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

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.064
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.082
I_D (A) per leg	6
Configuration	Dual
Package	SO-8

FEATURES

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

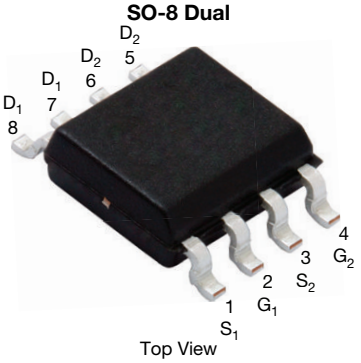
AUTOMOTIVE GRADE

Pb-free

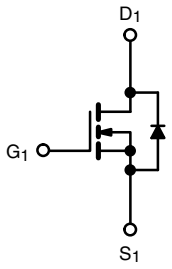
RoHS COMPLIANT

HALOGEN FREE

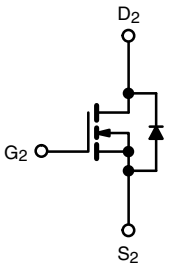
SO-8 Dual



Top View



N-Channel MOSFET



N-Channel MOSFET

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	I_D	5.4	A
	T_C = 125 °C		3.1	
Continuous Source Current (Diode Conduction) [a]		I_S	3.6	
Pulsed Drain Current [b]		I_{DM}	21.5	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	8.5	
Single Pulse Avalanche Energy		E_{AS}	3.6	mJ
Maximum Power Dissipation [b]	T_C = 25 °C	P_D	4	W
	T_C = 125 °C		1.3	
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}	112	°C/W
Junction-to-Foot (Drain)		R_{thJF}	38	

Notes

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

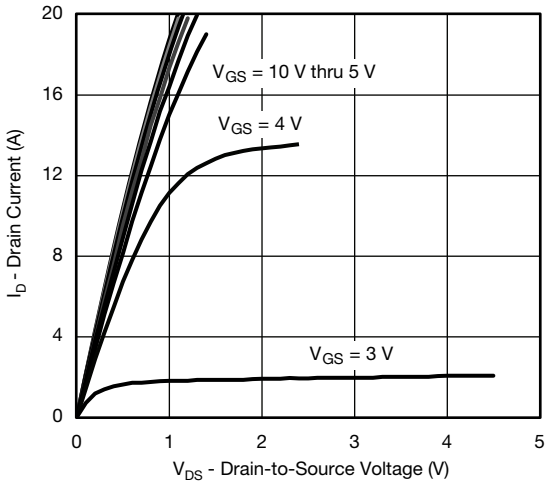
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA		60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		1.5	2	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	-	-	150	
On-State Drain Current [a]	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} ≥ 5 V	20	-	-	A
Drain-Source On-State Resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 3.4 A	-	0.045	0.064	Ω
		V_{GS} = 10 V	I_D = 3.4 A, T_J = 125 °C	-	-	0.110	
		V_{GS} = 10 V	I_D = 3.4 A, T_J = 175 °C	-	-	0.137	
		V_{GS} = 4.5 V	I_D = 3.7 A	-	0.060	0.082	
Forward Transconductance [f]	g_{fs}	V_{DS} = 15 V, I_D = 3.7 A		-	12	-	S
Dynamic [b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	375	470	pF
Output Capacitance	C_{oss}			-	70	88	
Reverse Transfer Capacitance	C_{rss}			-	30	36	
Total Gate Charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = 30 V, I_D = 4.3 A	-	8	12	nC
Gate-Source Charge [c]	Q_{gs}			-	1.2	1.5	
Gate-Drain Charge [c]	Q_{gd}			-	1.7	2.6	
Gate Resistance	R_g	f = 1 MHz		1.1	-	6.66	Ω
Turn-On Delay Time [c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 8.8 Ω I_D ≅ 3.4 A, V_{GEN} = 10 V, R_g = 1 Ω		-	6	9	ns
Rise Time [c]	t_r			-	2.8	4.2	
Turn-Off Delay Time [c]	$t_{d(off)}$			-	17	26	
Fall Time [c]	t_f			-	1.7	3	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed Current [a]	I_{SM}			-	-	21.5	A
Forward Voltage	V_{SD}	I_F = 2 A, V_{GS} = 0 V		-	0.75	1.1	V

Notes

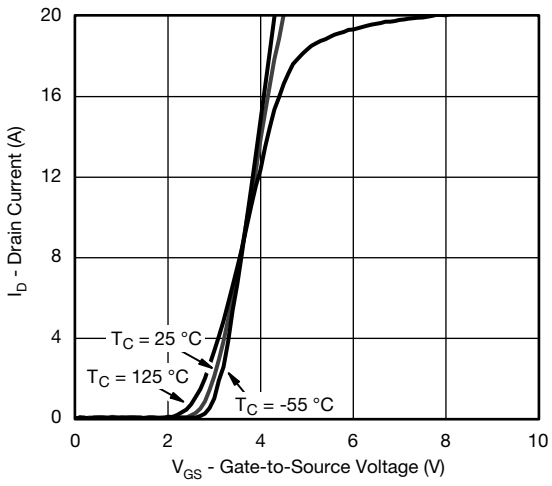
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

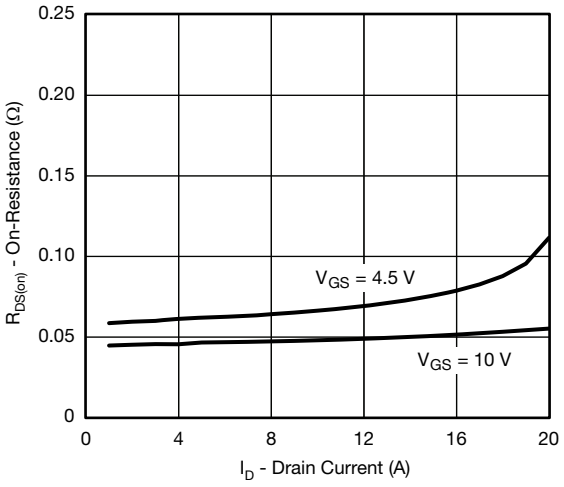
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



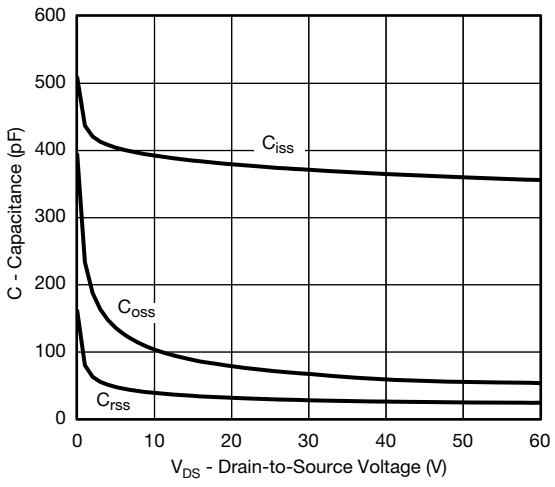
Output Characteristics



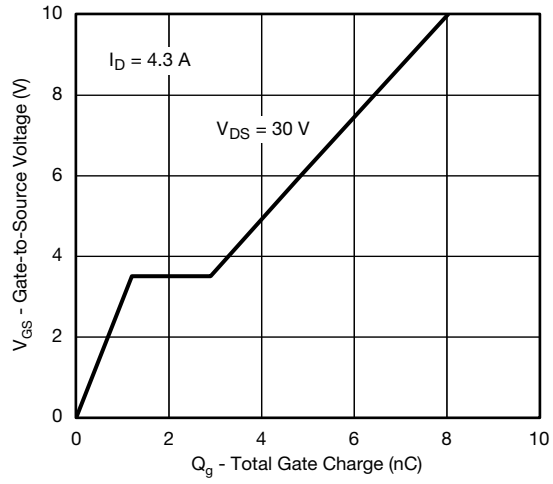
Transfer Characteristics



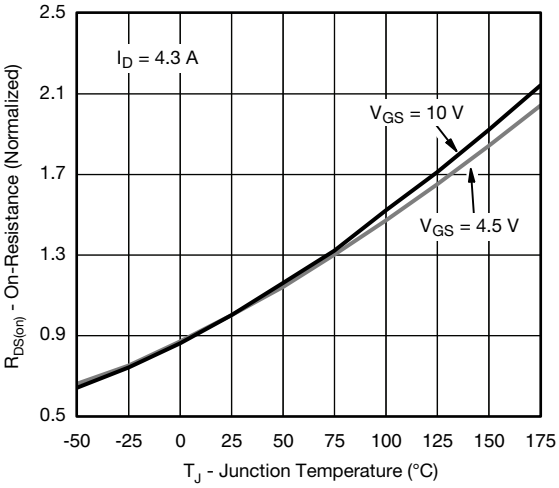
On-Resistance vs. Drain Current



Capacitance

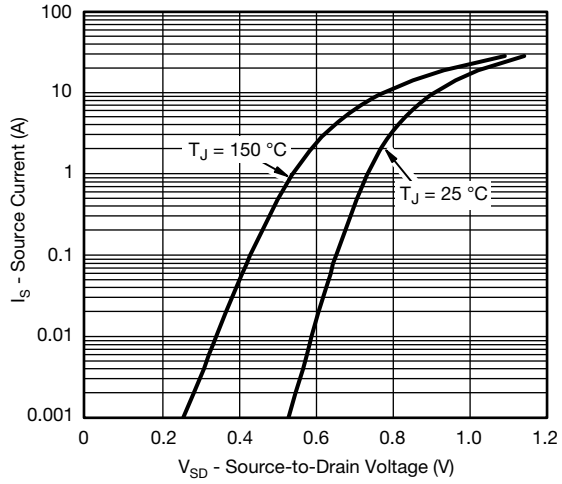


Gate Charge

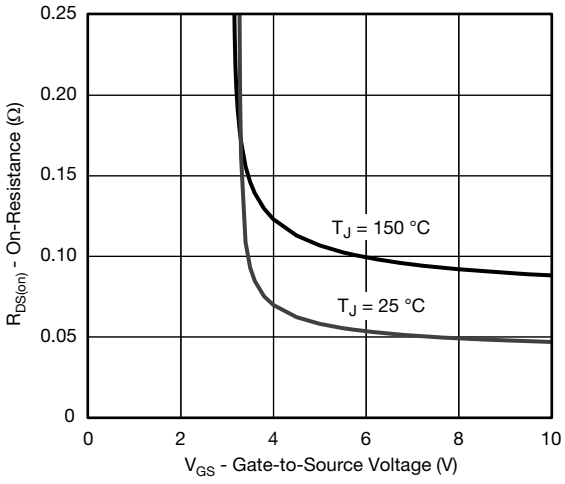


On-Resistance vs. Junction Temperature

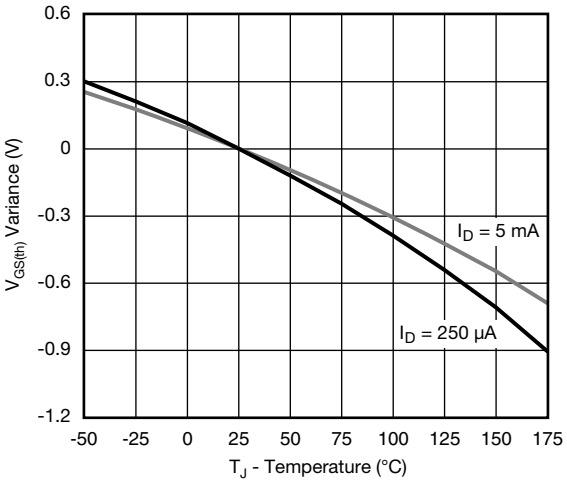
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



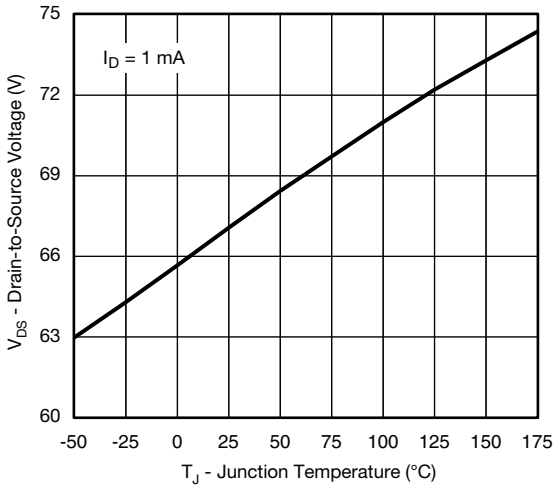
Source Drain Diode Forward Voltage



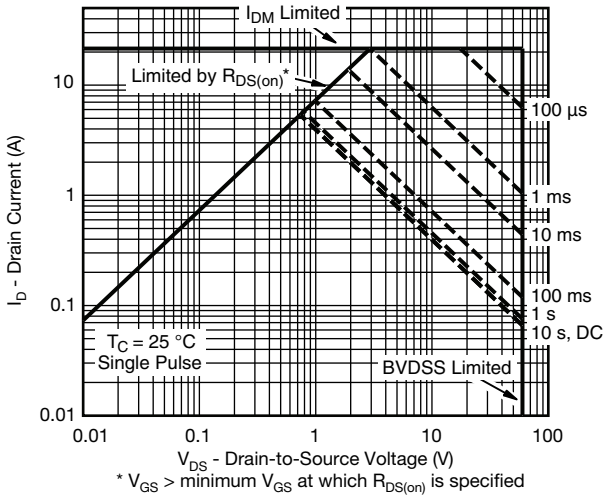
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

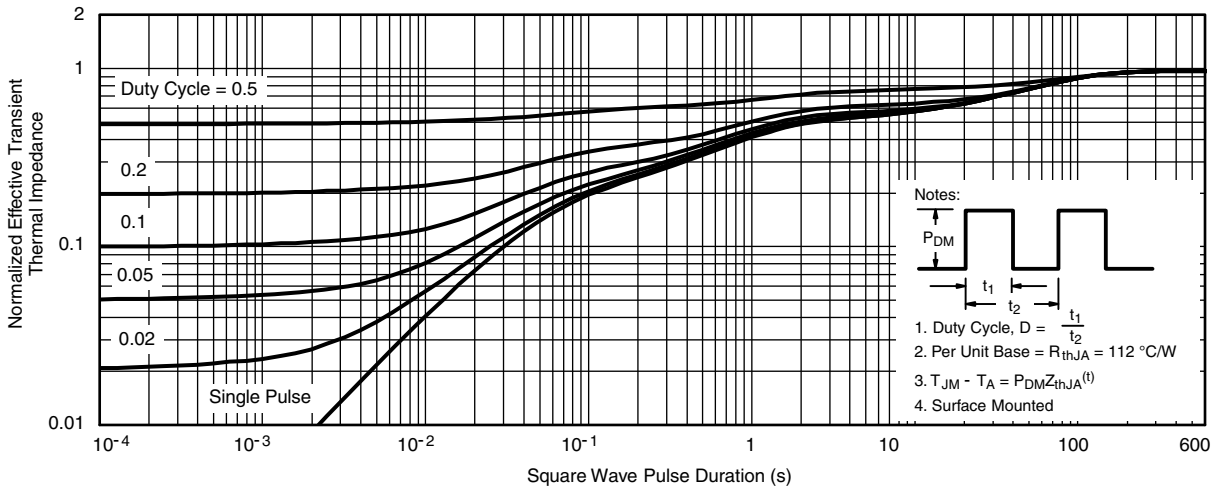


Drain Source Breakdown vs. Junction Temperature

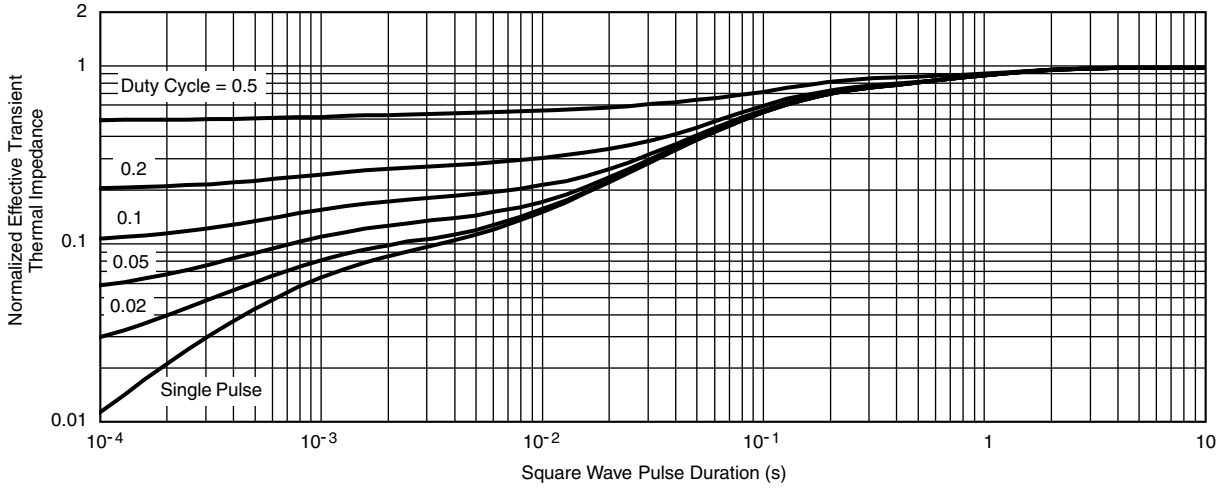


Safe Operating Area

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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REVISION HISTORY [a]		
REVISION	DATE	DESCRIPTION OF CHANGE
D	04-Aug-15	• Revised R_g minimum limit

Note

a. As of April 2014

SO-8

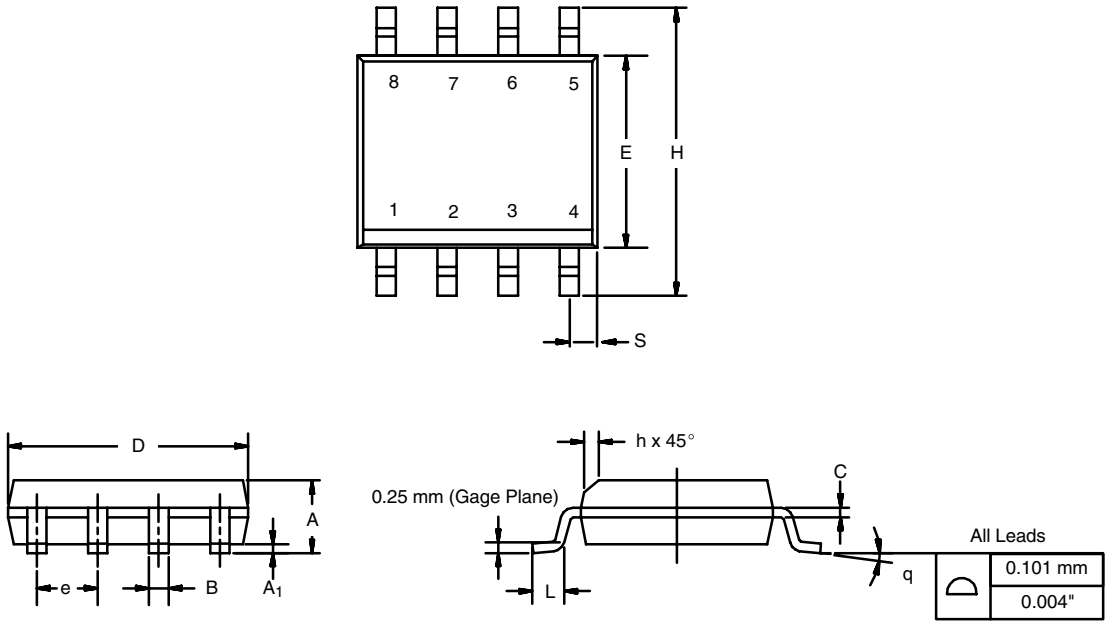
Ordering codes for the SQ rugged series power MOSFETs in the SO-8 package:

DATASHEET PART NUMBER	OLD ORDERING CODE [a]	NEW ORDERING CODE
SQ4005EY	-	**SQ4005EY-T1_GE3**
SQ4050EY	SQ4050EY-T1-GE3	**SQ4050EY-T1_GE3**
SQ4182EY	SQ4182EY-T1-GE3	**SQ4182EY-T1_GE3**
SQ4184EY	SQ4184EY-T1-GE3	**SQ4184EY-T1_GE3**
SQ4282EY	SQ4282EY-T1-GE3	**SQ4282EY-T1_GE3**
SQ4284EY	SQ4284EY-T1-GE3	**SQ4284EY-T1_GE3**
SQ4401EY	SQ4401EY-T1-GE3	**SQ4401EY-T1_GE3**
SQ4410EY	SQ4410EY-T1-GE3	**SQ4410EY-T1_GE3**
SQ4425EY	SQ4425EY-T1-GE3	**SQ4425EY-T1_GE3**
SQ4431EY	SQ4431EY-T1-GE3	**SQ4431EY-T1_GE3**
SQ4435EY	SQ4435EY-T1-GE3	**SQ4435EY-T1_GE3**
SQ4470EY	SQ4470EY-T1-GE3	**SQ4470EY-T1_GE3**
SQ4483BEEY	SQ4483BEEY-T1-GE3	**SQ4483BEEY-T1_GE3**
SQ4483EY	-	**SQ4483EY-T1_GE3**
SQ4532AEY	-	**SQ4532AEY-T1_GE3**
SQ4840EY	SQ4840EY-T1-GE3	**SQ4840EY-T1_GE3**
SQ4850EY	SQ4850EY-T1-GE3	**SQ4850EY-T1_GE3**
SQ4917EY	SQ4917EY-T1-GE3	**SQ4917EY-T1_GE3**
SQ4920EY	SQ4920EY-T1-GE3	**SQ4920EY-T1_GE3**
SQ4937EY	SQ4937EY-T1-GE3	**SQ4937EY-T1_GE3**
SQ4940AEY	SQ4940AEY-T1-GE3	**SQ4940AEY-T1_GE3**
SQ4946AEY	SQ4946AEY-T1-GE3	**SQ4946AEY-T1_GE3**
SQ4949EY	SQ4949EY-T1-GE3	**SQ4949EY-T1_GE3**
SQ4961EY	SQ4961EY-T1-GE3	**SQ4961EY-T1_GE3**
SQ9407EY	SQ9407EY-T1-GE3	**SQ9407EY-T1_GE3**
SQ9945BEY	SQ9945BEY-T1-GE3	**SQ9945BEY-T1_GE3**

Note

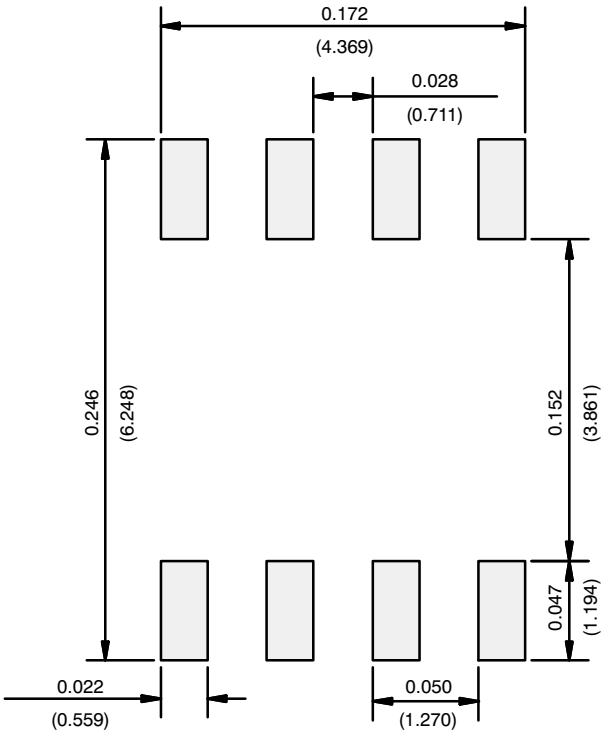
a. Old ordering code is obsolete and no longer valid for new orders

SOIC (NARROW): 8-LEAD
JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A_1	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06 DWG: 5498				

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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