N-Channel 60 V (D-S), 175 °C MOSFET, Logic Level

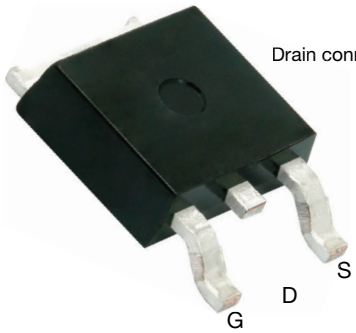
PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_d (A) [a]
60	0.031 at V_{GS} = 10 V	23
	0.045 at V_{GS} = 4.5 V	19.5

FEATURES

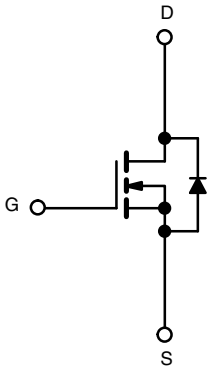
- TrenchFET® power MOSFET
- 175 °C junction temperature
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

TO-252



Top View



N-Channel MOSFET

Ordering Information:
SUD23N06-31L-E3 (lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current (T_J = 175 °C) [b]	T_C = 25 °C	I_D	23	A
	T_C = 100 °C		16.5	
Pulsed Drain Current		I_{DM}	50	
Continuous Source Current (Diode Conduction)		I_S	23	
Avalanche Current		I_{AS}	20	
Single Avalanche Energy (Duty Cycle ≤ 1 %)	L = 0.1 mH	E_{AS}	20	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	37.5	W
	T_A = 25 °C		3 [a]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum Junction-to-Ambient [a]	t ≤ 10 s	R_{thJA}	18	22	°C/W
	Steady State		40	50	
Maximum Junction-to-Case		R_{thJC}	3.2	4	

Note

a. Surface mounted on 1" x 1" FR4 board.

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SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP. [a]**	**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	3	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	-	-	± 100	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	-	-	50	
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 175 °C	-	-	250	
On-State Drain Current [b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	50	-	-	A
Drain-Source On-State Resistance [b]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 15 A	-	0.025	0.031	Ω
		V_{GS} = 10 V, I_D = 15 A, T_J = 125 °C	-	-	0.055	
		V_{GS} = 10 V, I_D = 15 A, T_J = 175 °C	-	-	0.069	
		V_{GS} = 4.5 V, I_D = 10 A	-	0.037	0.045	
Forward Transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 15 A	-	20	-	S
Dynamic [a]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	-	670	-	pF
Output Capacitance	C_{oss}		-	140	-	
Reverse Transfer Capacitance	C_{rss}		-	60	-	
Total Gate Charge [c]	Q_g	V_{DS} = 30 V, V_{GS} = 10 V, I_D = 23 A	-	11	17	nC
Gate-Source Charge [c]	Q_{gs}		-	3	-	
Gate-Drain Charge [c]	Q_{gd}		-	3	-	
Turn-On Delay Time [c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 1.3 Ω I_D ≅ 23 A, V_{GEN} = 10 V, R_g = 2.5 Ω	-	8	15	ns
Rise Time [c]	t_r		-	15	25	
Turn-Off Delay Time [c]	$t_{d(off)}$		-	30	45	
Fall Time [c]	t_f		-	25	40	
Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)						
Pulsed Current	I_{SM}		-	-	50	A
Diode Forward Voltage	V_{SD}	I_F = 15 A, V_{GS} = 0 V	-	1	1.5	V
Reverse Recovery Time	t_{rr}	I_F = 15 A, dI/dt = 100 A/µs	-	30	60	ns

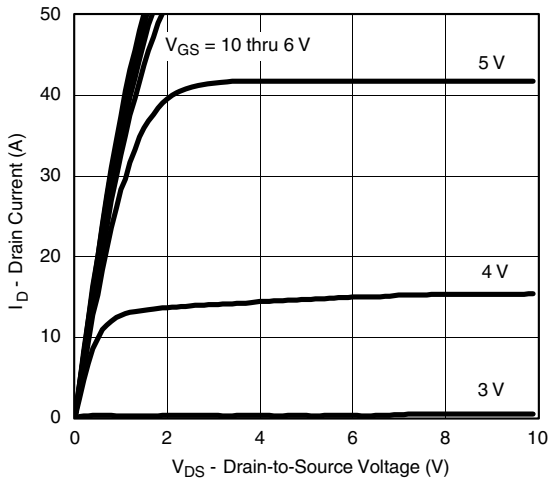
Notes

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

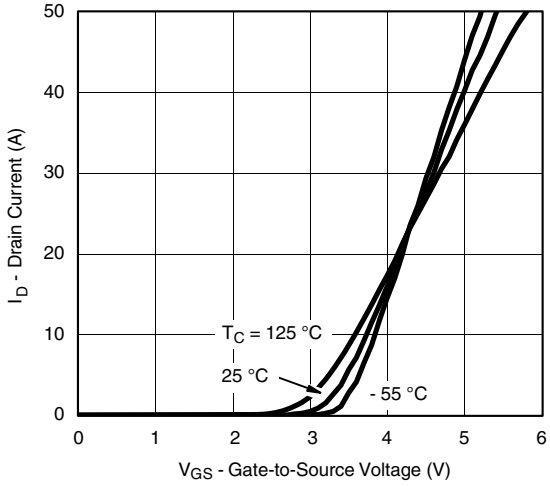
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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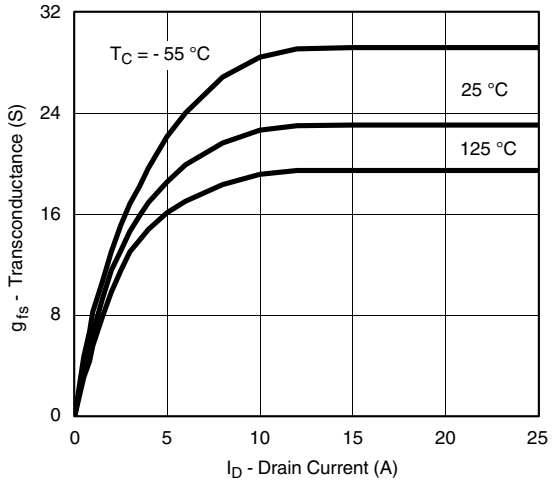
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



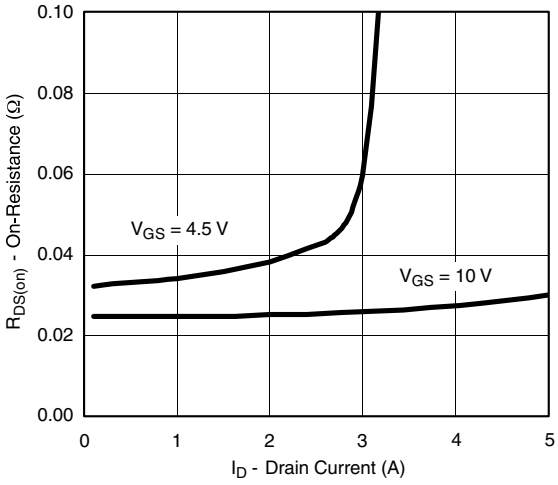
Output Characteristics



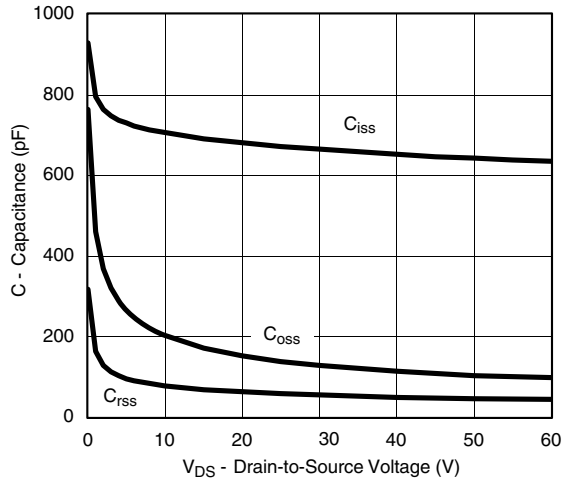
Transfer Characteristics



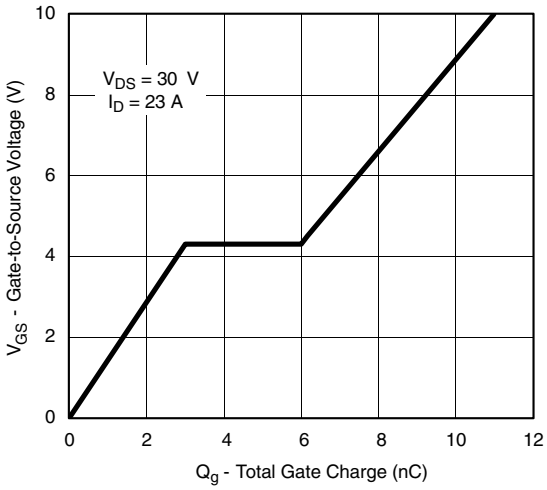
Transconductance



On-Resistance vs. Drain Current



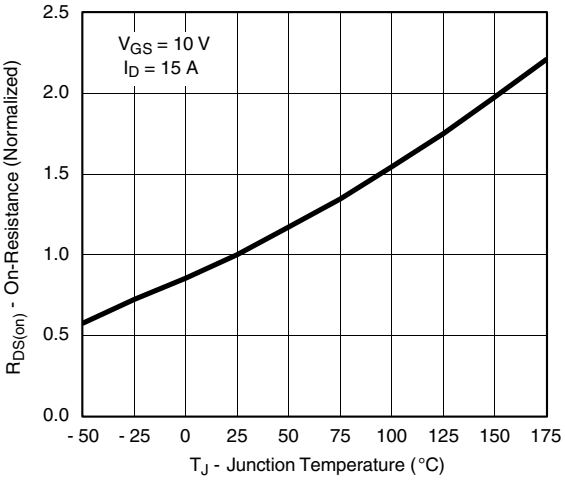
Capacitance



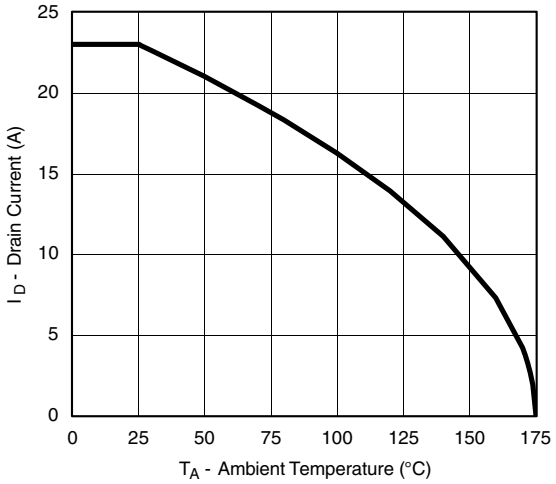
Gate Charge

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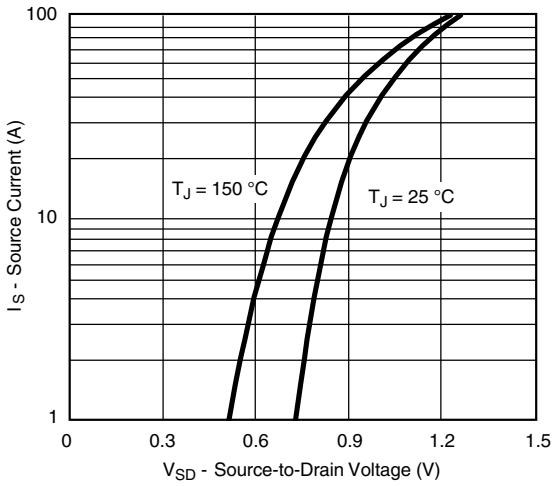
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



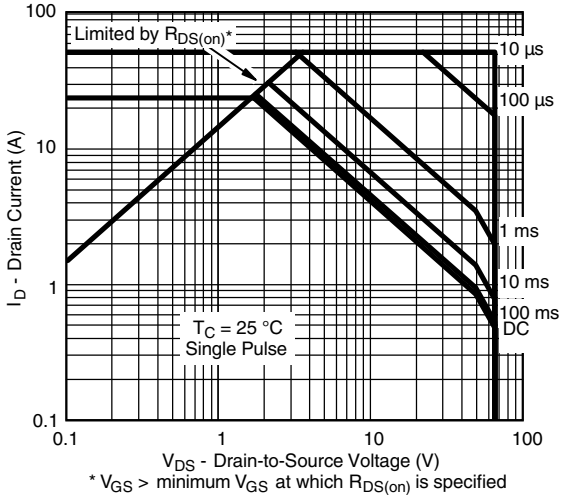
On-Resistance vs. Junction Temperature



Maximum Drain Current vs. Ambient Temperature



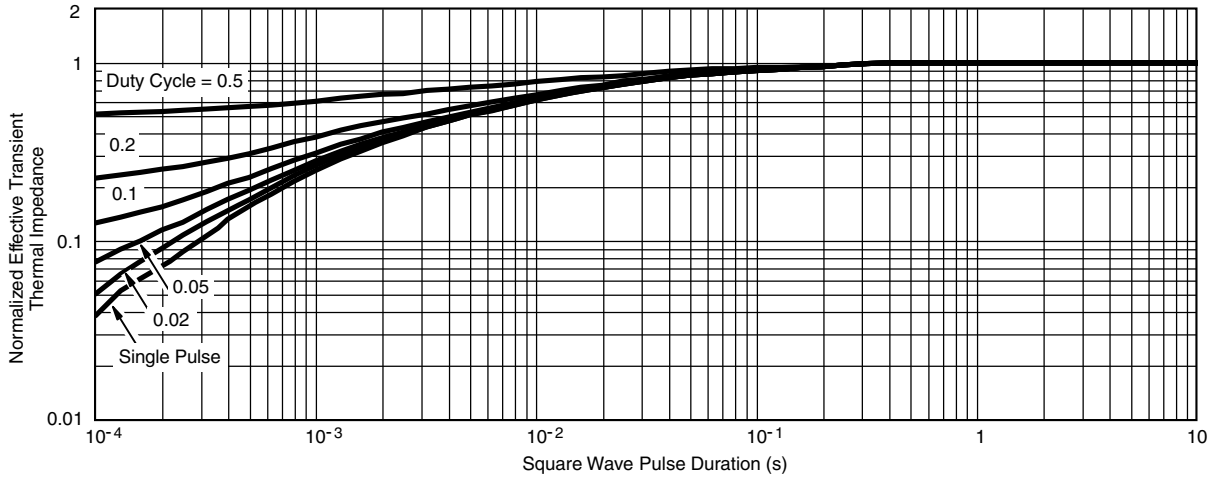
Source-Drain Diode Forward Voltage



Safe Operating Area

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TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



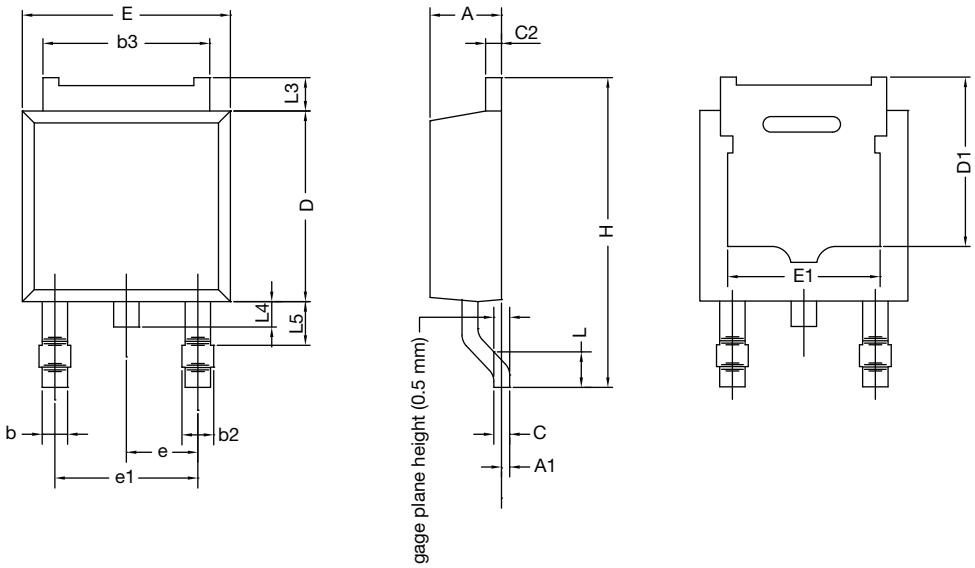
Normalized Thermal Transient Impedance, Junction-to-Case

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TO-252AA Case Outline

VERSION 1: FACILITY CODE = Y



	MILLIMETERS	
DIM.	MIN.	MAX.
A	2.18	2.38
A1	-	0.127
b	0.64	0.88
b2	0.76	1.14
b3	4.95	5.46
C	0.46	0.61
C2	0.46	0.89
D	5.97	6.22
D1	4.10	-
E	6.35	6.73
E1	4.32	-
H	9.40	10.41
e	2.28 BSC	
e1	4.56 BSC	
L	1.40	1.78
L3	0.89	1.27
L4	-	1.02
L5	1.01	1.52

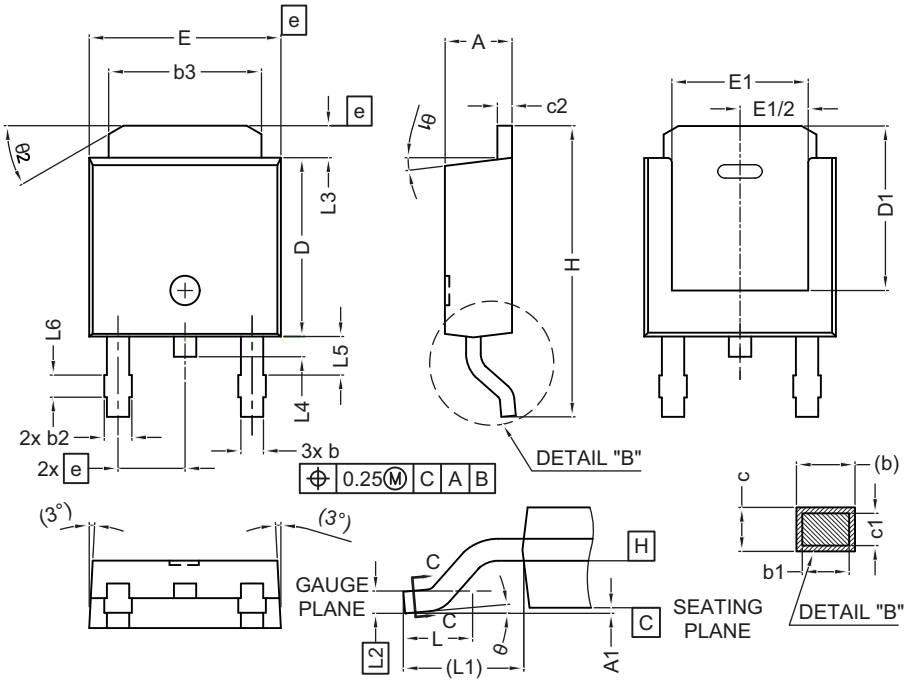
Note

- Dimension L3 is for reference only

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VERSION 2: FACILITY CODE = N



	MILLIMETERS	
DIM.	MIN.	MAX.
A	2.18	2.39
A1	-	0.13
b	0.65	0.89
b1	0.64	0.79
b2	0.76	1.13
b3	4.95	5.46
c	0.46	0.61
c1	0.41	0.56
c2	0.46	0.60
D	5.97	6.22
D1	5.21	-
E	6.35	6.73
E1	4.32	-
e	2.29 BSC	
H	9.94	10.34

	MILLIMETERS	
DIM.	MIN.	MAX.
L	1.50	1.78
L1	2.74 ref.	
L2	0.51 BSC	
L3	0.89	1.27
L4	-	1.02
L5	1.14	1.49
L6	0.65	0.85
θ	0°	10°
θ1	0°	15°
θ2	25°	35°

Notes

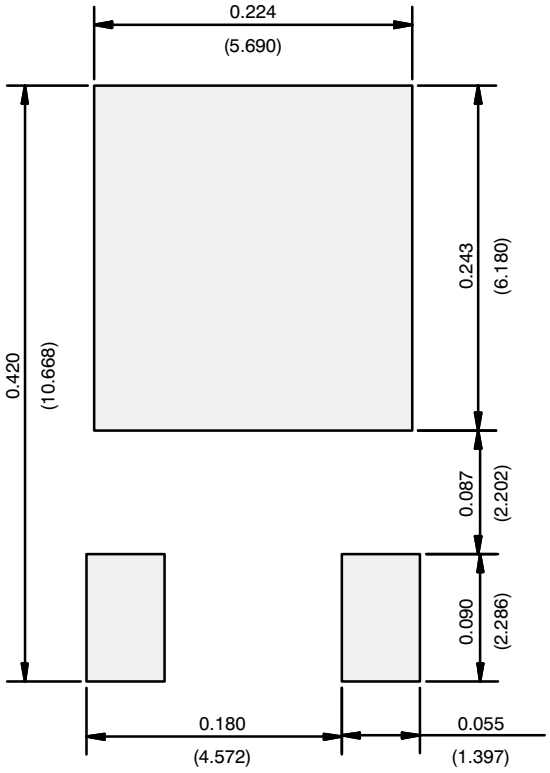
- Dimensioning and tolerance confirm to ASME Y14.5M-1994
- All dimensions are in millimeters. Angles are in degrees
- Heat sink side flash is max. 0.8 mm
- Radius on terminal is optional

ECN: E22-0399-Rev. R, 03-Oct-2022
DWG: 5347

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RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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APPLICATION NOTE

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