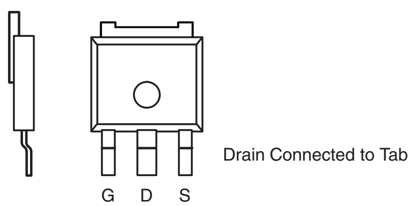
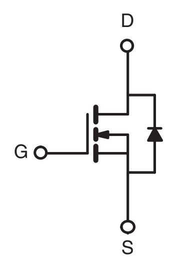
Automotive N-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.0076
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.009
I_D (A)	50
Configuration	Single

TO-252
Reverse Lead DPAK



Top View



N-Channel MOSFET

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- 100 % R_g and UIS Tested
- AEC-Q101 Qualified[d]
- Compliant to RoHS Directive 2002/95/EC

AUTOMOTIVE GRADE
RoHS COMPLIANT
HALOGEN FREE

ORDERING INFORMATION	
Package	TO-252 Reverse Lead DPAK
Lead (Pb)-free and Halogen-free	SQR50N06-07L-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	50	A
	T_C = 125 °C		50	
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	mJ
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
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.

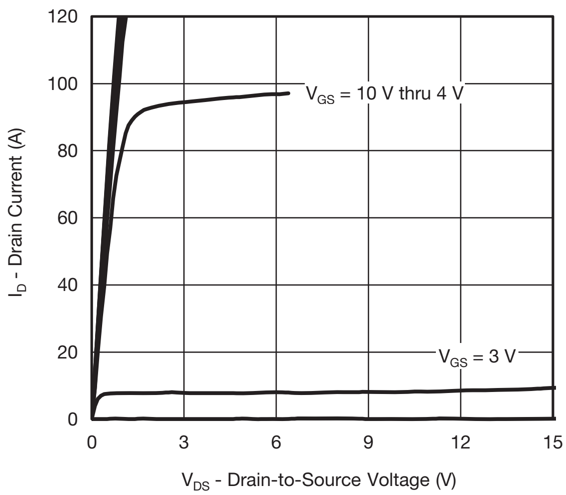
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA		60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA		1.5	2.0	2.5	
Gate-Source 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	-	-	1.0	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	$V_{DS} \geq$ 5 V	50	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 20 A	-	0.0064	0.0076	Ω
		V_{GS} = 10 V	I_D = 20 A, T_J = 125 °C	-	-	0.0130	
		V_{GS} = 10 V	I_D = 20 A, T_J = 175 °C	-	-	0.0160	
		V_{GS} = 4.5 V	I_D = 20 A	-	0.0078	0.0090	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		-	82	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	4455	5570	pF
Output Capacitance	C_{oss}			-	407	510	
Reverse Transfer Capacitance	C_{rss}			-	223	280	
Total Gate Charge[c]	Q_g	V_{GS} = 10 V	V_{DS} = 30 V, I_D = 50 A	-	80	120	nC
Gate-Source Charge[c]	Q_{gs}			-	11.1	-	
Gate-Drain Charge[c]	Q_{gd}			-	15.7	-	
Gate Resistance	R_g	f = 1 MHz		1	2	3	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 0.6 Ω $I_D \cong$ 50 A, V_{GEN} = 10 V, R_g = 1 Ω		-	12	18	ns
Rise Time[c]	t_r			-	13	20	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	42	63	
Fall Time[c]	t_f			-	7	11	
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		-	0.85	1.5	V

Notes

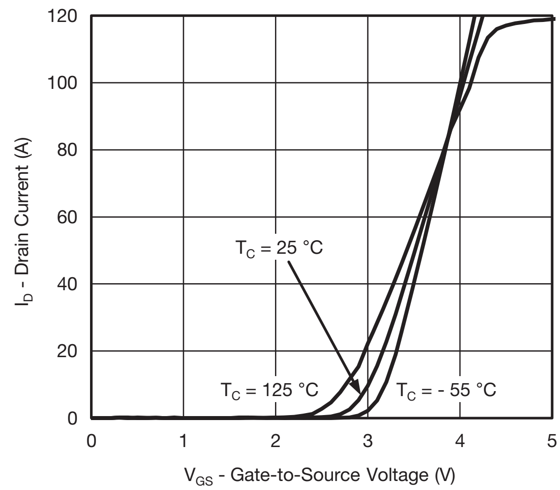
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

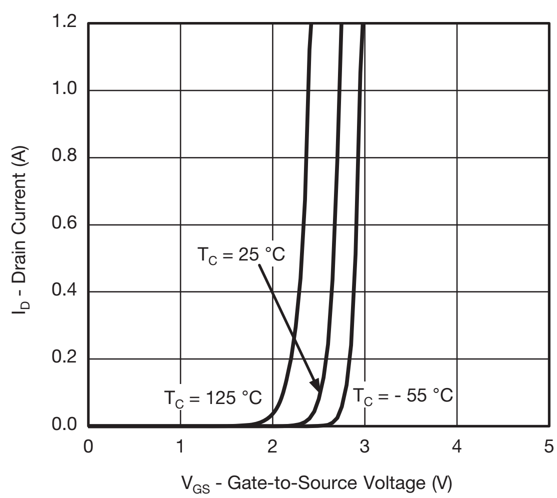
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



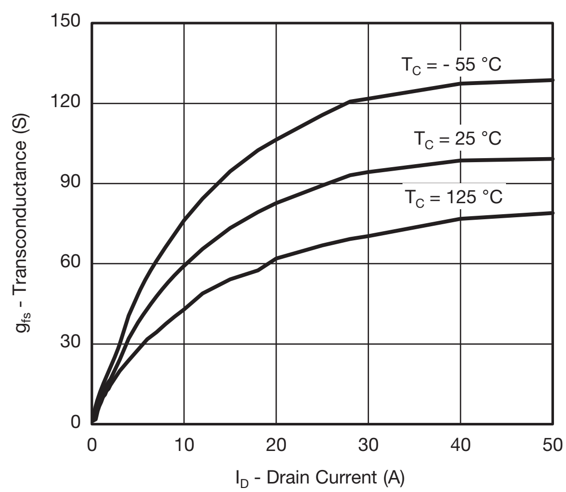
Output Characteristics



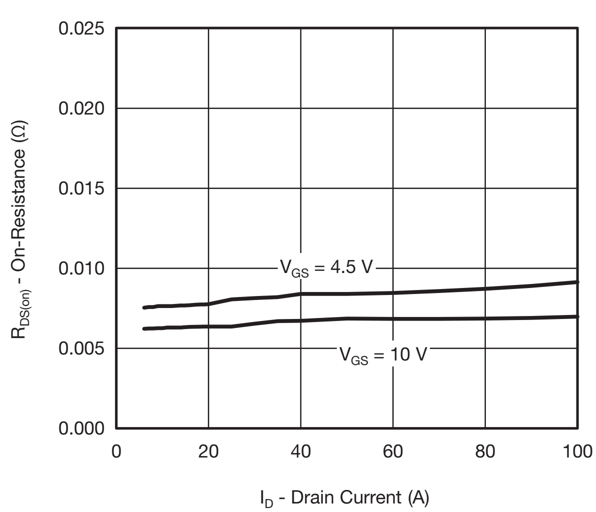
Transfer Characteristics



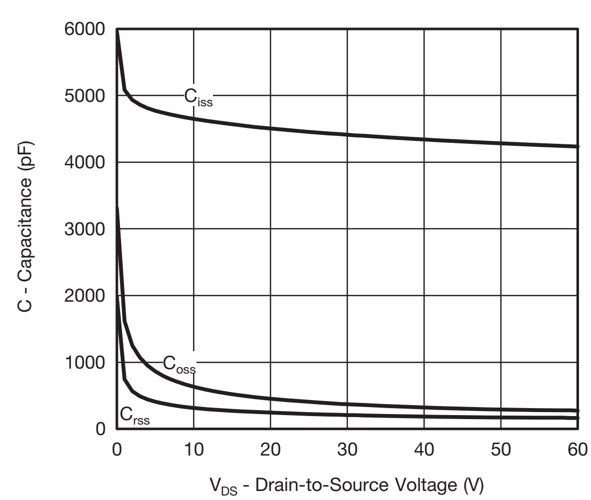
Transfer Characteristics



Transconductance

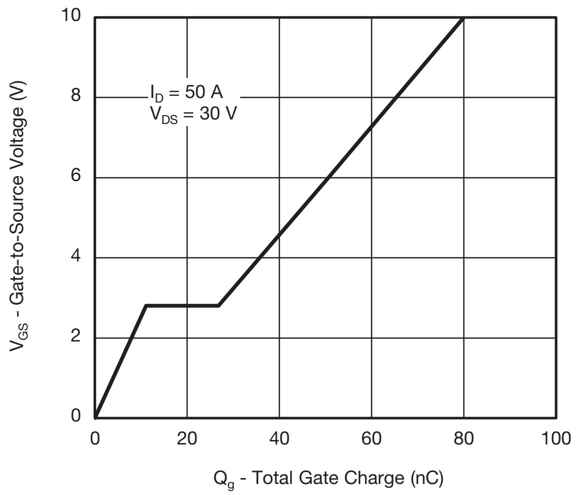


On-Resistance vs. Drain Current

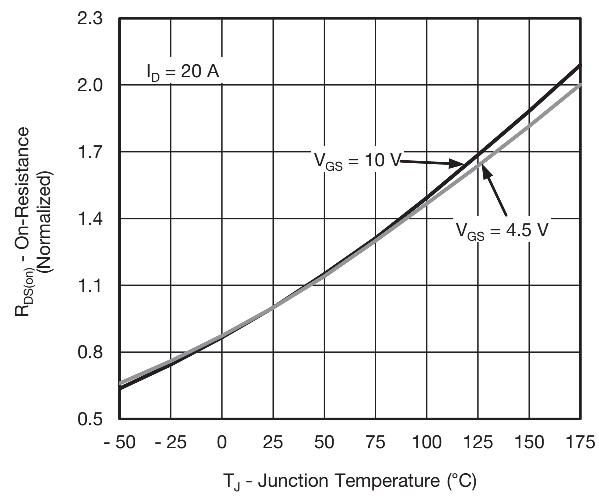


Capacitance

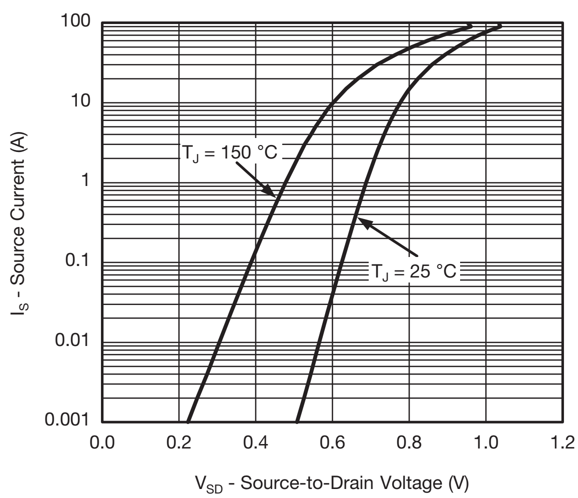
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



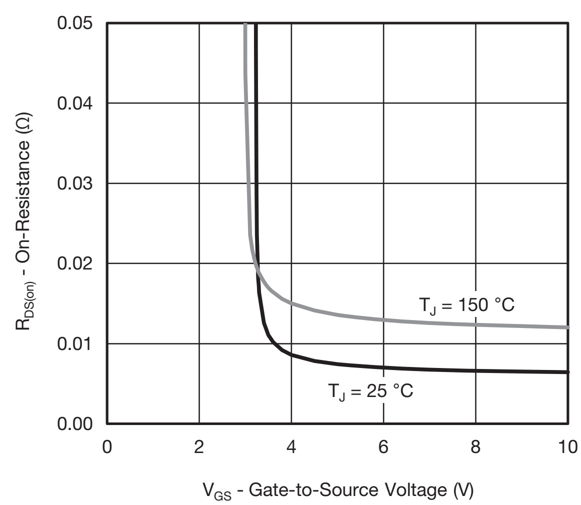
Gate Charge



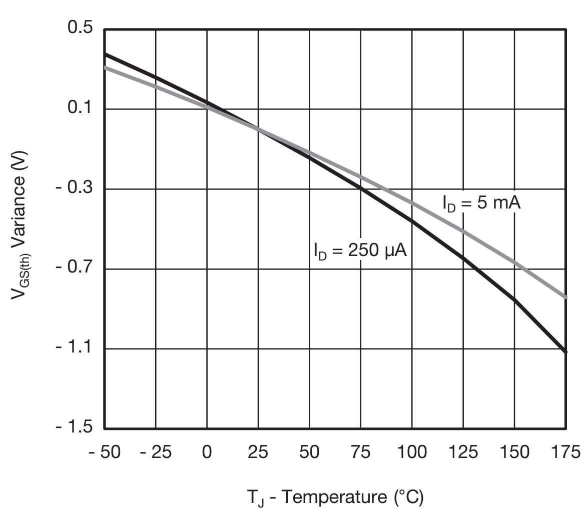
On-Resistance vs. Junction Temperature



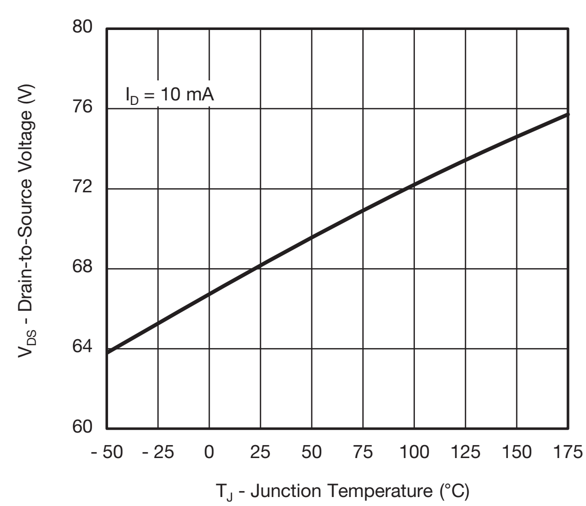
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

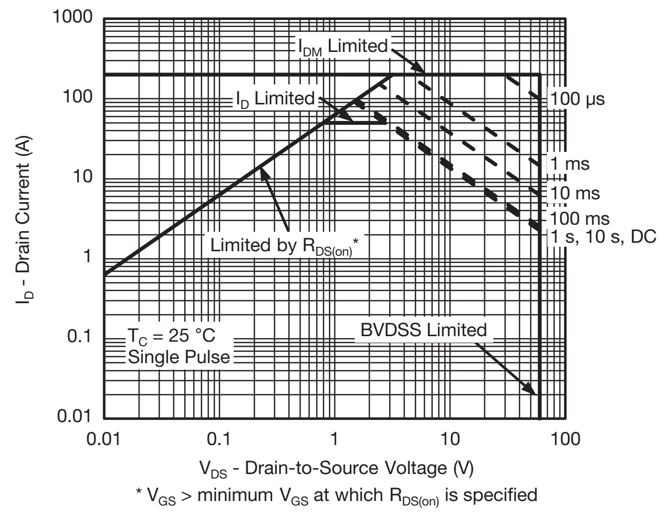


Threshold Voltage

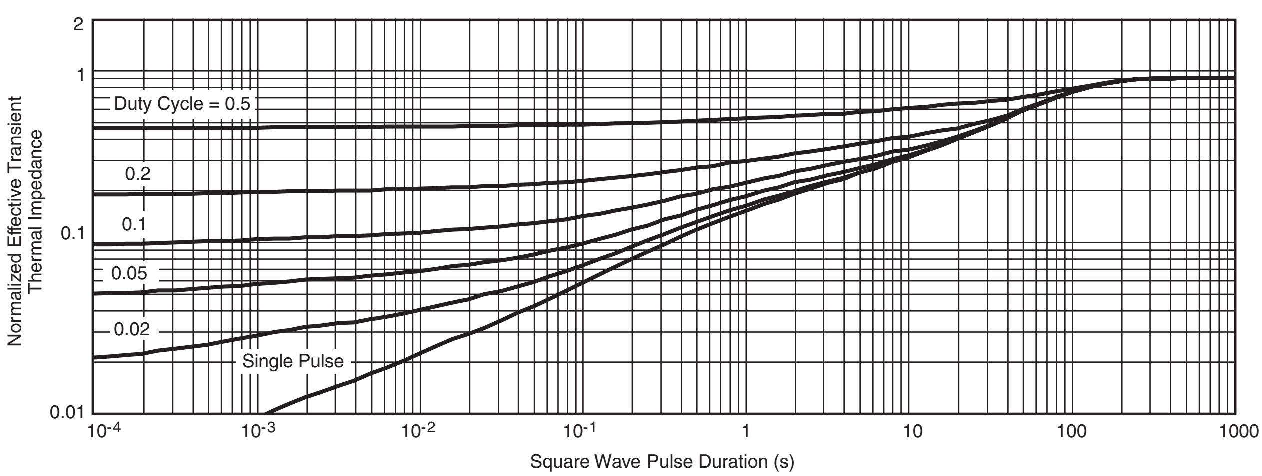


Drain Source Breakdown vs. Junction Temperature

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

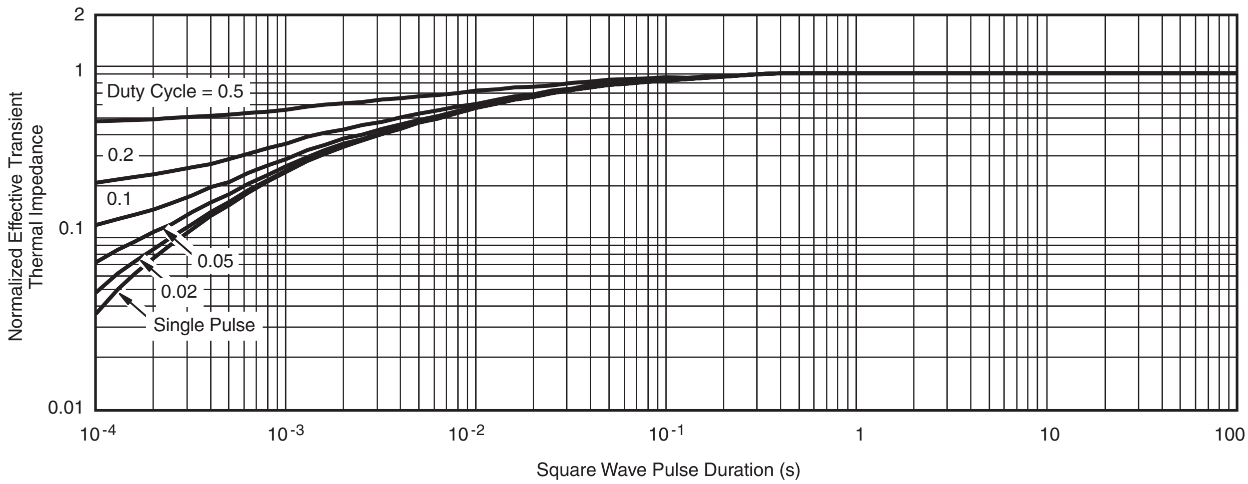


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

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



Normalized Thermal Transient Impedance, Junction-to-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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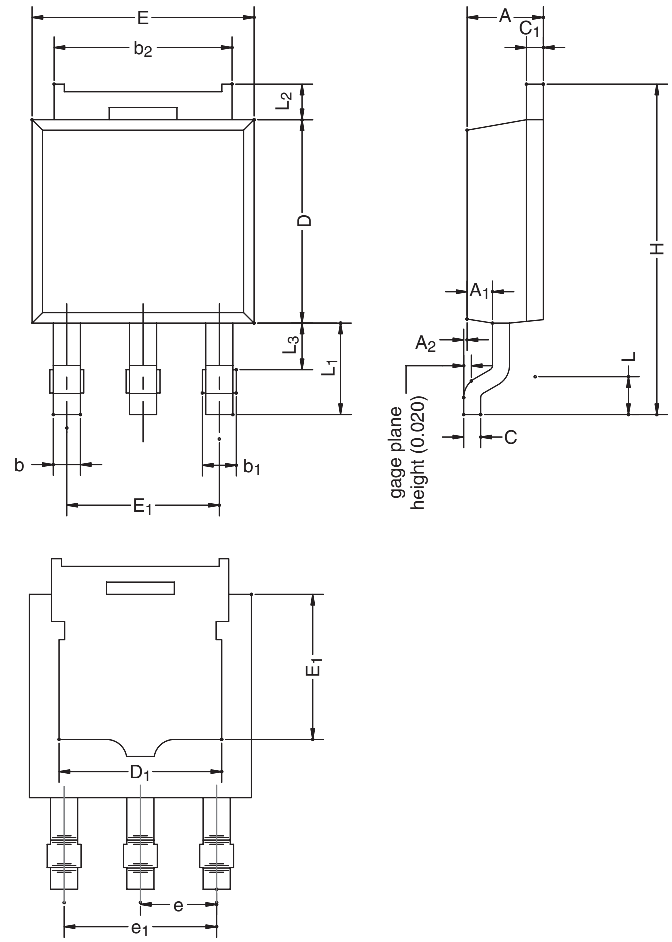
TO-252 REVERSE LEAD CASE OUTLINE



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.23	2.33	0.088	0.092
A_1	0.64	0.89	0.025	0.035
A_2	0.03	0.23	0.001	0.009
b	0.71	0.88	0.028	0.035
b_1	0.76	1.14	0.030	0.045
b_2	5.23	5.44	0.206	0.214
C	0.46	0.58	0.018	0.023
C_1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
D_1	4.49	5.00	0.177	0.197
E	6.48	6.73	0.255	0.265
E_1	4.32	-	0.170	-
e	2.28 BSC		0.090 BSC	
e_1	4.57 BSC		0.180 BSC	
H	9.65	10.41	0.380	0.410
L	1.40	1.78	0.055	0.070
L_1	2.74 BSC		0.108 BSC	
L_2	0.89	1.27	0.035	0.050
L_3	1.15	1.52	0.040	0.060
ECN: T-08706-Rev. B, 29-Sep-08 DWG: 5894				

Note

Dimension L_3 for reference only.

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