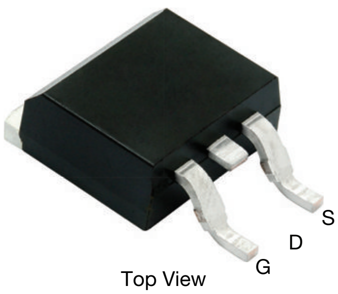
N-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω) MAX.	I_D (A) [d]	Q_g (TYP.)
60	0.0021 at V_{GS} = 10 V	120	126
	0.0026 at V_{GS} = 4.5 V	120	

TO-263



Top View

Ordering Information:
SUM50020EL-GE3 (lead (Pb)-free and halogen-free)

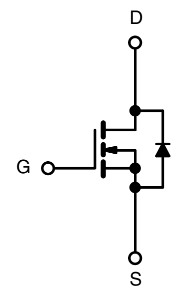
FEATURES

- TrenchFET® power MOSFET
- Maximum 175 °C junction temperature
- Q_{gd}/Q_{gs} ratio < 0.25
- Operable with logic-level gate drive
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Power supply
  - Secondary synchronous rectification
- DC/DC converter
- Power tools
- Motor drive switch
- DC/AC inverter
- Battery management



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_J = 150 °C)	T_C = 25 °C	I_D	120 [d]	A
	T_C = 70 °C		120 [d]	
Pulsed Drain Current (t = 100 μs)		I_{DM}	300	
Avalanche Current	L = 0.1 mH	I_{AS}	75	
Single Avalanche Energy [a]		E_{AS}	281	mJ
Maximum Power Dissipation [a]	T_C = 25 °C	P_D	375 [b]	W
	T_C = 125 °C		125 [b]	
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}	40	°C/W
Junction-to-Case (Drain)	R_{thJC}	0.4	

Notes

a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. When mounted on 1" square PCB (FR4 material).
d. Package limited.

For technical questions, contact: pmostechsupport@vishay.com

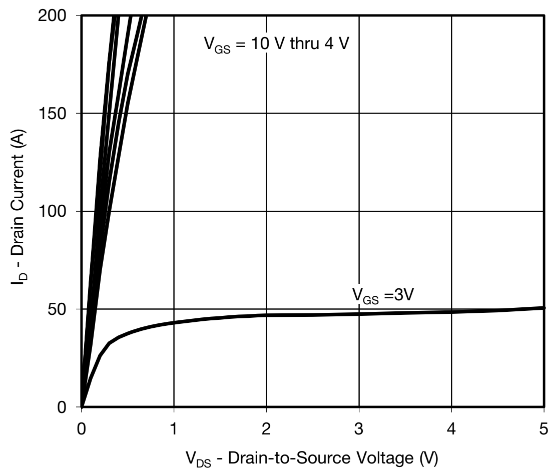
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 μA	60	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	1.2	-	2.5	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	-	-	± 250	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 125 °C	-	-	150	
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 175 °C	-	-	5	mA
On-State Drain Current [a]	$I_{D(on)}$	V_{DS} ≥ 10 V, V_{GS} = 10 V	120	-	-	A
Drain-Source On-State Resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A	-	0.0017	0.0021	Ω
		V_{GS} = 4.5 V, I_D = 20 A	-	0.0021	0.0026	
Forward Transconductance [a]	g_{fs}	V_{DS} = 15 V, I_D = 30 A	-	145	-	S
Dynamic [b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz	-	11 113	-	pF
Output Capacitance	C_{oss}		-	4625	-	
Reverse Transfer Capacitance	C_{rss}		-	475	-	
Total Gate Charge [c]	Q_g	V_{DS} = 30 V, V_{GS} = 10 V, I_D = 20 A	-	126	-	nC
Gate-Source Charge [c]	Q_{gs}		-	31.2	-	
Gate-Drain Charge [c]	Q_{gd}		-	7.1	-	
Gate Resistance	R_g	f = 1 MHz	0.32	1.6	3.2	Ω
Turn-On Delay Time [c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 5 Ω I_D ≅ 10 A, V_{GEN} = 10 V, R_g = 1 Ω	-	15	30	ns
Rise Time [c]	t_r		-	20	40	
Turn-Off Delay Time [c]	$t_{d(off)}$		-	55	100	
Fall Time [c]	t_f		-	11	20	
Drain-Source Body Diode Ratings and Characteristics [b] (T_C = 25 °C)						
Pulsed Current (t = 100 μs)	I_{SM}		-	-	300	A
Forward Voltage [a]	V_{SD}	I_F = 10 A, V_{GS} = 0 V	-	0.8	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 39 A, di/dt = 100 A/μs	-	120	180	ns
Peak Reverse Recovery Charge	$I_{RM(REC)}$		-	5	10	A
Reverse Recovery Charge	Q_{rr}		-	0.287	0.430	μC

Notes

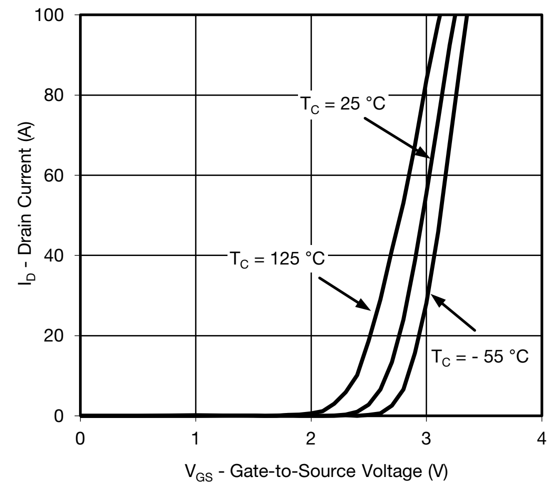
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

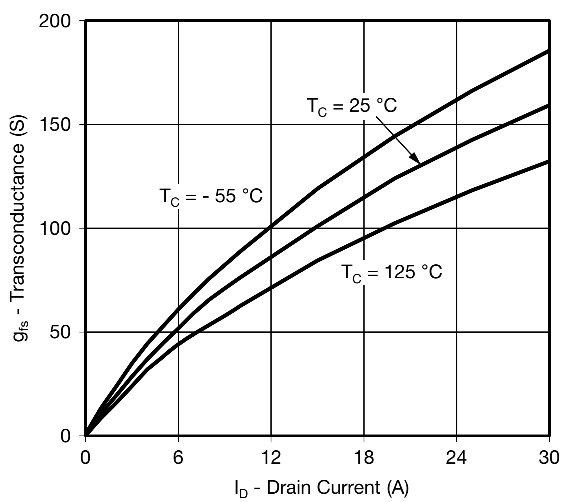
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



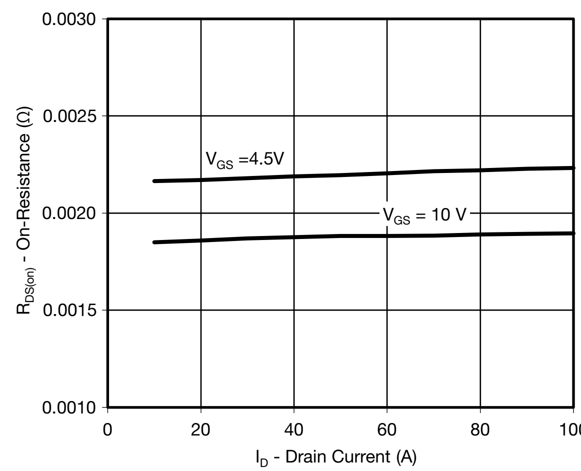
Output Characteristics



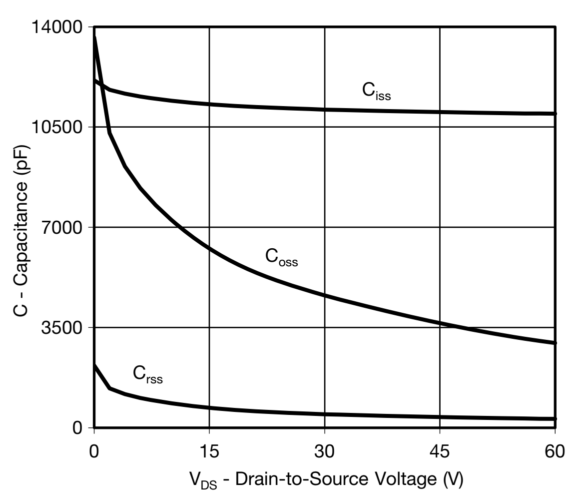
Transfer Characteristics



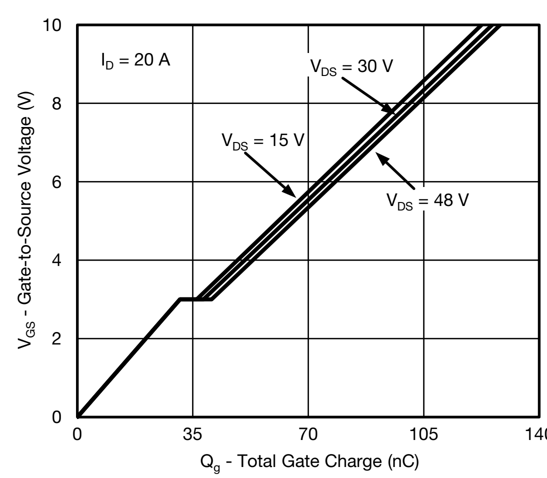
Transconductance



On-Resistance vs. Drain Current

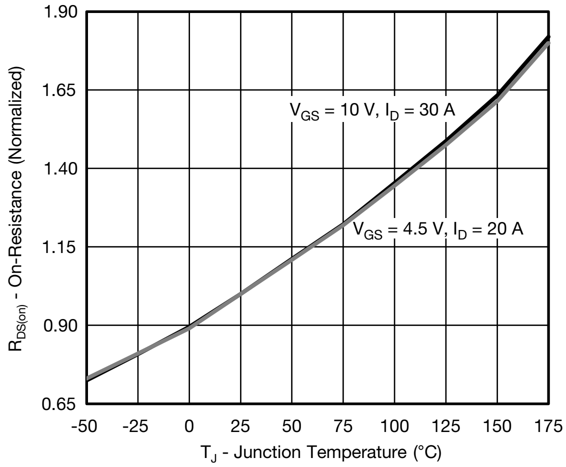


Capacitance

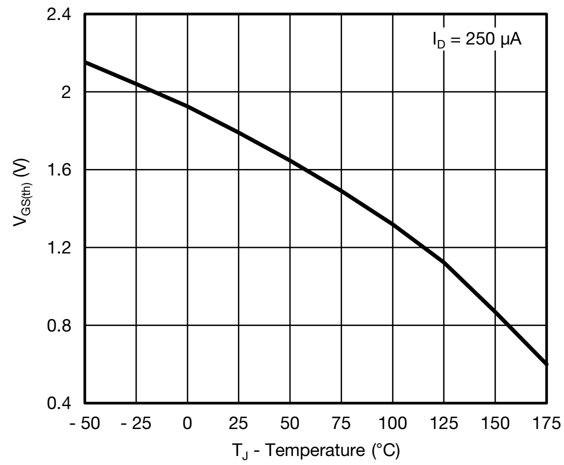


Gate Charge

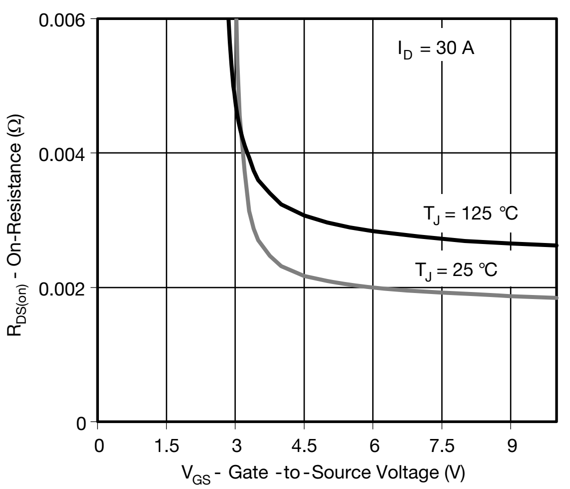
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



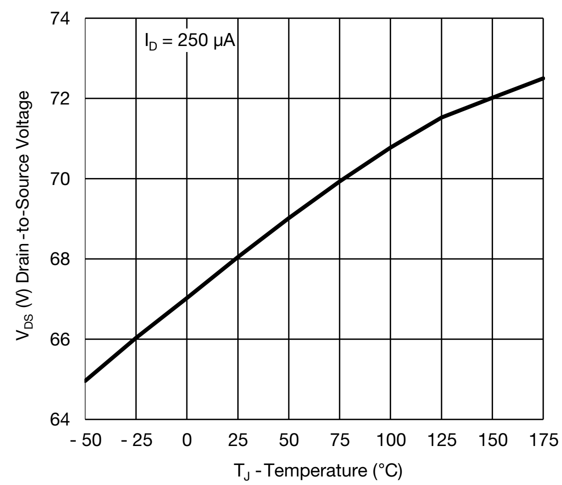
On-Resistance vs. Junction Temperature



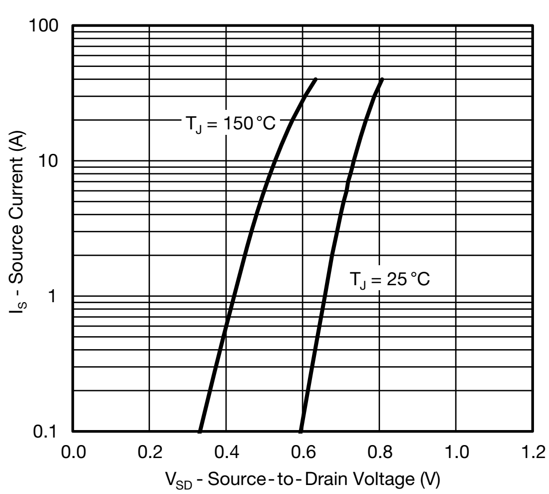
Threshold Voltage



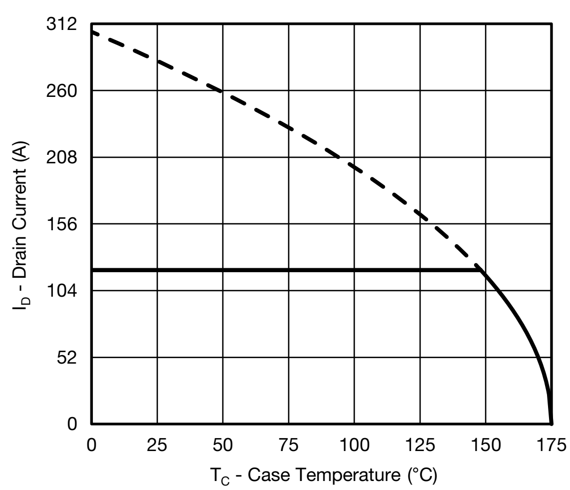
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature

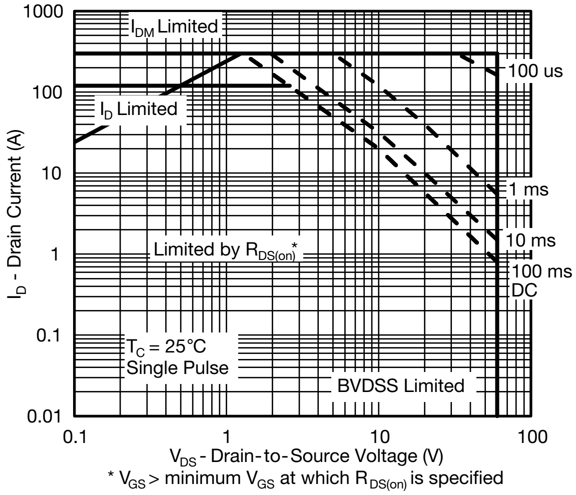


Source Drain Diode Forward Voltage

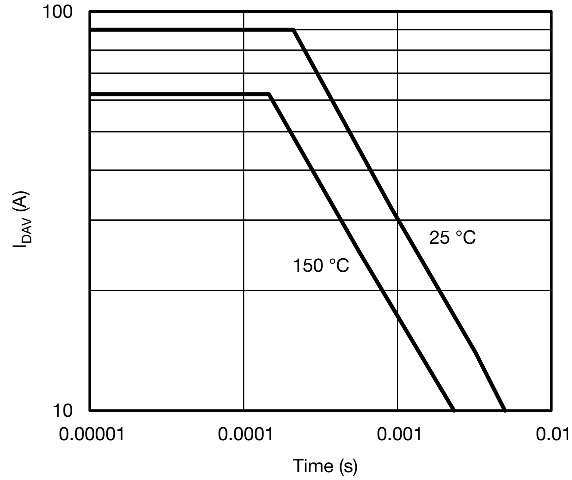


Current De-rating

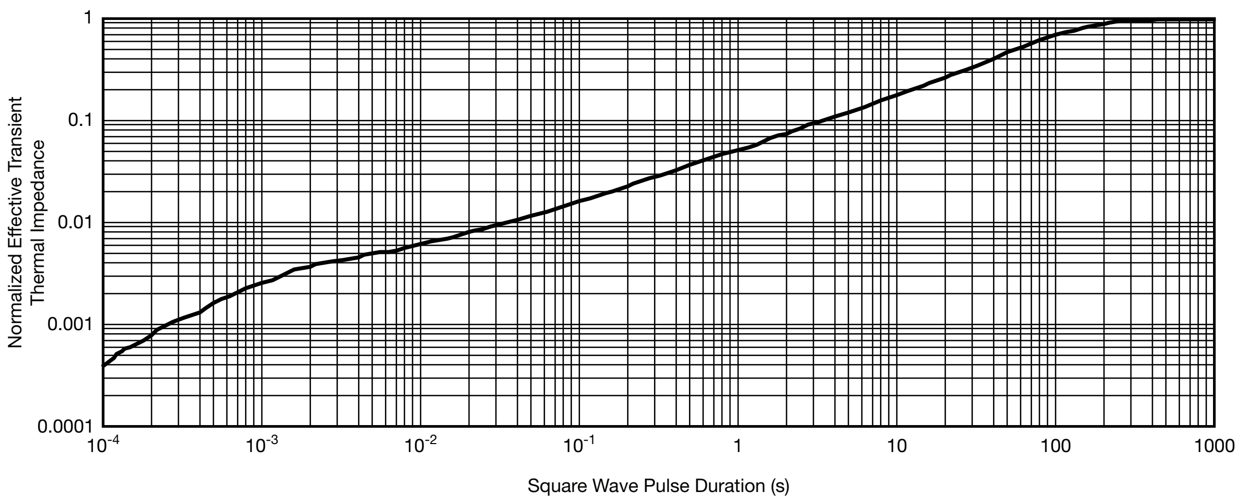
THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Safe Operating Area

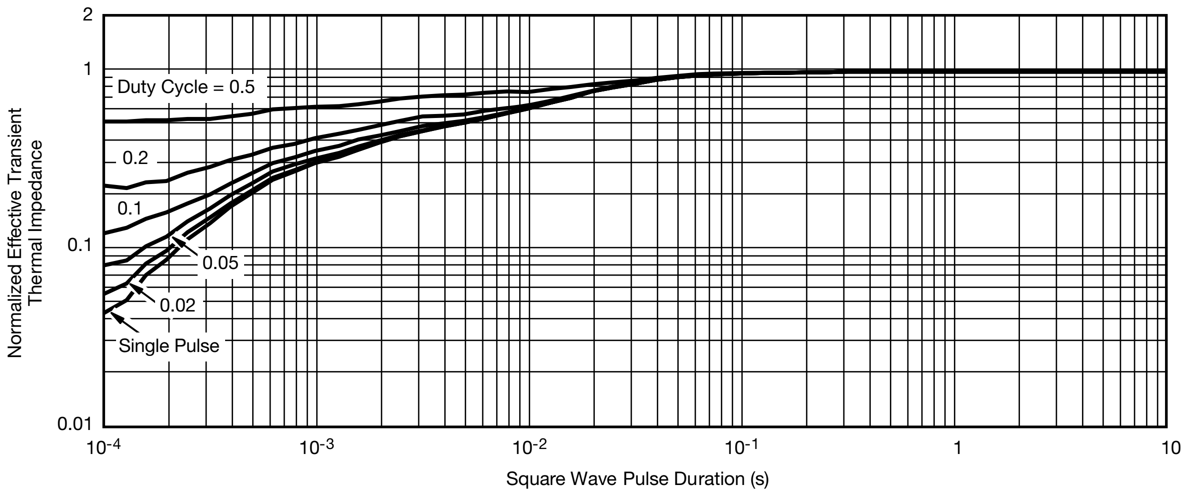


Single Pulse Avalanche Current Capability vs. Time



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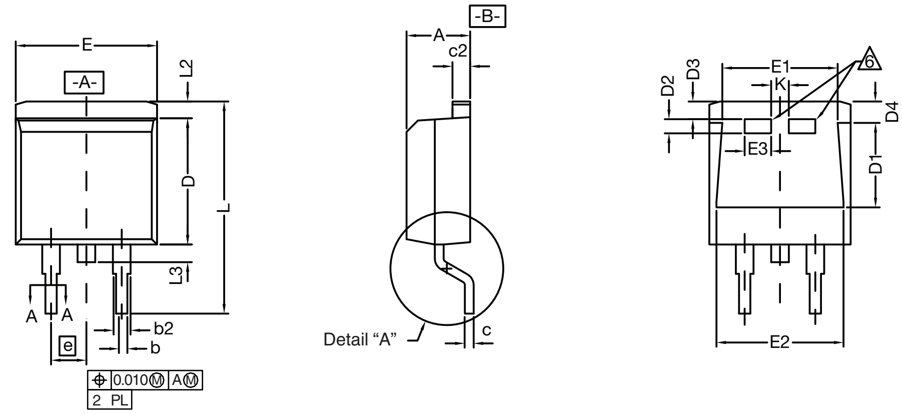
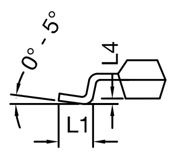
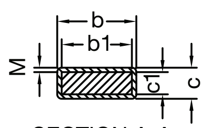
TO-263 (D^2PAK): 3-LEAD





DETAIL A (ROTATED 90°)



SECTION A-A

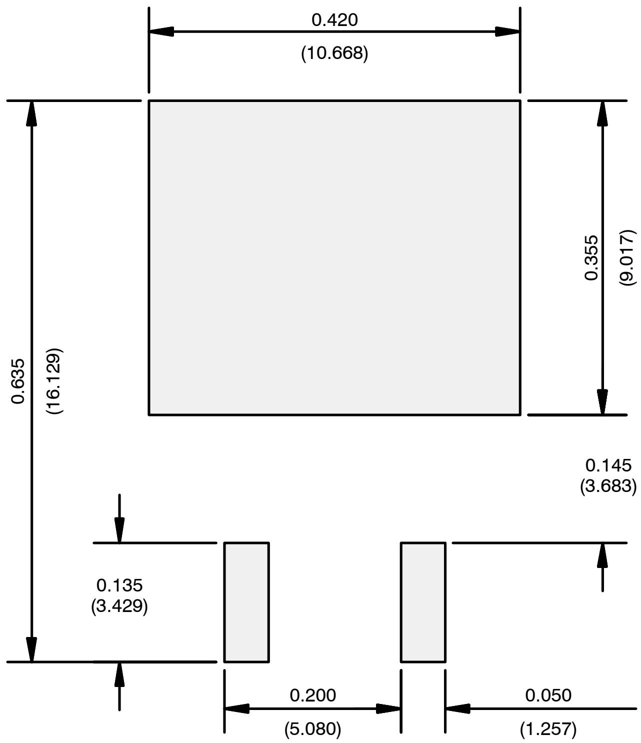
DIM.		INCHES MIN.	INCHES MAX.	MILLIMETERS MIN.	MILLIMETERS MAX.
A		0.160	0.190	4.064	4.826
b		0.020	0.039	0.508	0.990
b1		0.020	0.035	0.508	0.889
b2		0.045	0.055	1.143	1.397
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	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 D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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