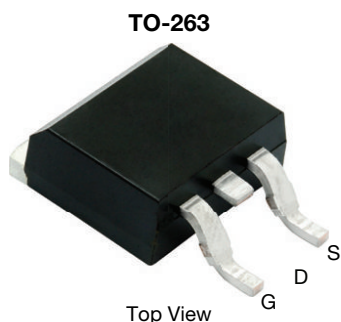


N-Channel 200 V (D-S) 175 °C MOSFET



FEATURES

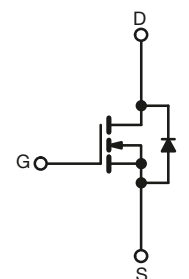
- ThunderFET® power MOSFET
- Low R_{DS} - Q_g figure-of-merit (FOM)
- Maximum 175 °C junction temperature
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Synchronous rectification
- Power supplies
- DC/AC inverter
- DC/DC converter
- Solar micro inverter
- Motor drive switch



N-Channel MOSFET

PRODUCT SUMMARY

V_{DS} (V)	200
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.0216
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 7.5$ V	0.0235
Q_g typ. (nC)	31.6
I_D (A)	64
Configuration	Single

ORDERING INFORMATION

Package	TO-263
Lead (Pb)-free and halogen-free	SUM90220E-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	200	V
Gate-source voltage	V_{GS}	± 20	
Continuous drain current	I_D	64	A
		37	
Pulsed drain current ($t = 100$ μ s)	I_{DM}	100	
Continuous source-drain diode current	I_S	64.7	
Single pulse avalanche current ^a	I_{AS}	45	mJ
Single pulse avalanche energy ^a	E_{AS}	101	
Maximum power dissipation	P_D	230 ^b	W
		77 ^b	
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) ^c		260	

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	MAXIMUM	UNIT
Maximum junction-to-ambient (PCB mount) ^c	R_{thJA}	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	0.65	

Notes

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR4 material).

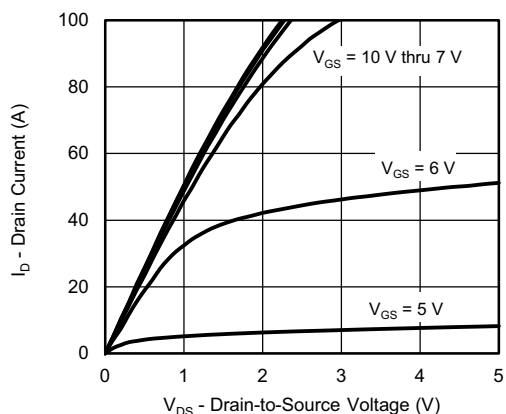
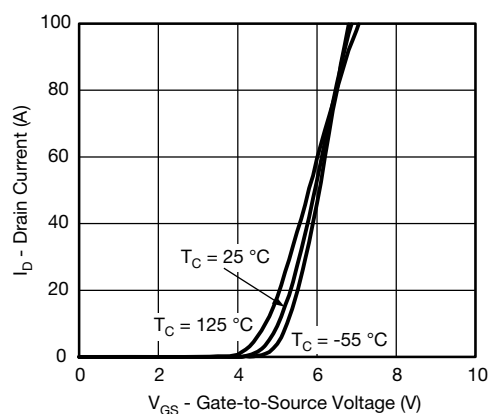
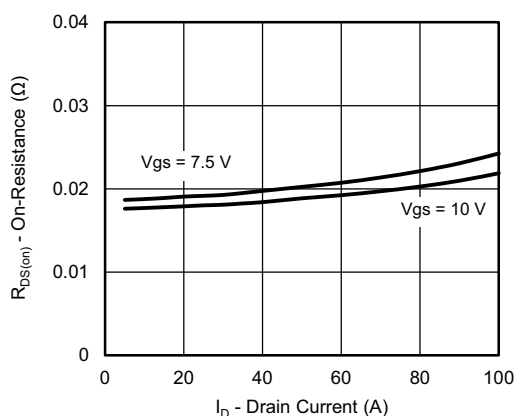
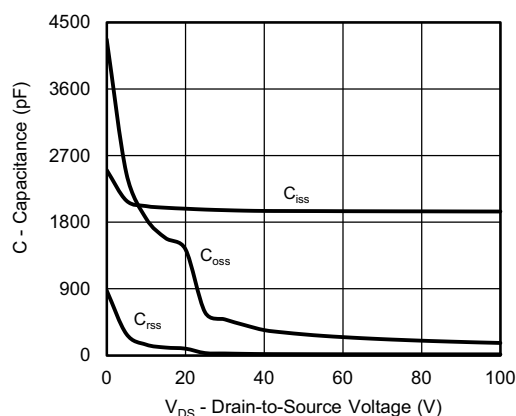
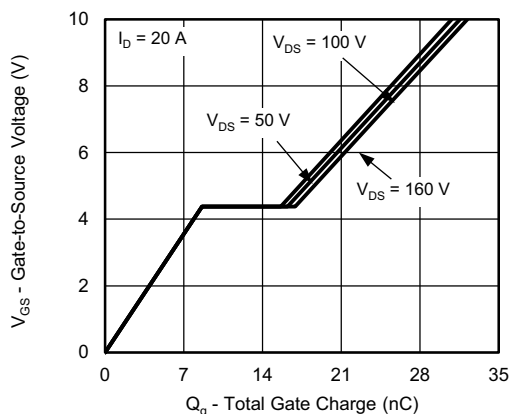
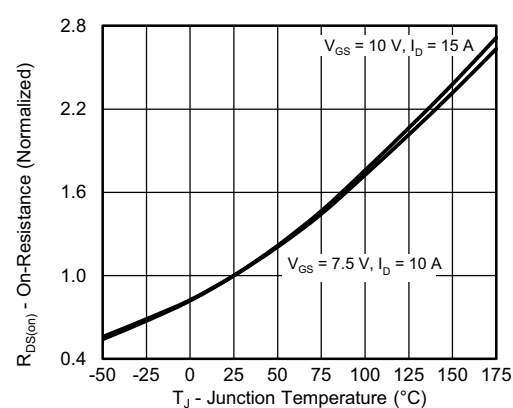


SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	200	-	-	V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	2	-	4	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	250	nA
Zero gate voltage drain current	I _{DSS}	V _{DS} = 200 V, V _{GS} = 0 V	-	-	1	μA
		V _{DS} = 200 V, V _{GS} = 0 V, T _J = 125 °C	-	-	150	
		V _{DS} = 200 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	30	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A	-	0.0180	0.0216	Ω
		V _{GS} = 7.5 V, I _D = 10 A	-	0.0188	0.0235	
Forward transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 15 A	-	37	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{DS} = 100 V, V _{GS} = 0 V, f = 1 MHz	-	1950	-	pF
Output capacitance	C _{oss}		-	170	-	
Reverse transfer capacitance	C _{rss}		-	15	-	
Total gate charge	Q _g	V _{DS} = 100 V, V _{GS} = 10 V, I _D = 15 A	-	31.6	48	nC
Gate-source charge	Q _{gs}		-	8.6	-	
Gate-drain charge	Q _{gd}		-	7.6	-	
Gate resistance	R _g	f = 1 MHz	0.6	3	6	Ω
Turn-on delay time	t _{d(on)}	V _{DD} = 100 V, R _L = 8.3 Ω, I _D ≅ 12 A, V _{GEN} = 10 V, R _g = 1 Ω	-	15	30	ns
Rise time	t _r		-	35	53	
Turn-off delay time	t _{d(off)}		-	28	42	
Fall time	t _f		-	38	57	
Drain-Source Body Diode Characteristics						
Pulse diode forward current (t = 100 μs)	I _{SM}		-	-	100	A
Body diode voltage	V _{SD}	I _F = 12 A, V _{GS} = 0 V	-	0.85	1.5	V
Body diode reverse recovery time	t _{rr}	I _F = 12 A, di/dt = 100 A/μs	-	120	180	ns
Body diode reverse recovery charge	Q _{rr}		-	0.91	1.37	μC
Reverse recovery fall time	t _a		-	95	-	ns
Reverse recovery rise time	t _b		-	25	-	
Body diode peak reverse recovery charge	I _{RM(REC)}		-	12	18	A

Notes

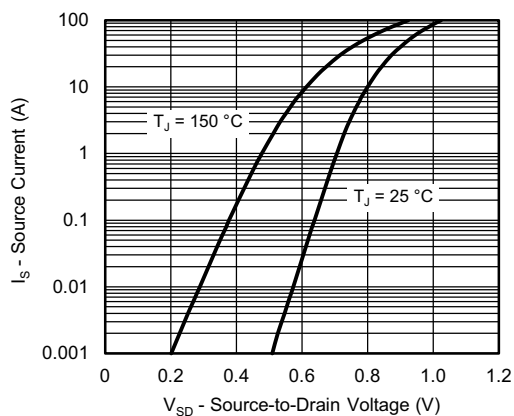
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

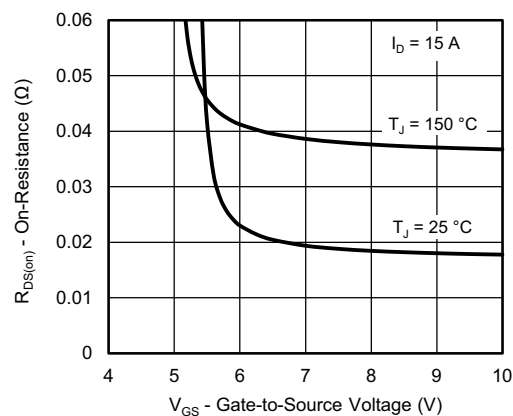
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature



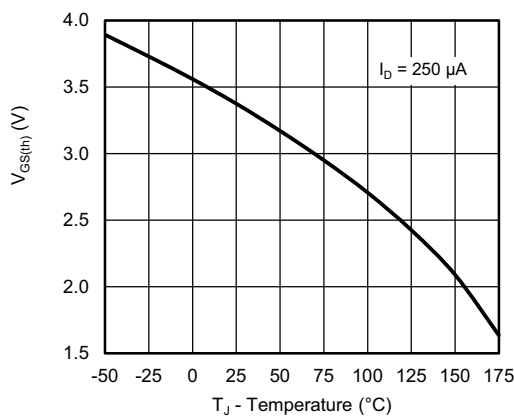
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



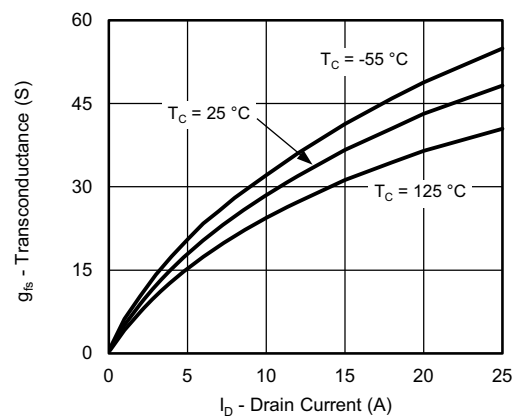
Source-Drain Diode Forward Voltage



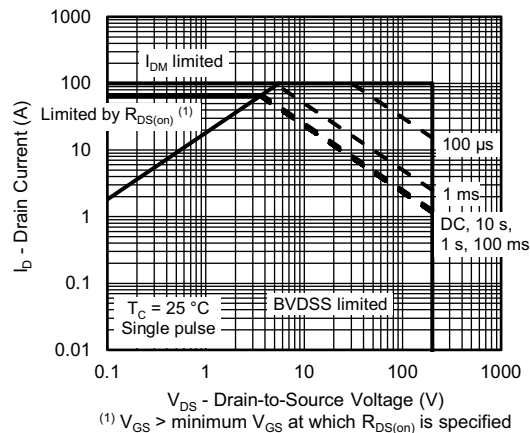
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



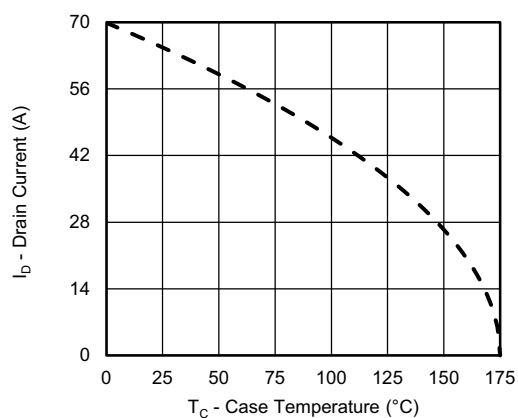
Transconductance



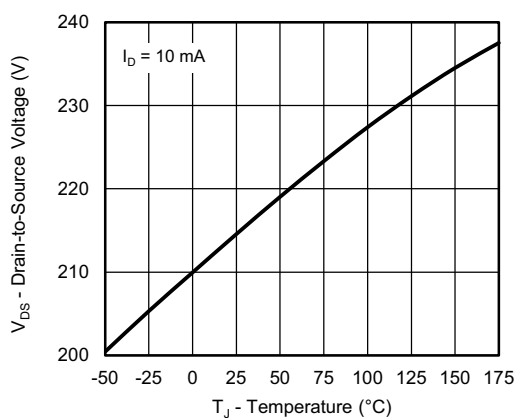
Safe Operating Area, Junction-to-Ambient



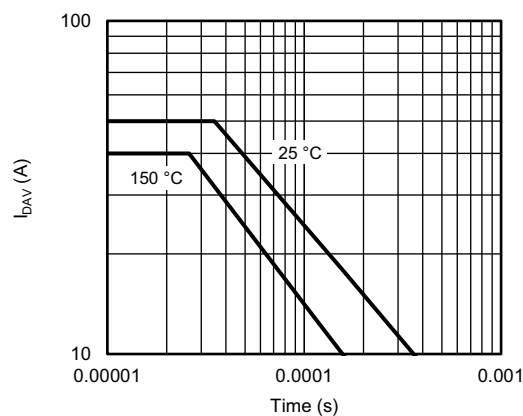
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Drain Source Breakdown vs. Junction Temperature



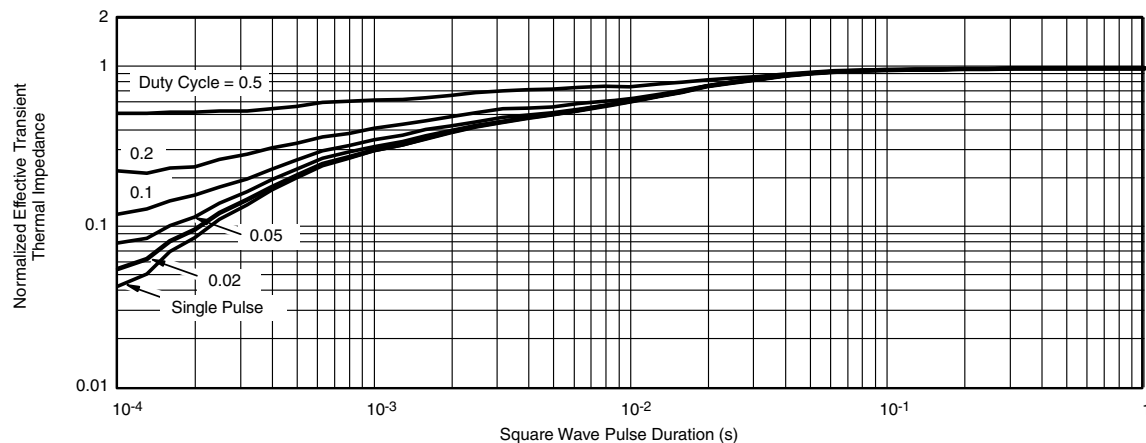
I_{DAV} vs. Time

Note

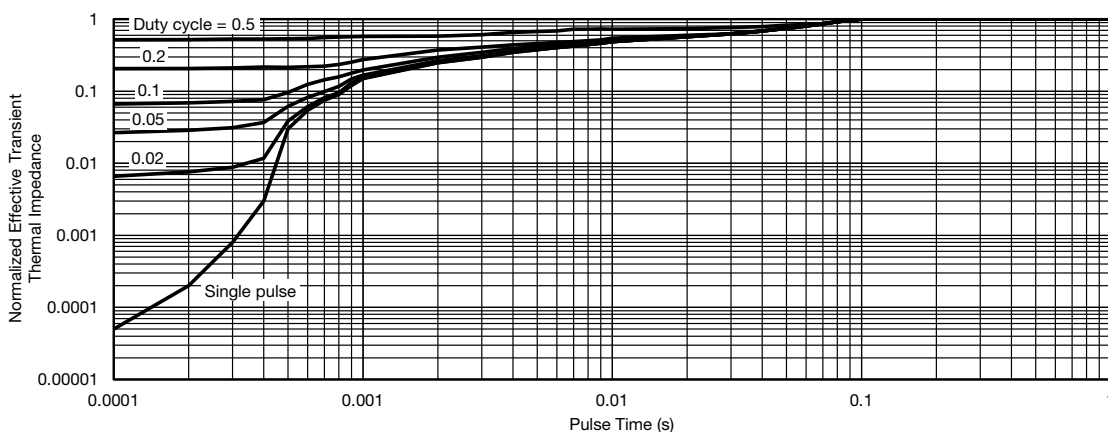
- a. The power dissipation P_D is based on T_J max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

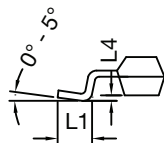
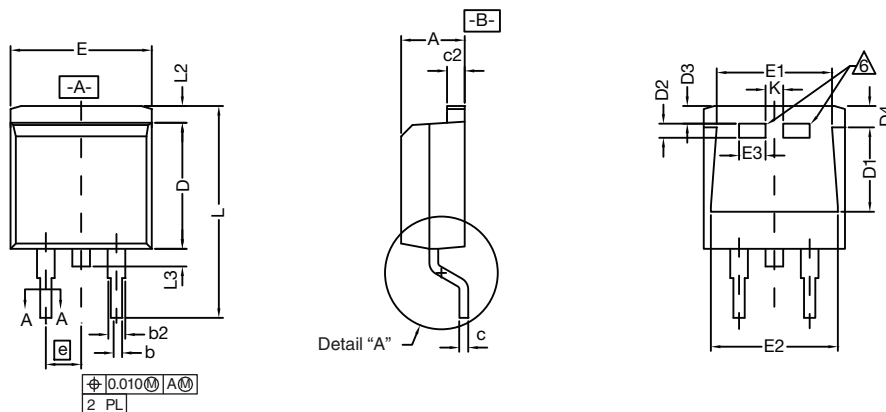


Normalized Thermal Transient Impedance, Junction-to-Case

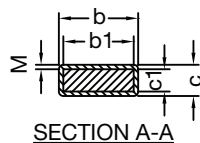
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TO-263 (D²PAK): 3-LEAD

VERSION 1: FACILITY CODE = T




DETAIL A (ROTATED 90°)



SECTION A-A

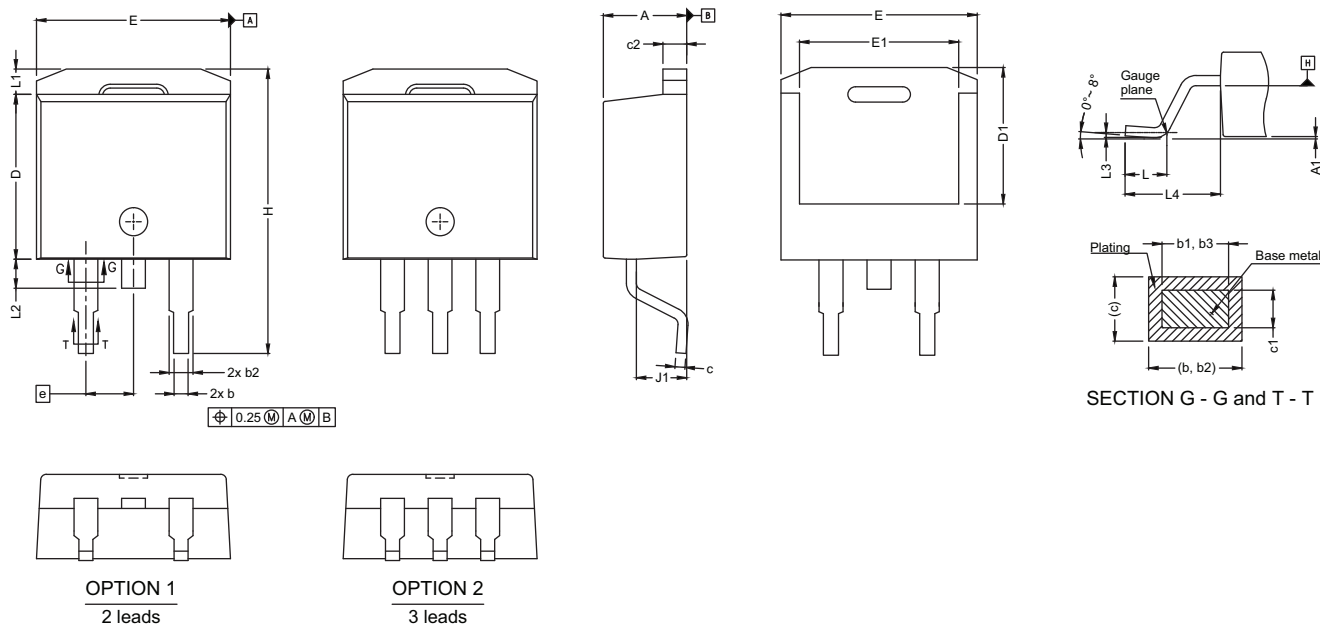
DIM.		INCHES		MILLIMETERS	
		MIN.	MAX.	MIN.	MAX.
A		0.160	0.190	4.064	4.826
b		0.020	0.039	0.508	0.990
b1		0.020	0.035	0.508	0.889
b2		0.045	0.055	1.143	1.397
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	0.027	0.584	0.685
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

Notes

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



VERSION 2: FACILITY CODE = N



DIM.	MIN.	MAX.
A	4.36	4.56
A1	0	0.25
b	0.70	0.90
b1	0.51	0.89
b2	1.20	1.46
b3	1.17	1.37
c	0.38	0.694
c1	0.38	0.534
c2	1.19	1.34
D	8.60	9.00
D1	6.9	7.5
E	10.15	10.55
E1	8.1	8.7
e	2.54 BSC	
H	15.0	15.6
L	1.9	2.5
L1	-	1.65
L2	-	1.78
L3	0.25 typ.	
L4	4.78	5.28
J1	2.56	2.96

ECN: S24-1080-Rev. L, 28-Oct-2024
DWG: 5843

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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