

Automotive N-Channel 40 V (D-S) 175 °C MOSFET



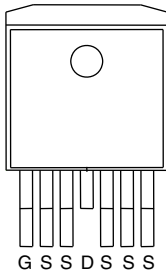
RoHS
COMPLIANT
HALOGEN
FREE

PRODUCT SUMMARY

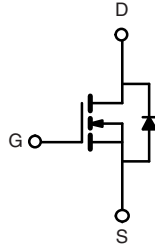
V_{DS} (V)	40
$R_{DS(on)}$ (Ω) at $V_{GS} = 10$ V	0.0011
$R_{DS(on)}$ (Ω) at $V_{GS} = 4.5$ V	0.0013
I_D (A)	200
Configuration	Single

FEATURES

- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- 100 % R_g and UIS Tested
- AEC-Q101 Qualified^d
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?999912

TO-263-7L


Drain connected to Tab



N-Channel MOSFET

ORDERING INFORMATION

Package	TO-263-7L
Lead (Pb)-free and Halogen-free	SQM200N04-1m1L-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ^a	I_D	$T_C = 25$ °C	200
		$T_C = 125$ °C	200
Continuous Source Current (Diode Conduction) ^a	I_S	200	A
Pulsed Drain Current ^b	I_{DM}	600	
Single Pulse Avalanche Current	I_{AS}	100	
Single Pulse Avalanche Energy	E_{AS}	500	mJ
Maximum Power Dissipation ^b	P_D	$T_C = 25$ °C	375
		$T_C = 125$ °C	125
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 175	°C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	R_{thJA}	40	°C/W
Junction-to-Case (Drain)			

Notes

- Package limited.
- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR-4 material).
- 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	40	-	-	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} = 40 V	-	-	1	μA
		V _{GS} = 0 V, V _{DS} = 40 V, T _J = 125 °C	-	-	50	
		V _{GS} = 0 V, V _{DS} = 40 V, T _J = 175 °C	-	-	500	
On-State Drain Current ^a	I _{D(on)}	V _{GS} = 10 V, V _{DS} ≥ 5 V	200	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 30 A	-	0.0008	0.0011	Ω
		V _{GS} = 10 V, I _D = 30 A, T _J = 125 °C	-	-	0.0019	
		V _{GS} = 10 V, I _D = 30 A, T _J = 175 °C	-	-	0.0023	
		V _{GS} = 4.5 V, I _D = 20 A	-	0.0009	0.0013	
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 30 A	-	219	-	S
Dynamic^b						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1 MHz	-	16 524	20 655	pF
Output Capacitance	C _{oss}		-	2060	2575	
Reverse Transfer Capacitance	C _{rss}		-	484	605	
Total Gate Charge ^c	Q _g	V _{GS} = 10 V, V _{DS} = 20 V, I _D = 20 A	-	275	413	nC
Gate-Source Charge ^c	Q _{gs}		-	56.6	-	
Gate-Drain Charge ^c	Q _{gd}		-	45.4	-	
Gate Resistance	R _g	f = 1 MHz	4.2	8.5	12.8	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 20 V, R _L = 1 Ω I _D = 20 A, V _{GEN} = 10 V, R _g = 1 Ω	-	13	20	ns
Rise Time ^c	t _r		-	12	18	
Turn-Off Delay Time ^c	t _{d(off)}		-	443	665	
Fall Time ^c	t _f		-	126	189	
Source-Drain Diode Ratings and Characteristics^b						
Pulsed Current ^a	I _{SM}		-	-	600	A
Forward Voltage	V _{SD}	I _F = 60 A, V _{GS} = 0 V	-	0.8	1.5	V

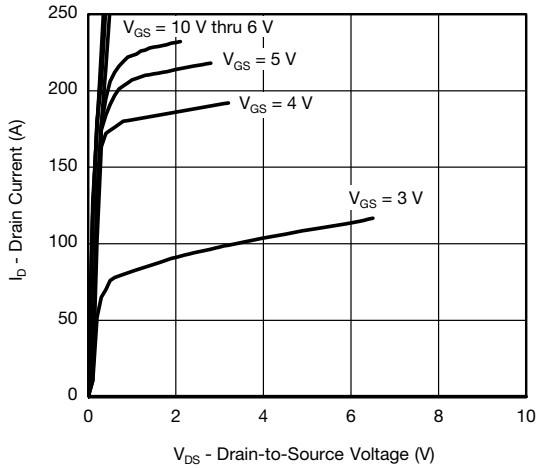
Notes

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

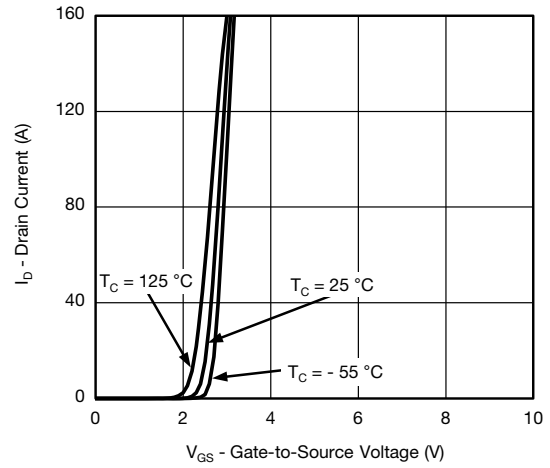
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



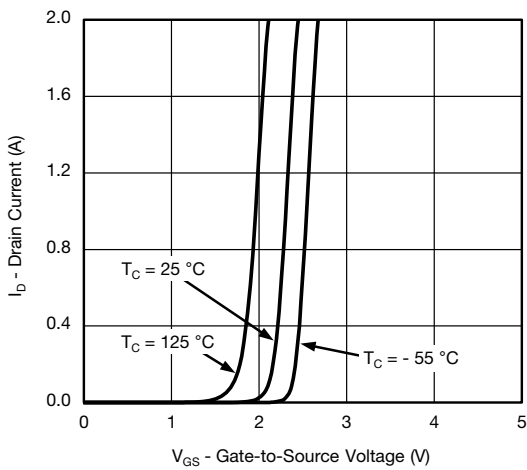
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



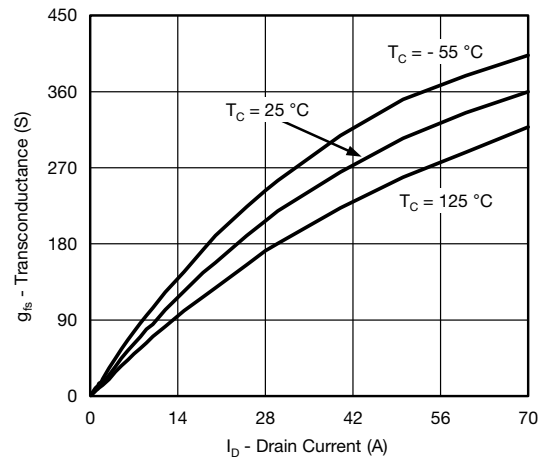
Output Characteristics



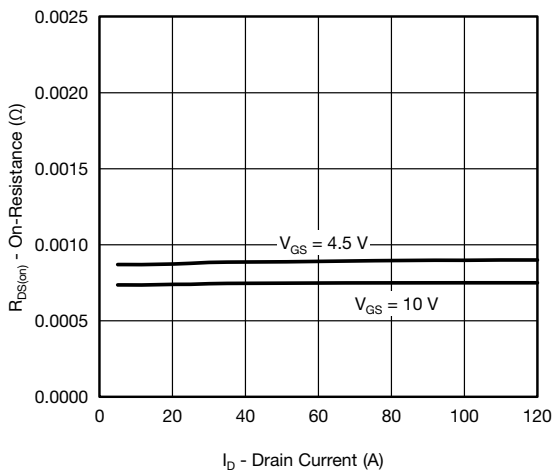
Transfer Characteristics



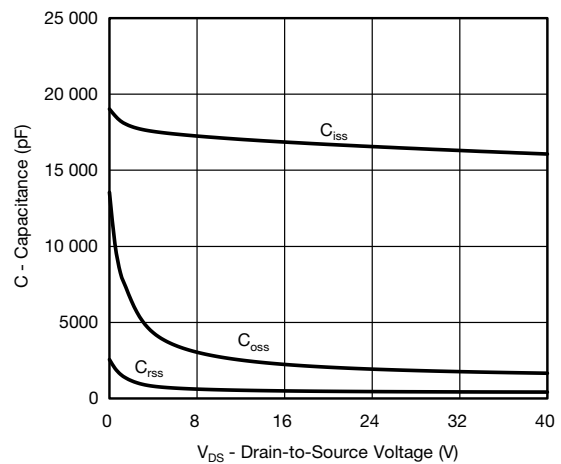
Transfer Characteristics



Transconductance



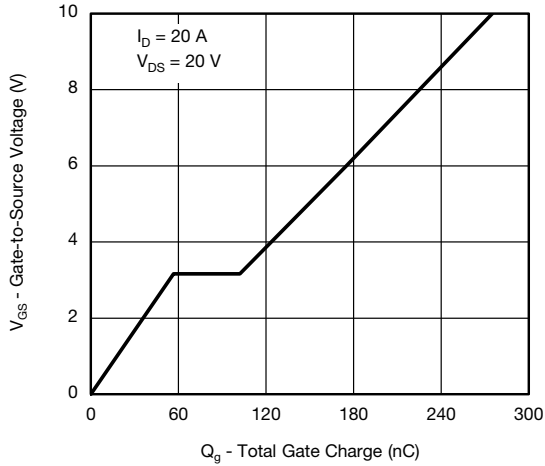
On-Resistance vs. Drain Current



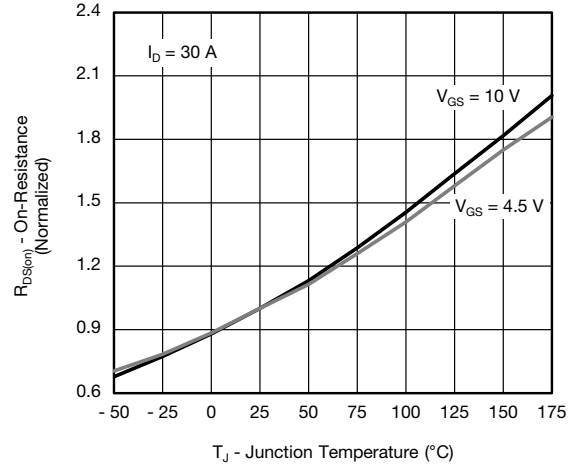
Capacitance



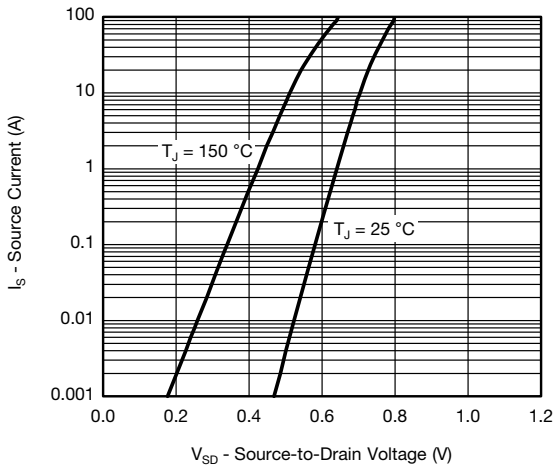
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



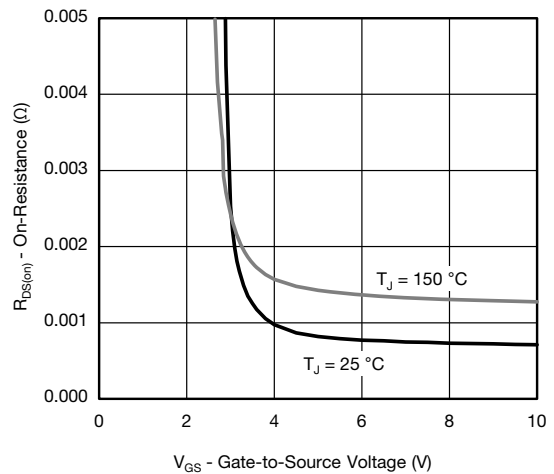
Gate Charge



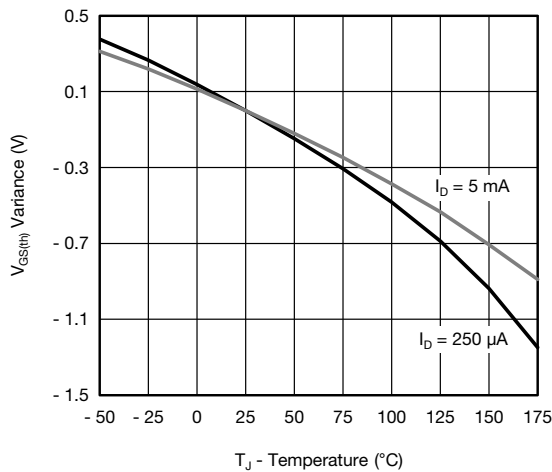
On-Resistance vs. Junction Temperature



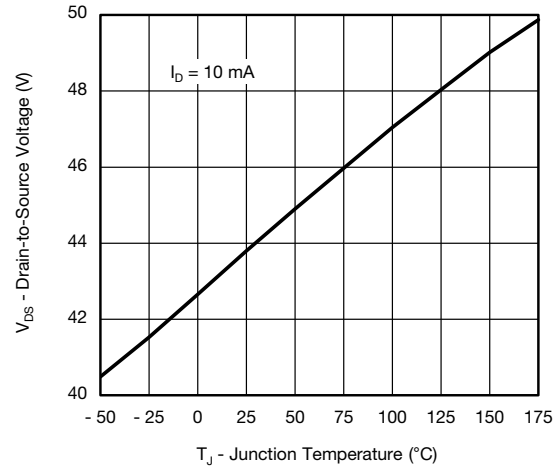
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



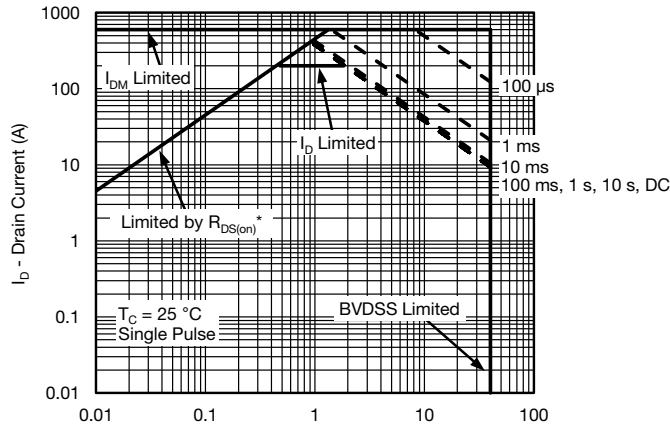
Threshold Voltage



Drain Source Breakdown vs. Junction Temperature

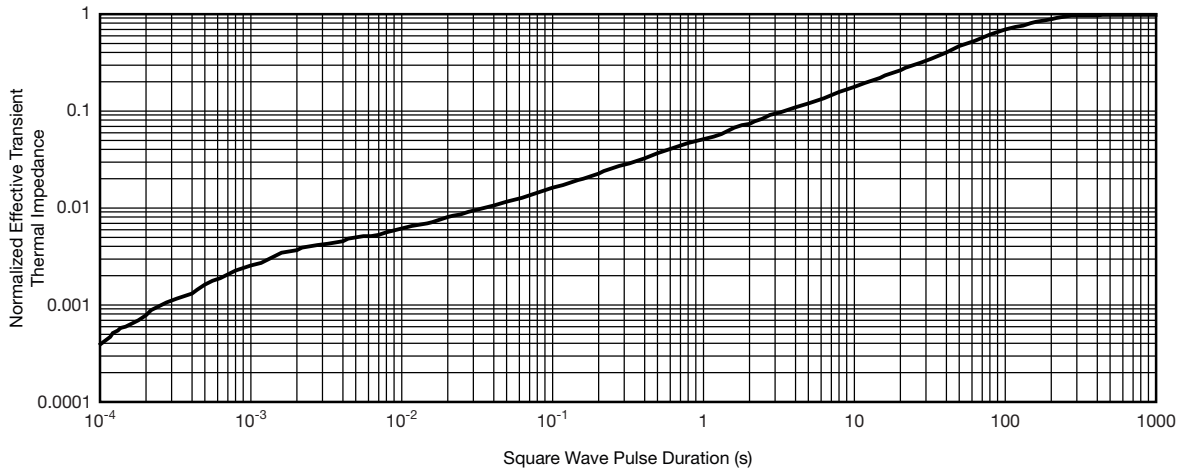


THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



V_{DS} - Drain-to-Source Voltage (V)
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

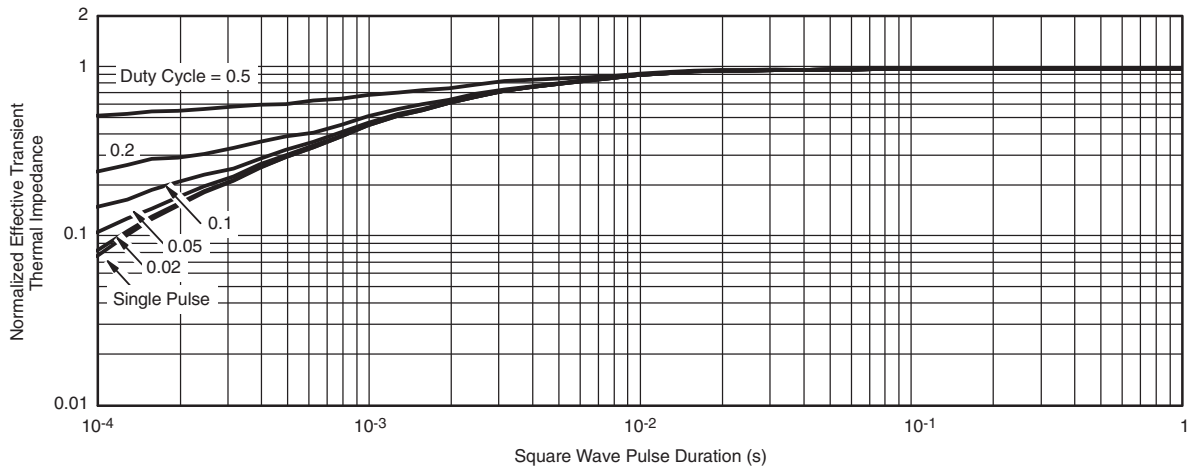
Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient



THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



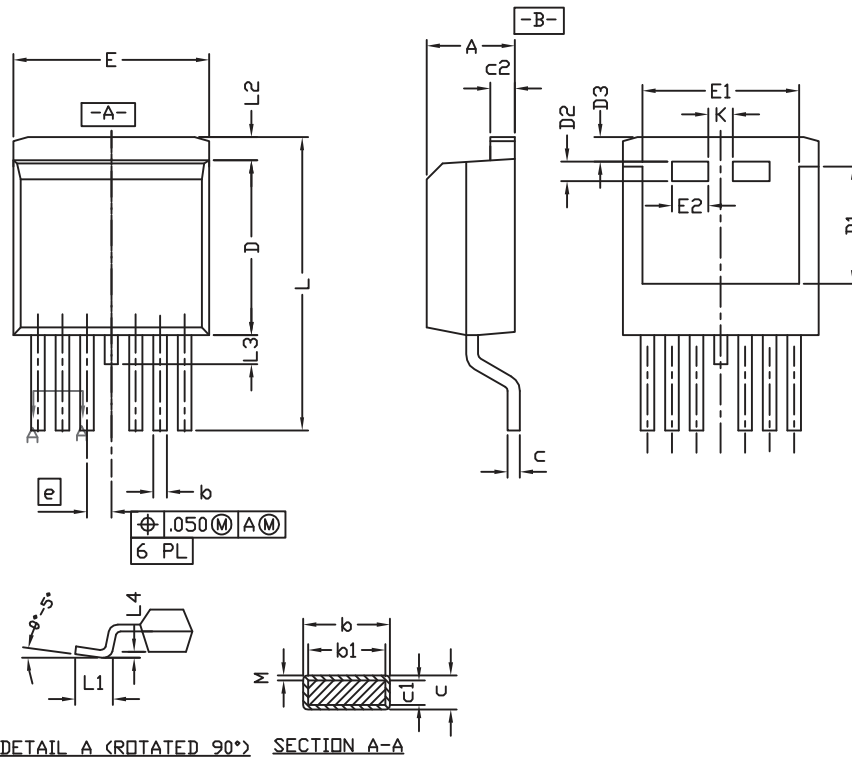
Normalized Thermal Transient Impedance, Junction-to-Case

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-263-7L) Case Outline



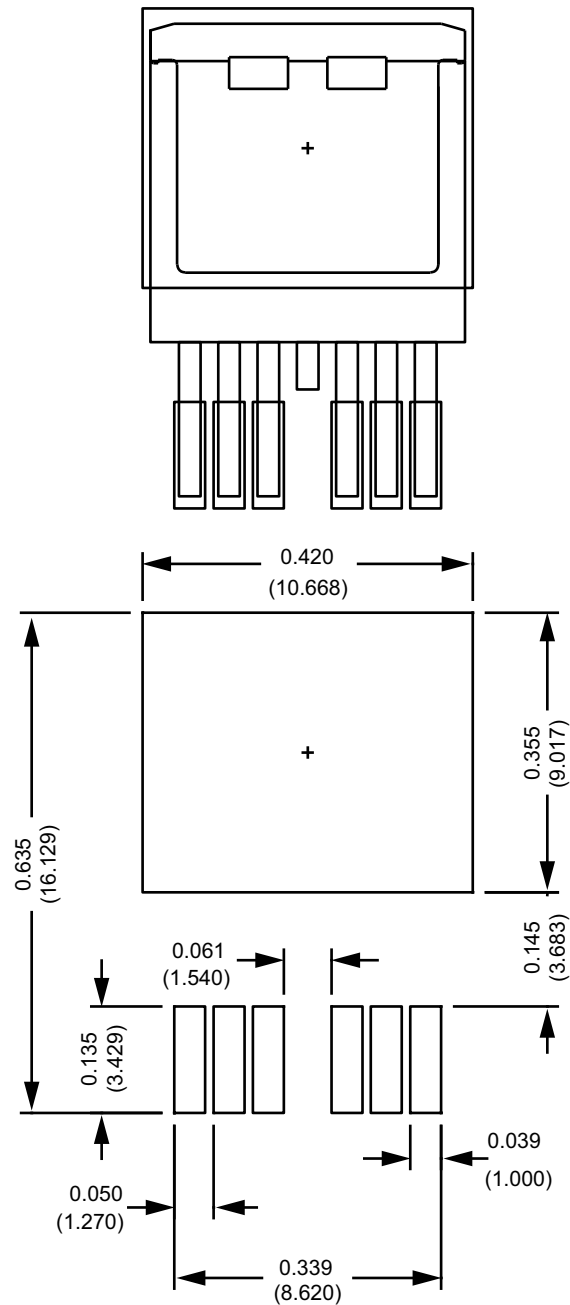
DETAIL A (ROTATED 90°) SECTION A-A

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. Lead thickness 25 mils
5. For SUM part numbers lead thickness is 24 mils to 29 mils
6. For reference only
7. Use inches as the primary measurement
8. This feature is only for SUM

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
c* SUB	0.012	0.018	0.305	0.457
c* SUM	0.022	0.028	0.559	0.711
c1	0.018	0.025	0.457	0.635
c2	0.045	0.055	1.143	1.397
D	0.340	0.380	8.636	9.652
D1	0.260	0.280	6.604	7.112
D2	0.046	0.050	1.168	1.270
D3	0.045	0.055	1.143	1.397
E	0.380	0.410	9.652	10.414
E1	0.245	-	6.223	-
E2	0.072	0.078	1.829	1.981
e	0.050 BSC		1.27 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: T22-0410-Rev. D, 19-Sep-2022				
DWG: 6006				

Recommended Land Pattern D²PAK (TO-263-7L)





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