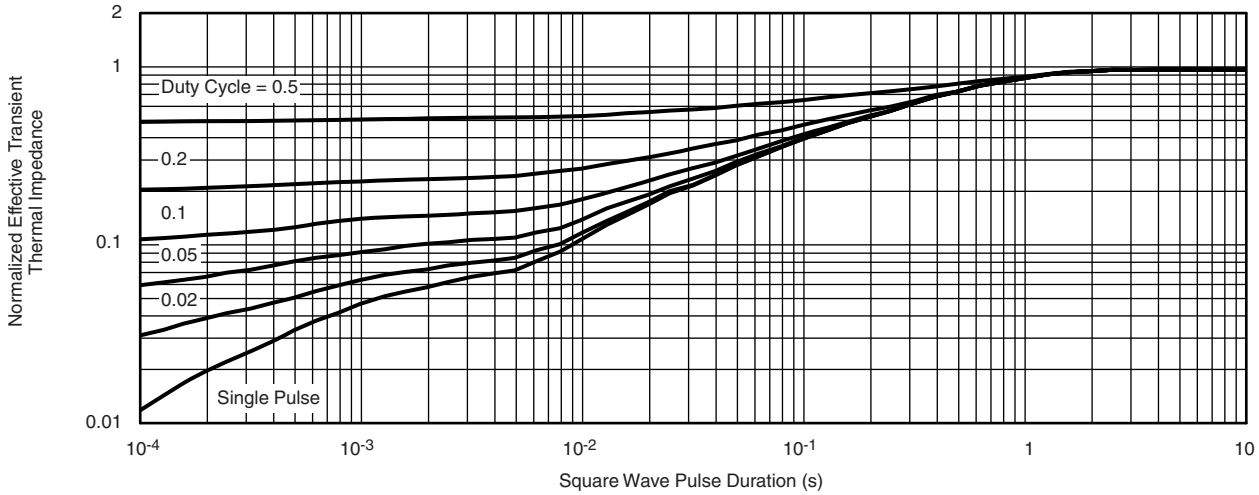


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

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



Normalized Thermal Transient Impedance, Junction-to-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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