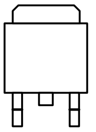
Automotive N-Channel 55 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	55
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.006
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.010
I_D (A)	110
Configuration	Single

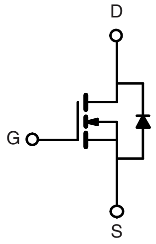
FEATURES

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

TO-263



Top View



N-Channel MOSFET

ORDERING INFORMATION	
Package	TO-263
Lead (Pb)-free and Halogen-free	SQM110N05-06L-GE3

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	55	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current	T_C = 25 °C	I_D	110	A
	T_C = 125 °C		64	
Continuous Source Current (Diode Conduction)		I_S	120	
Pulsed Drain Current[a]		I_{DM}	443	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	61	
Single Pulse Avalanche Energy		E_{AS}	186	mJ
Maximum Power Dissipation[a]	T_C = 25 °C	P_D	157	W
	T_C = 125 °C		52	
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}	40	°C/W
Junction-to-Case (Drain)		R_{thJC}	0.95	

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)

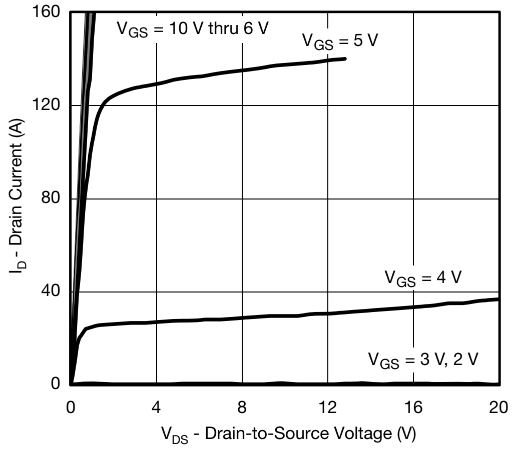
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$, $I_D = 250$ µA		55	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ µA		1.5	2.0	2.5	
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0$ V	$V_{DS} = 55$ V	-	-	1.0	µA
		$V_{GS} = 0$ V	$V_{DS} = 55$ V, $T_J = 125$ °C	-	-	50	
		$V_{GS} = 0$ V	$V_{DS} = 55$ V, $T_J = 175$ °C	-	-	150	
On-State Drain Current[a]	$I_{D(on)}$	$V_{GS} = 10$ V	$V_{DS} \geq 5$ V	120	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	$V_{GS} = 10$ V	$I_D = 30$ A	-	0.0047	0.006	Ω
		$V_{GS} = 10$ V	$I_D = 30$ A, $T_J = 125$ °C	-	-	0.0105	
		$V_{GS} = 10$ V	$I_D = 30$ A, $T_J = 175$ °C	-	-	0.0132	
		$V_{GS} = 4.5$ V	$I_D = 20$ A	-	0.008	0.010	
Forward Transconductance[b]	g_{fs}	$V_{DS} = 15$ V, $I_D = 30$ A		-	90	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	$V_{GS} = 0$ V	$V_{DS} = 25$ V, f = 1 MHz	-	3550	4440	pF
Output Capacitance	C_{oss}			-	610	765	
Reverse Transfer Capacitance	C_{rss}			-	288	360	
Total Gate Charge[c]	Q_g	$V_{GS} = 10$ V	$V_{DS} = 28$ V, $I_D = 110$ A	-	73	110	nC
Gate-Source Charge[c]	Q_{gs}			-	14.5	-	
Gate-Drain Charge[c]	Q_{gd}			-	16.8	-	
Gate Resistance	R_g	f = 1 MHz		0.62	1.2	1.85	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	$V_{DD} = 28$ V, $R_L = 0.25$ Ω $I_D \cong 110$ A, $V_{GEN} = 10$ V, $R_g = 2.5$ Ω		-	12	18	ns
Rise Time[c]	t_r			-	13	20	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	37	56	
Fall Time[c]	t_f			-	13	20	
Source-Drain Diode Ratings and Characteristics[b]							
Pulsed Current[a]	I_{SM}			-	-	443	A
Forward Voltage	V_{SD}	$I_F = 85$ A, $V_{GS} = 0$		-	0.9	1.5	V

Notes

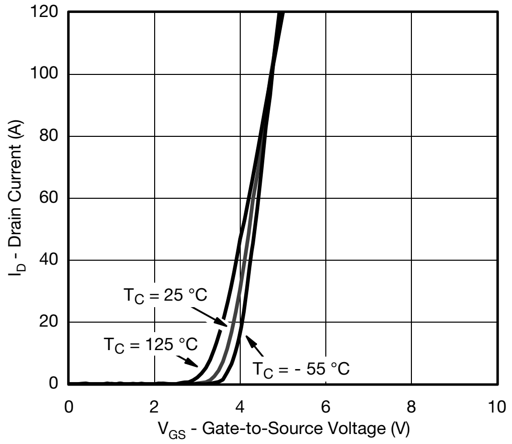
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

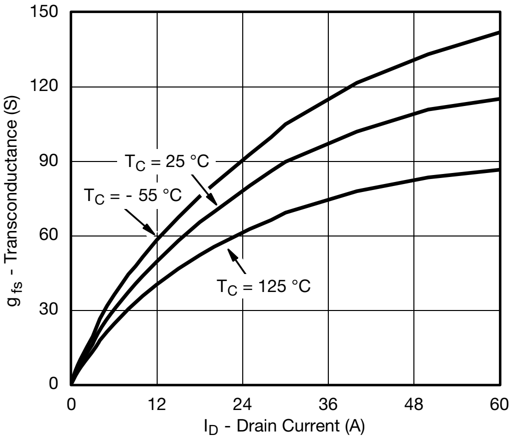
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



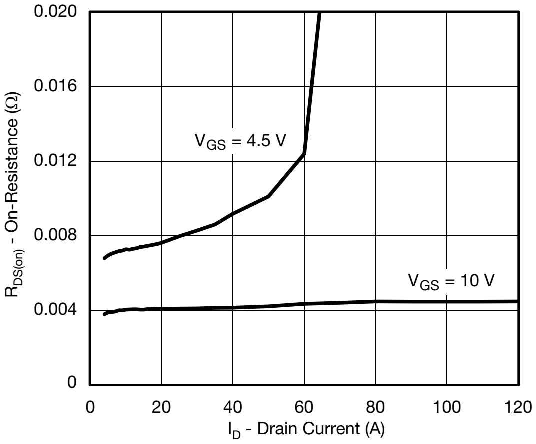
Output Characteristics



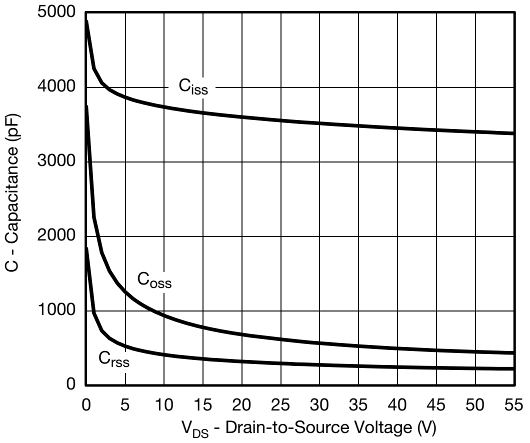
Transfer Characteristics



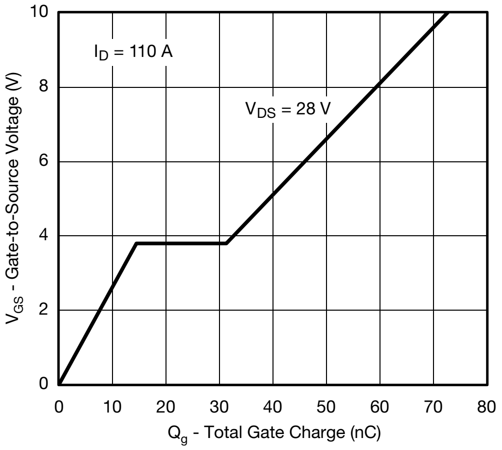
Transconductance



On-Resistance vs. Drain Current

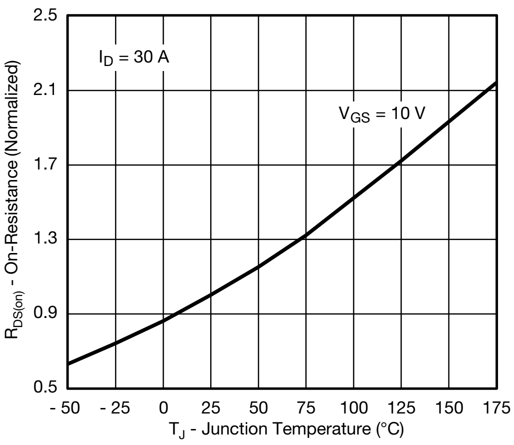


Capacitance

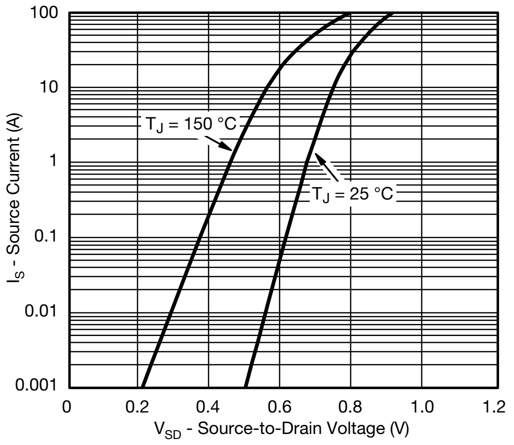


Gate Charge

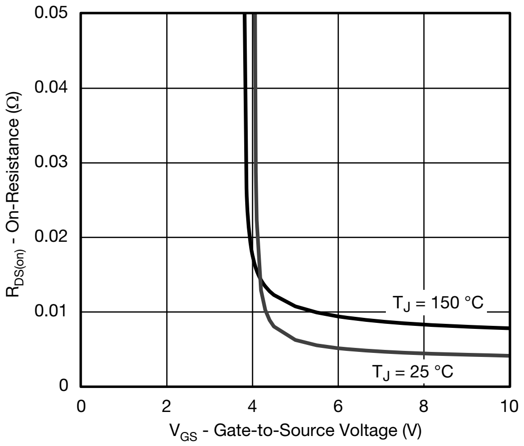
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



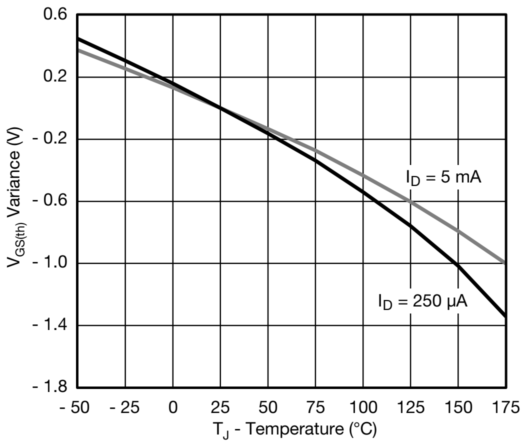
On-Resistance vs. Junction Temperature



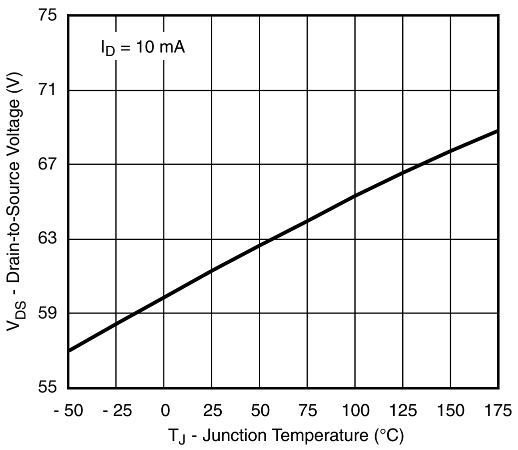
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

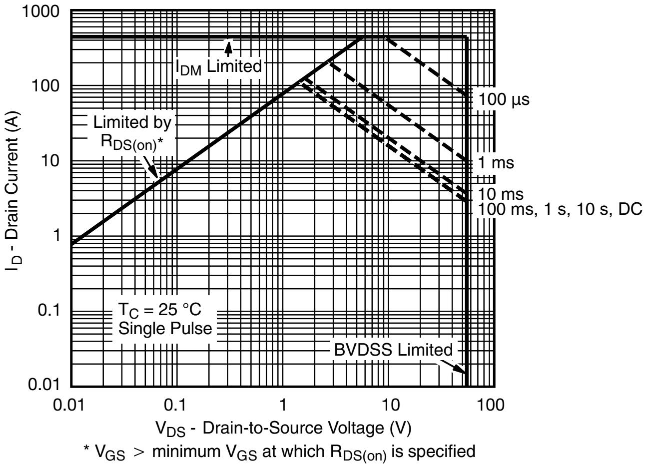


Threshold Voltage

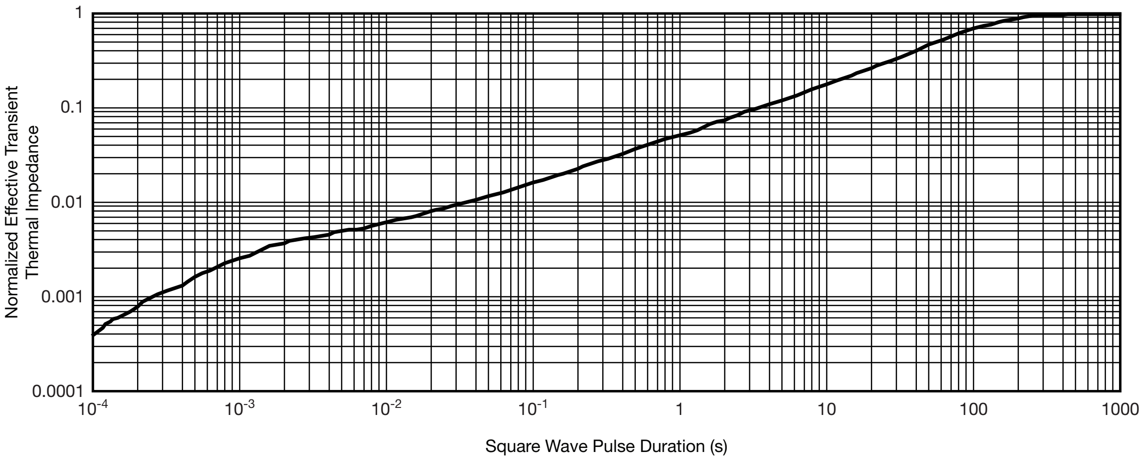


Drain Source Breakdown vs. Junction Temperature

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

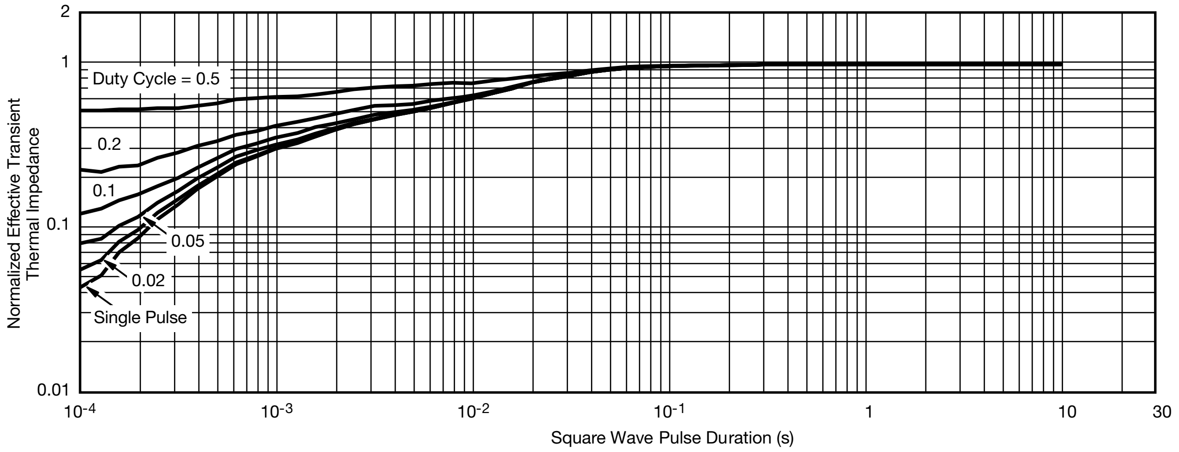


Safe Operating Area



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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D²PAK / TO-263 and TO-262

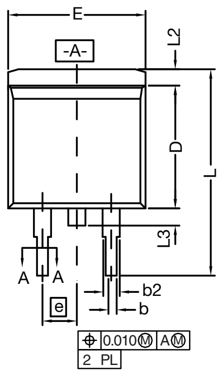
Ordering codes for the SQ rugged series power MOSFETs in the D²PAK / TO-263 and TO-262 packages:

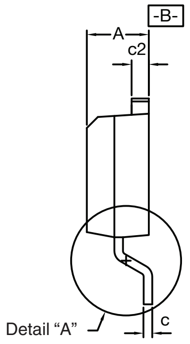
DATASHEET PART NUMBER	OLD ORDERING CODE [a]	NEW ORDERING CODE
SQM100N04-2m7	SQM100N04-2M7-GE3	**SQM100N04-2M7_GE3**
SQM100N10-10	SQM100N10-10-GE3	**SQM100N10-10_GE3**
SQM110N05-06L	SQM110N05-06L-GE3	**SQM110N05-06L_GE3**
SQM110P06-8m9L	SQM110P06-8M9L-GE3	**SQM110P06-8M9L_GE3**
SQM120N02-1m3L	SQM120N02-1M3L-GE3	**SQM120N02-1M3L_GE3**
SQM120N03-1m5L	SQM120N03-1M5L-GE3	**SQM120N03-1M5L_GE3**
SQM120N04-1m7	SQM120N04-1M7-GE3	**SQM120N04-1M7_GE3**
SQM120N04-1m7L	SQM120N04-1M7L-GE3	**SQM120N04-1M7L_GE3**
SQM120N04-1m9	SQM120N04-1M9-GE3	**SQM120N04-1M9_GE3**
SQM120N06-06	SQM120N06-06-GE3	**SQM120N06-06_GE3**
SQM120N06-3m5L	SQM120N06-3M5L-GE3	**SQM120N06-3M5L_GE3**
SQM120N10-09	SQM120N10-09-GE3	**SQM120N10-09_GE3**
SQM120N10-3m8	SQM120N10-3M8-GE3	**SQM120N10-3M8_GE3**
SQM120P04-04L	SQM120P04-04L-GE3	**SQM120P04-04L_GE3**
SQM120P06-07L	SQM120P06-07L-GE3	**SQM120P06-07L_GE3**
SQM120P10-10m1L	-	**SQM120P10_10m1LGE3**
SQM200N04-1m1L	SQM200N04-1M1L-GE3	**SQM200N04-1M1L_GE3**
SQM200N04-1m7L	SQM200N04-1M7L-GE3	**SQM200N04-1M7L_GE3**
SQM200N04-1m8	SQM200N04-1M8-GE3	**SQM200N04-1M8_GE3**
SQM25N15-52	SQM25N15-52-GE3	**SQM25N15-52_GE3**
SQM35N30-97	SQM35N30-97-GE3	**SQM35N30-97_GE3**
SQM40010EL	-	**SQM40010EL_GE3**
SQM40N10-30	SQM40N10-30-GE3	**SQM40N10-30_GE3**
SQM40N15-38	SQM40N15-38-GE3	**SQM40N15-38_GE3**
SQM40P10-40L	SQM40P10-40L-GE3	**SQM40P10-40L_GE3**
SQM47N10-24L	SQM47N10-24L-GE3	**SQM47N10-24L_GE3**
SQM50020EL	-	**SQM50020EL_GE3**
SQM50N04-4m0L	SQM50N04-4M0L-GE3	**SQM50N04-4M0L_GE3**
SQM50N04-4m1	SQM50N04-4M1-GE3	**SQM50N04-4M1_GE3**
SQM50P03-07	SQM50P03-07-GE3	**SQM50P03-07_GE3**
SQM50P04-09L	SQM50P04-09L-GE3	**SQM50P04-09L_GE3**
SQM50P06-15L	SQM50P06-15L-GE3	**SQM50P06-15L_GE3**
SQM50P08-25L	SQM50P08-25L-GE3	**SQM50P08-25L_GE3**
SQM60030E	-	**SQM60030E_GE3**
SQM60N06-15	SQM60N06-15-GE3	**SQM60N06-15_GE3**
SQM60N20-35	SQM60N20-35-GE3	**SQM60N20-35_GE3**
SQM70060EL	-	**SQM70060EL_GE3**
SQM85N15-19	SQM85N15-19-GE3	**SQM85N15-19_GE3**
SQV120N10-3m8	SQV120N10-3m8-GE3	**SQV120N10-3m8_GE3**
SQV120N06-4m7L	-	**SQV120N06-4m7L_GE3**

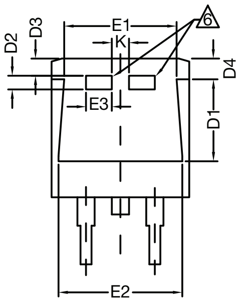
Note

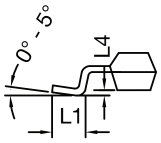
a. Old ordering code is obsolete and no longer valid for new orders

TO-263 (D^{2}PAK): 3-LEAD

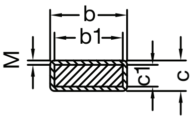








DETAIL A (ROTATED 90°)



SECTION A-A

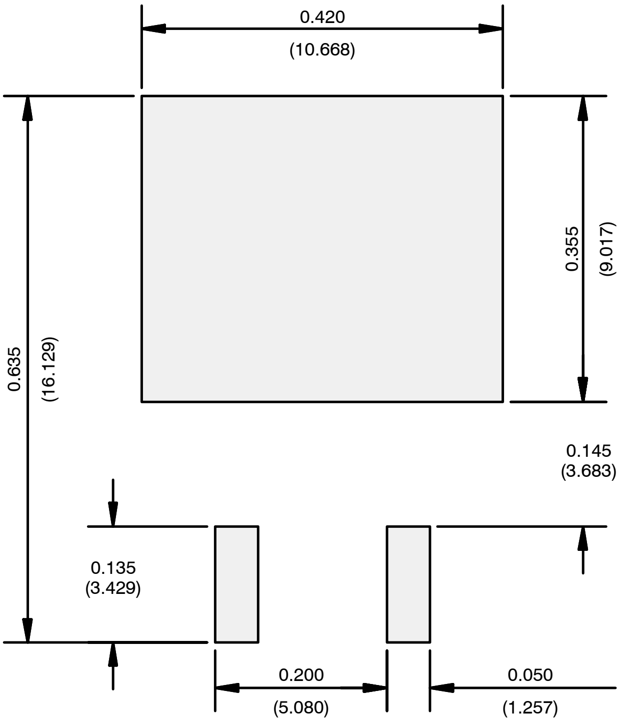
DIM.		INCHES		MILLIMETERS	
		MIN.	MAX.	MIN.	MAX.
A		0.160	0.190	4.064	4.826
b		0.020	0.039	0.508	0.990
b1		0.020	0.035	0.508	0.889
b2		0.045	0.055	1.143	1.397
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	0.027	0.584	0.685
c2		0.045	0.055	1.143	1.397
D		0.340	0.380	8.636	9.652
D1		0.220	0.240	5.588	6.096
D2		0.038	0.042	0.965	1.067
D3		0.045	0.055	1.143	1.397
D4		0.044	0.052	1.118	1.321
E		0.380	0.410	9.652	10.414
E1		0.245	-	6.223	-
E2		0.355	0.375	9.017	9.525
E3		0.072	0.078	1.829	1.981
e		0.100 BSC		2.54 BSC	
K		0.045	0.055	1.143	1.397
L		0.575	0.625	14.605	15.875
L1		0.090	0.110	2.286	2.794
L2		0.040	0.055	1.016	1.397
L3		0.050	0.070	1.270	1.778
L4		0.010 BSC		0.254 BSC	
M		-	0.002	-	0.050

ECN: T13-0707-Rev. K, 30-Sep-13
DWG: 5843

Notes

1. Plane B includes maximum features of heat sink tab and plastic.
2. No more than 25 % of L1 can fall above seating plane by max. 8 mils.
3. Pin-to-pin coplanarity max. 4 mils.
4. *: Thin lead is for SUB, SYB.
   Thick lead is for SUM, SYM, SQM.
5. Use inches as the primary measurement.
6. This feature is for thick lead.

RECOMMENDED MINIMUM PADS FOR D^{2}PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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