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	0.140
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.200
I_D (A)	1.6
Configuration	Single

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- AEC-Q101 Qualified[d]
- 100 % R_g Tested
- Typical ESD Protection: 800 V
- Compliant to RoHS Directive 2002/95/EC

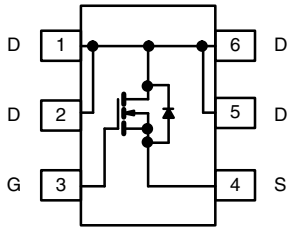
AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

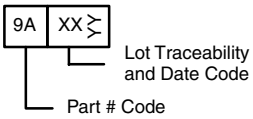
HALOGEN FREE

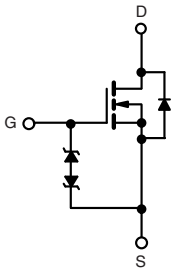
SOT-363
SC-70 (6-LEADS)



Top View

Marking Code





N-Channel MOSFET

ORDERING INFORMATION	
Package	SC-70
Lead (Pb)-free and Halogen-free	SQ1420EEH-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	1.6	A
	T_C = 125 °C		1.6	
Continuous Source Current (Diode Conduction)[a]		I_S	1.6	
Pulsed Drain Current[b]		I_{DM}	6.7	
Maximum Power Dissipation[b]	T_C = 25 °C	P_D	3.3	W
	T_C = 125 °C		1.1	
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}	125	°C/W
Junction-to-Foot (Drain)		R_{thJF}	45	

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.

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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, 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} = ± 12 V		-	-	± 500	nA
		V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	1	mA
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	1	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 1.2 A	-	0.100	0.140	Ω
		V_{GS} = 10 V	I_D = 1.2 A, T_J = 125 °C	-	-	0.245	
		V_{GS} = 10 V	I_D = 1.2 A, T_J = 175 °C	-	-	0.308	
		V_{GS} = 4.5 V	I_D = 1 A	-	0.152	0.200	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 1 A		-	2.9	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	172	215	pF
Output Capacitance	C_{oss}			-	36	45	
Reverse Transfer Capacitance	C_{rss}			-	24	30	
Total Gate Charge[c]	Q_g	V_{GS} = 4.5 V	V_{DS} = 30 V, I_D = 2.8 A	-	2.7	4	nC
Gate-Source Charge[c]	Q_{gs}			-	0.7	-	
Gate-Drain Charge[c]	Q_{gd}			-	1.4	-	
Gate Resistance	R_g	f = 1 MHz		1.1	1.6	2.1	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 30 Ω I_D ≅ 1 A, V_{GEN} = 4.5 V, R_g = 1 Ω		-	12	18	ns
Rise Time[c]	t_r			-	21	32	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	8	12	
Fall Time[c]	t_f			-	7	11	
Source-Drain Diode Ratings and Characteristics[b]							
Pulsed Current[a]	I_{SM}			-	-	6.7	A
Forward Voltage	V_{SD}	I_F = 0.8 A, V_{GS} = 0		-	0.8	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.

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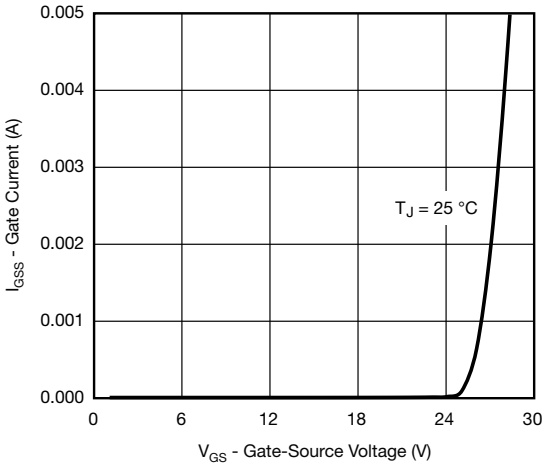
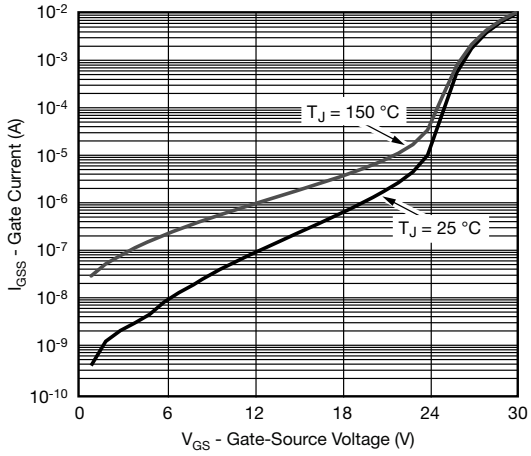
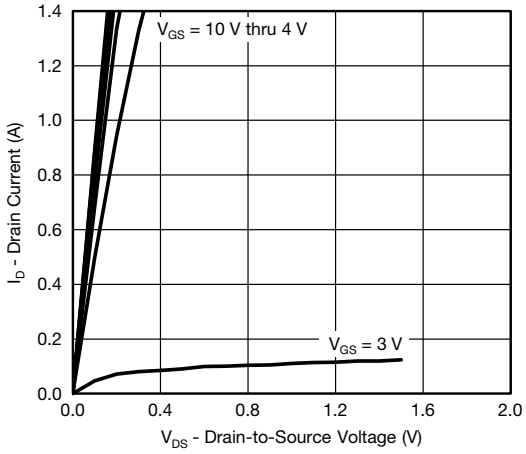


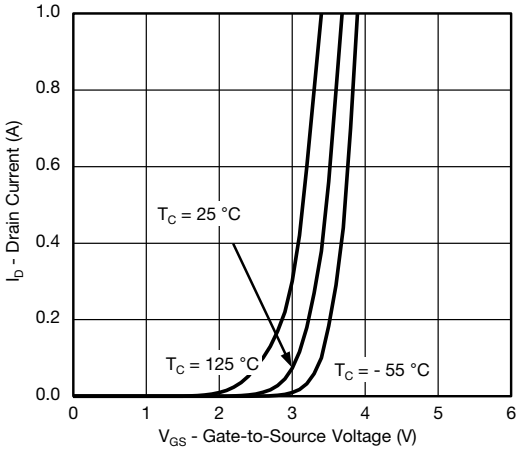
Gate Current vs. Gate-Source Voltage



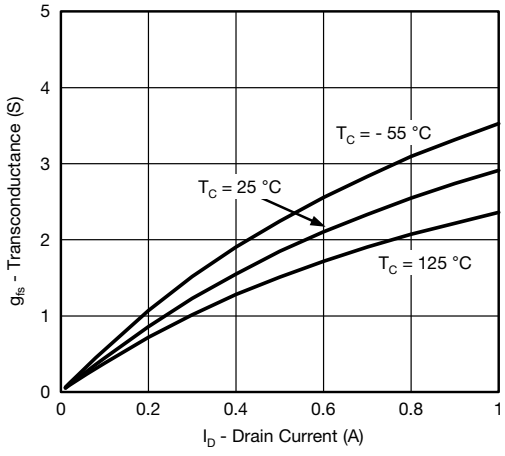
Gate Current vs. Gate-Source Voltage



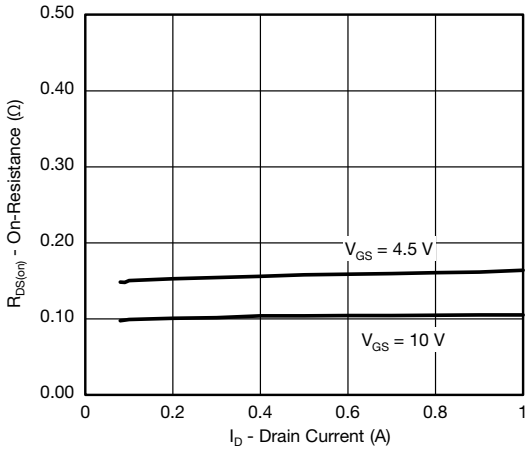
Output Characteristics



Transfer Characteristics



Transconductance



On-Resistance vs. Drain Current

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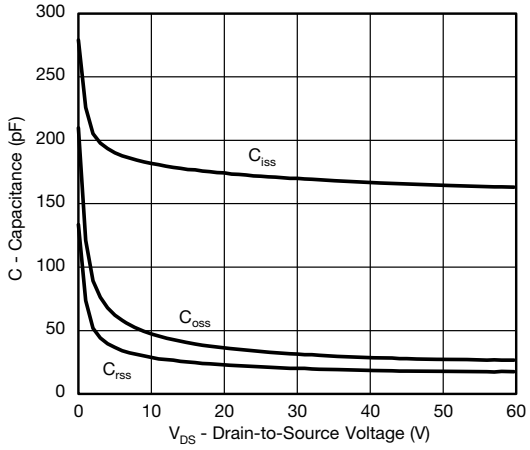
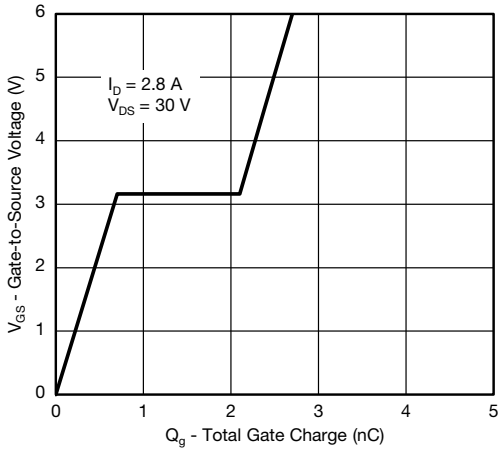
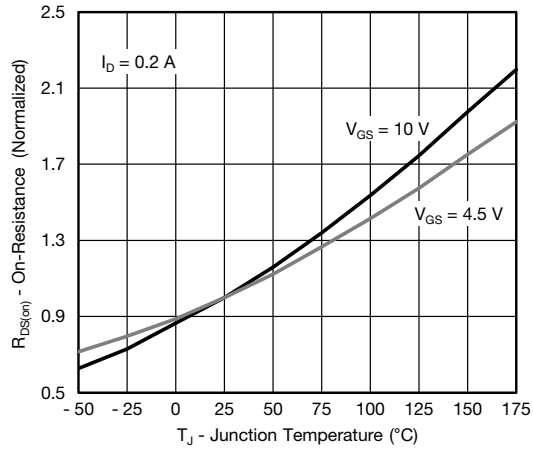


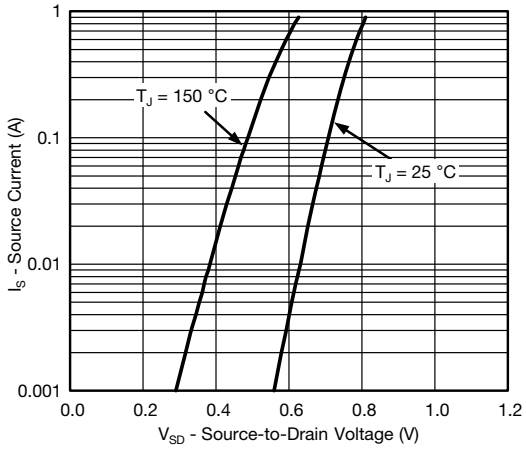
Capacitance



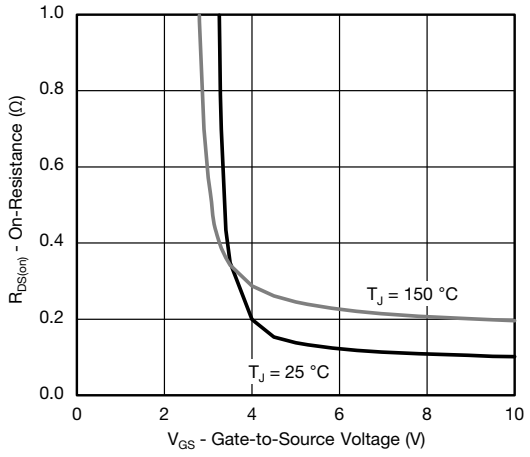
Gate Charge



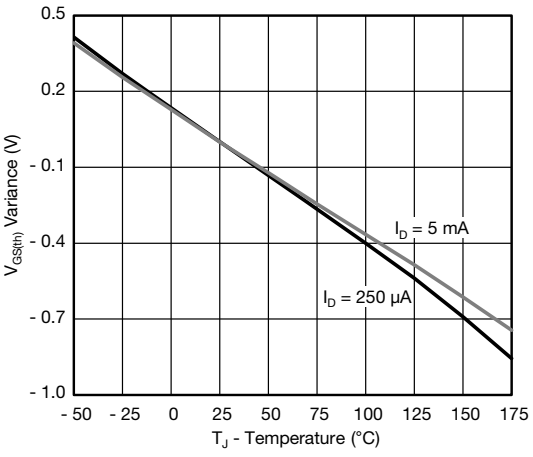
On-Resistance vs. Junction Temperature



Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

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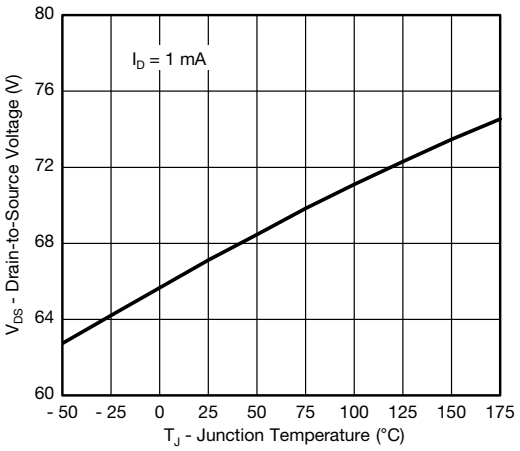
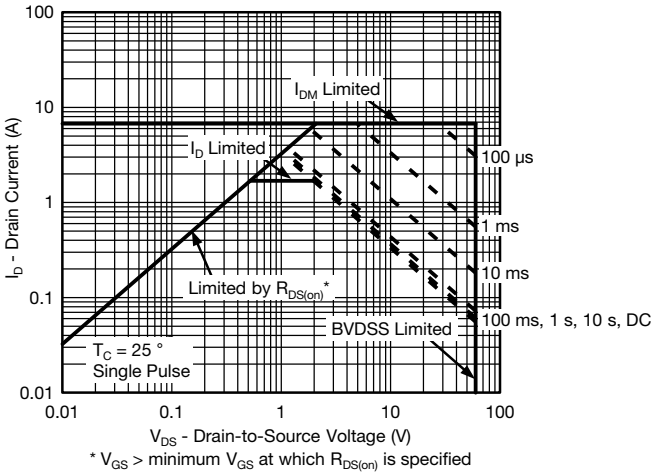
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



Drain Source Breakdown vs. Junction Temperature



Safe Operating Area

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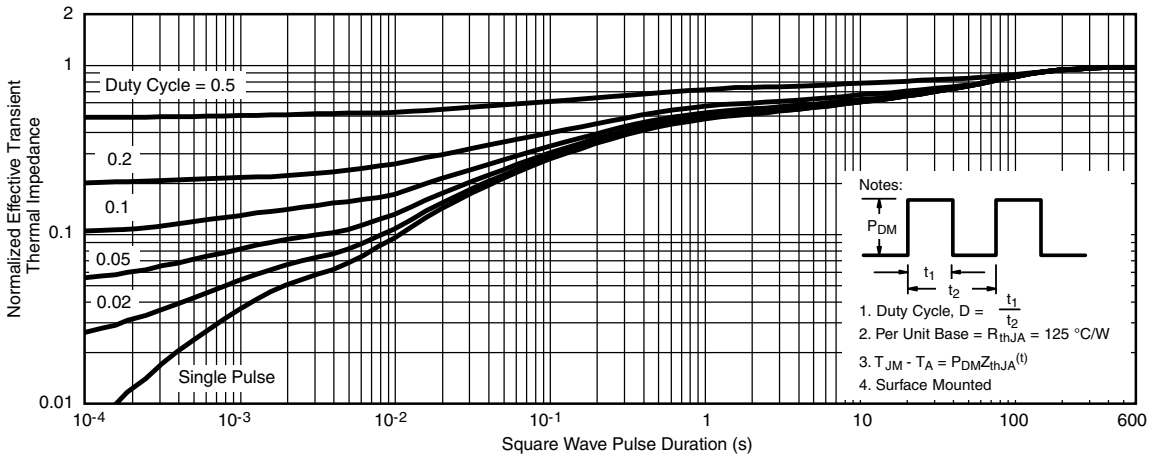
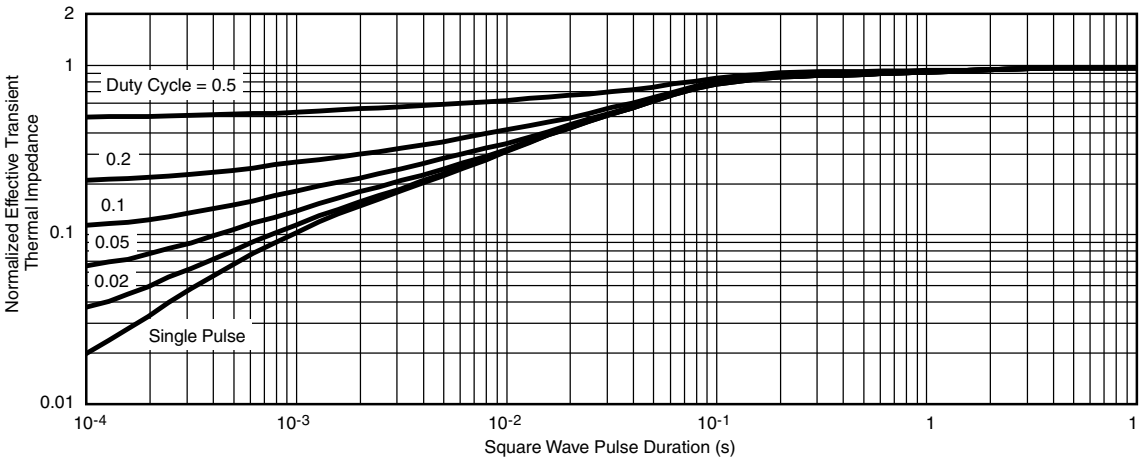
THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



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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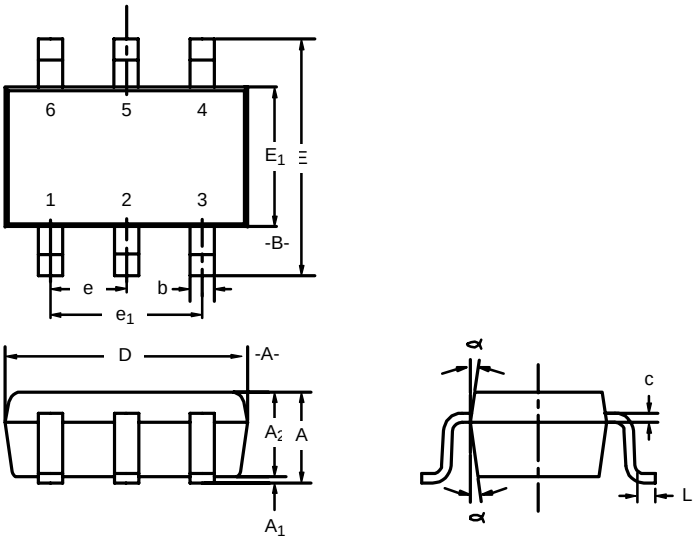
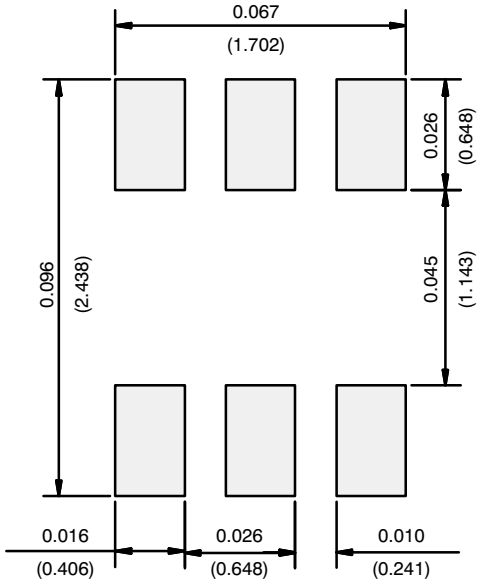
SC-70: 6-LEADS



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.90	–	1.10	0.035	–	0.043
A_1	–	–	0.10	–	–	0.004
A_2	0.80	–	1.00	0.031	–	0.039
b	0.15	–	0.30	0.006	–	0.012
c	0.10	–	0.25	0.004	–	0.010
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.80	2.10	2.40	0.071	0.083	0.094
E_1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65BSC			0.026BSC		
e_1	1.20	1.30	1.40	0.047	0.051	0.055
L	0.10	0.20	0.30	0.004	0.008	0.012
α	7°Nom			7°Nom		

ECN: S-03946—Rev. B, 09-Jul-01
DWG: 5550

RECOMMENDED MINIMUM PADS FOR SC-70: 6-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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