



# N-Channel 25-V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	r <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a, e</sup>	Q <sub>g</sub> (Typ)
25	0.0062 at V <sub>GS</sub> = 10 V	78	20.5 nC
	0.010 at V <sub>GS</sub> = 4.5 V	62	

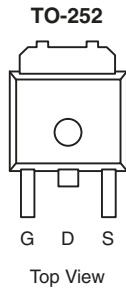
### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> Tested
- RoHS Compliant

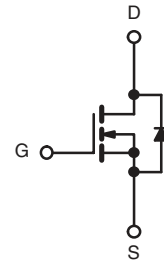


### APPLICATIONS

- DC/DC Conversion, Low-Side
- Desktop PC



Drain Connected to Tab



Ordering Information: SUD50N025-06P-E3 (Lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V <sub>DS</sub>	25	V	
Gate-Source Voltage	V <sub>GS</sub>	± 20		
Continuous Drain Current (T <sub>J</sub> = 175 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	78 <sup>a, e</sup>	A
		T <sub>C</sub> = 70 °C	65 <sup>a, e</sup>	
		T <sub>A</sub> = 25 °C	32 <sup>b, c</sup>	
		T <sub>A</sub> = 70 °C	25 <sup>b, c</sup>	
Pulsed Drain Current	I <sub>DM</sub>	100		
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	43	
		T <sub>A</sub> = 25 °C	7.1 <sup>b, c</sup>	
Avalanche Current Pulse	I <sub>AS</sub>	35		
Single Pulse Avalanche Energy	E <sub>AS</sub>	61.25	mJ	
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	65 <sup>a</sup>	W
		T <sub>C</sub> = 70 °C	45 <sup>a</sup>	
		T <sub>A</sub> = 25 °C	10.7 <sup>b, c</sup>	
		T <sub>A</sub> = 70 °C	7.5 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C	

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b, d</sup>	R <sub>thJA</sub>	11	14	°C/W
Maximum Junction-to-Case	R <sub>thJC</sub>	1.9	2.3	

Notes:

- Based on T<sub>C</sub> = 25 °C.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 sec.
- Maximum under Steady State conditions is 90 °C/W.
- Calculated based on maximum junction temperature. Package limitation current is 50 A.

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	25			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		20		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.4		2.4	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.0051	0.0062	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 15\text{ A}$		0.0081	0.010	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		55		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 12\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		2490		pF
Output Capacitance	$C_{oss}$			530		
Reverse Transfer Capacitance	$C_{rss}$			280		
Total Gate Charge	$Q_g$	$V_{DS} = 12\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		44	66	nC
			$V_{DS} = 12\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$	20.5	31	
Gate-Source Charge	$Q_{gs}$	7.5				
Gate-Drain Charge	$Q_{gd}$	7.0				
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	0.55	1.1	1.65	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 12\text{ V}, R_L = 0.24\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		19	28	ns
Rise Time	$t_r$			12	18	
Turn-Off Delay Time	$t_{d(off)}$			18	27	
Fall Time	$t_f$			7	11	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 12\text{ V}, R_L = 0.24\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		9	14	
Rise Time	$t_r$			11	16.5	
Turn-Off Delay Time	$t_{d(off)}$			24	36	
Fall Time	$t_f$			8	12	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			43	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				100	
Body Diode Voltage	$V_{SD}$	$I_S = 30\text{ A}$		0.9	1.5	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		30	45	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			20	30	nC
Reverse Recovery Fall Time	$t_a$			13.5		ns
Reverse Recovery Rise Time	$t_b$			16.5		

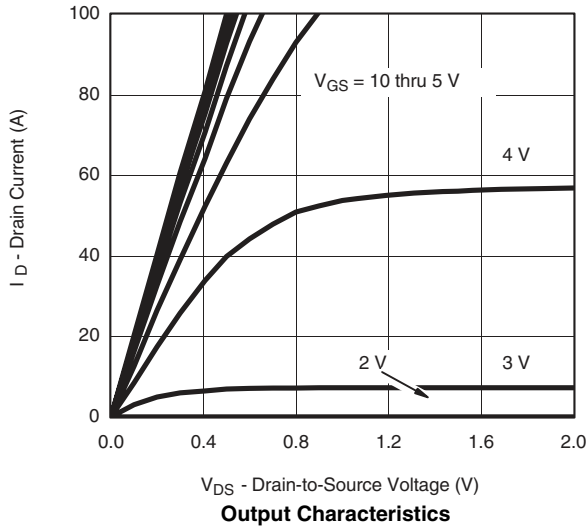
Notes:

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

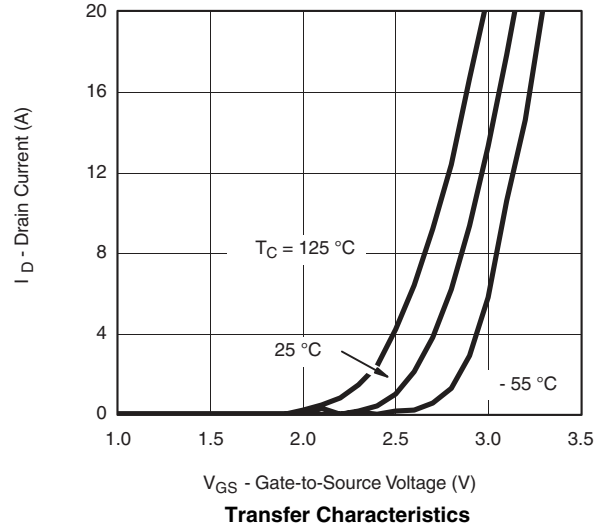
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



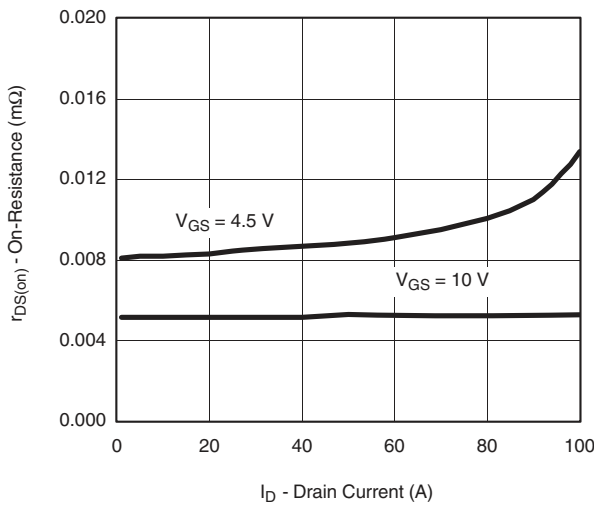
**TYPICAL CHARACTERISTICS** 25 °C unless noted



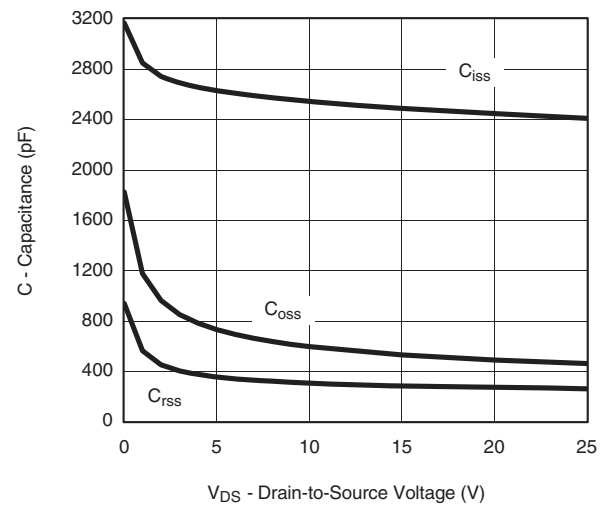
**Output Characteristics**



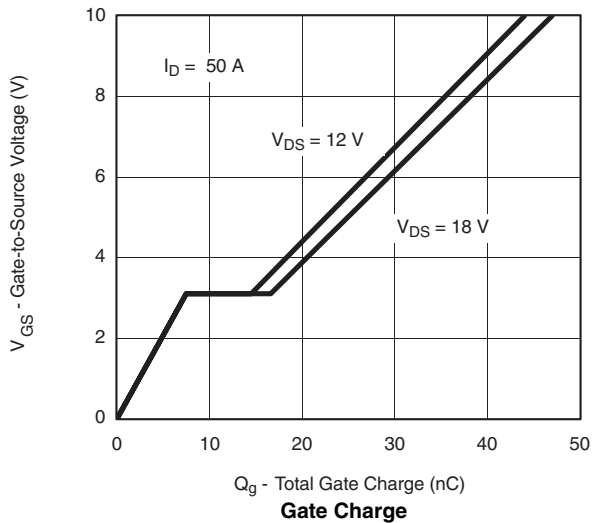
**Transfer Characteristics**



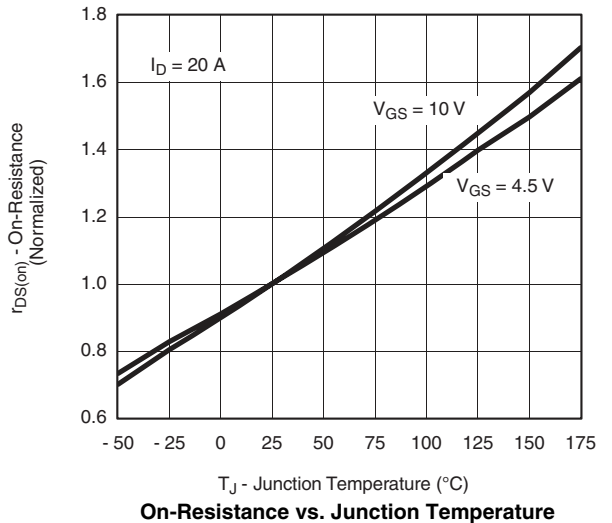
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**



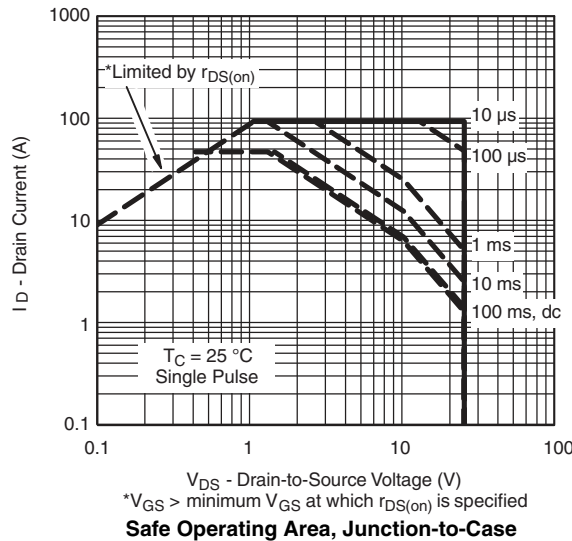
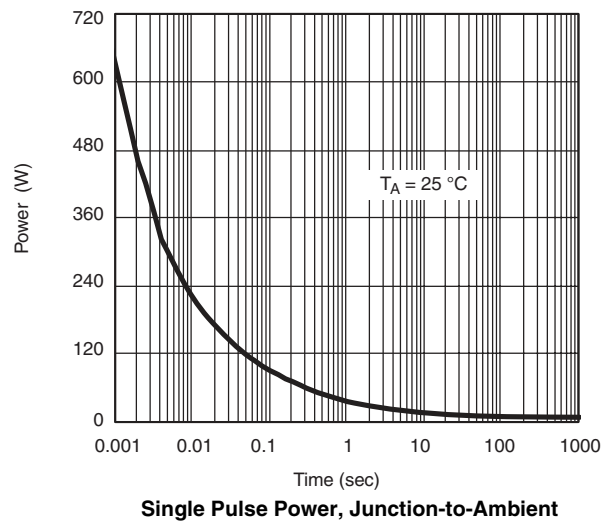
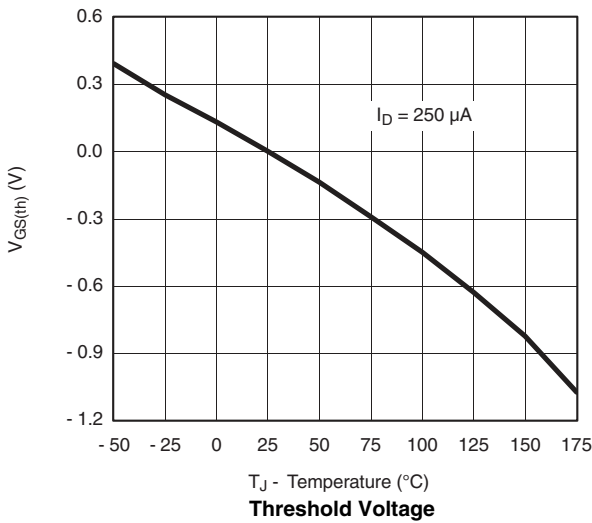
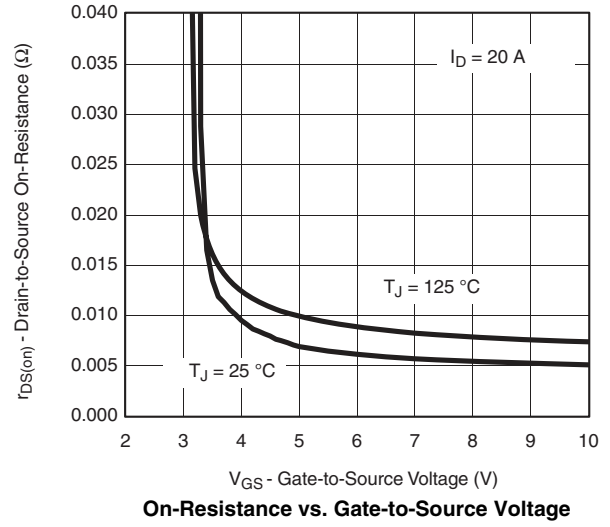
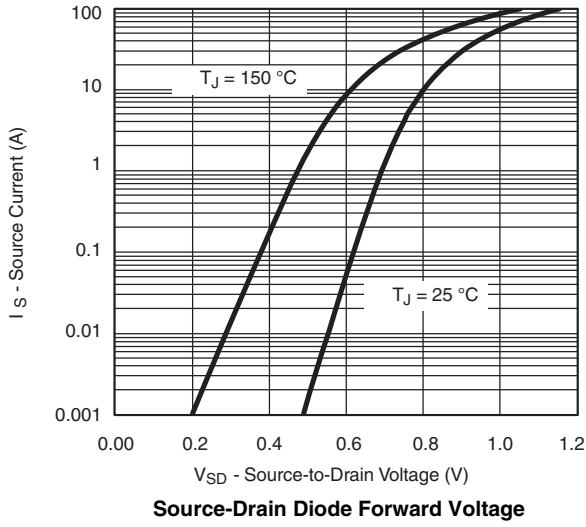
**Gate Charge**



**On-Resistance vs. Junction Temperature**

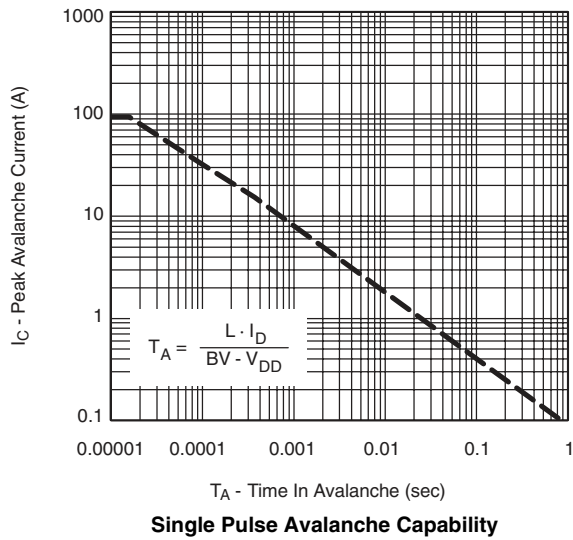
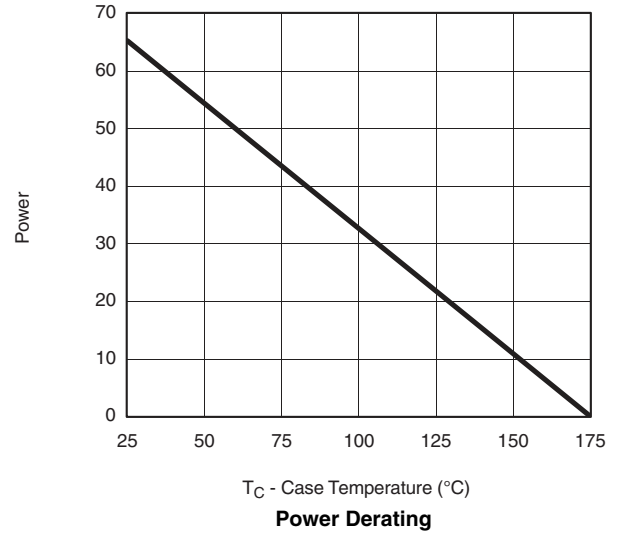
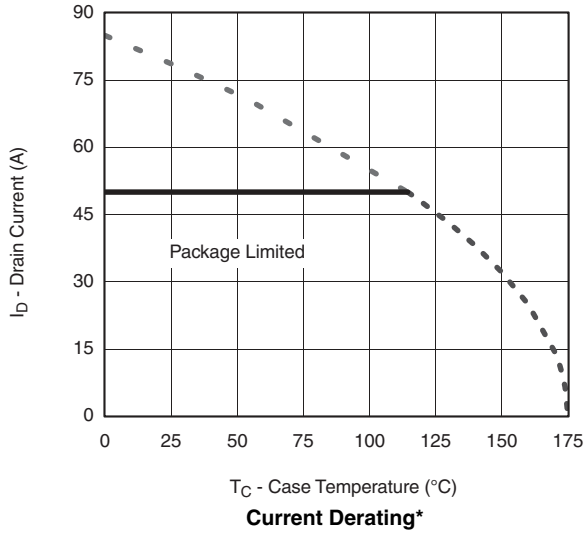


**TYPICAL CHARACTERISTICS** 25 °C unless noted



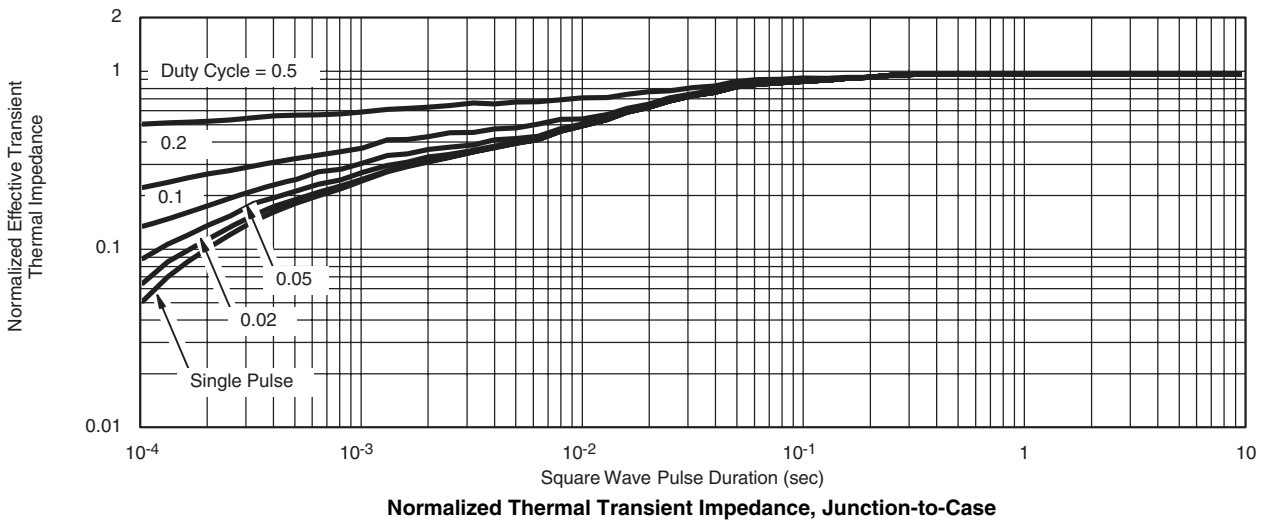
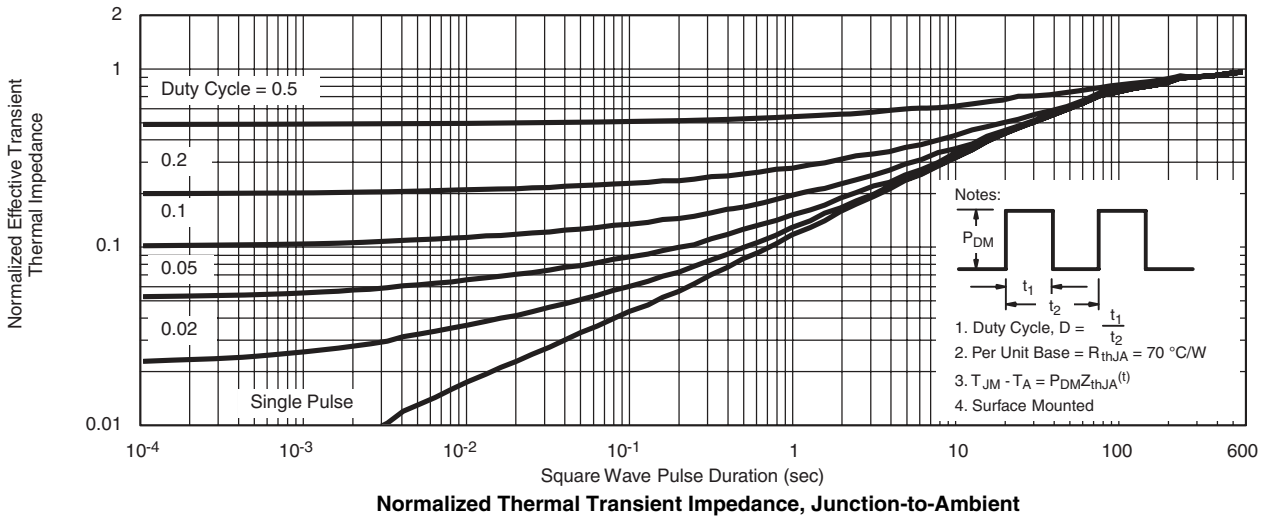


**TYPICAL CHARACTERISTICS** 25 °C unless noted



\*The power dissipation  $P_D$  is based on  $T_{J(max)} = 175\text{ }^\circ\text{C}$ , 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 noted

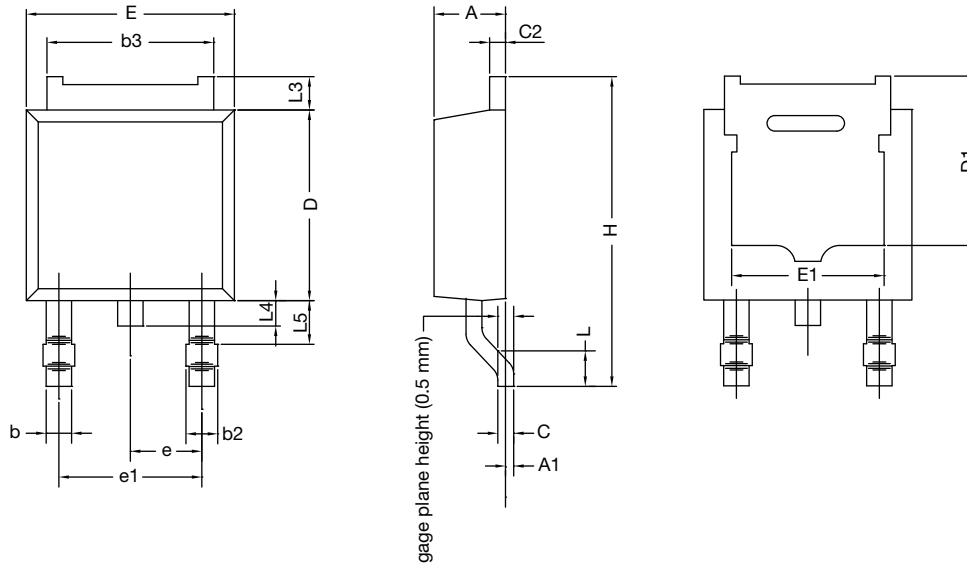


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# TO-252AA Case Outline

## VERSION 1: FACILITY CODE = Y



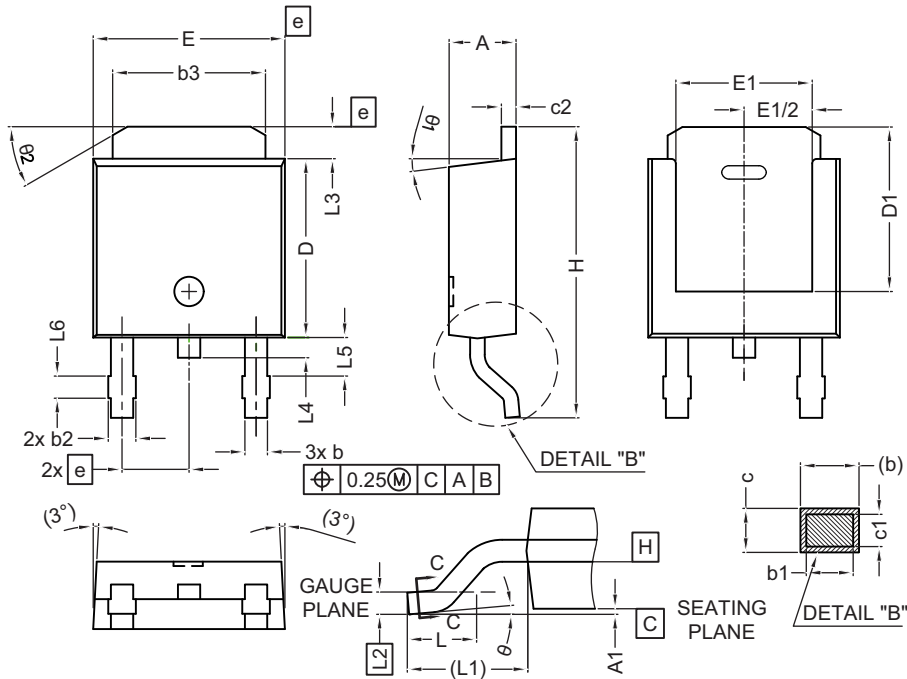
DIM.	MILLIMETERS	
	MIN.	MAX.
A	2.18	2.38
A1	-	0.127
b	0.64	0.88
b2	0.76	1.14
b3	4.95	5.46
C	0.46	0.61
C2	0.46	0.89
D	5.97	6.22
D1	4.10	-
E	6.35	6.73
E1	4.32	-
H	9.40	10.41
e	2.28 BSC	
e1	4.56 BSC	
L	1.40	1.78
L3	0.89	1.27
L4	-	1.02
L5	1.01	1.52

### Note

- Dimension L3 is for reference only



VERSION 2: FACILITY CODE = N



DIM.	MILLIMETERS	
	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

DIM.	MILLIMETERS	
	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°

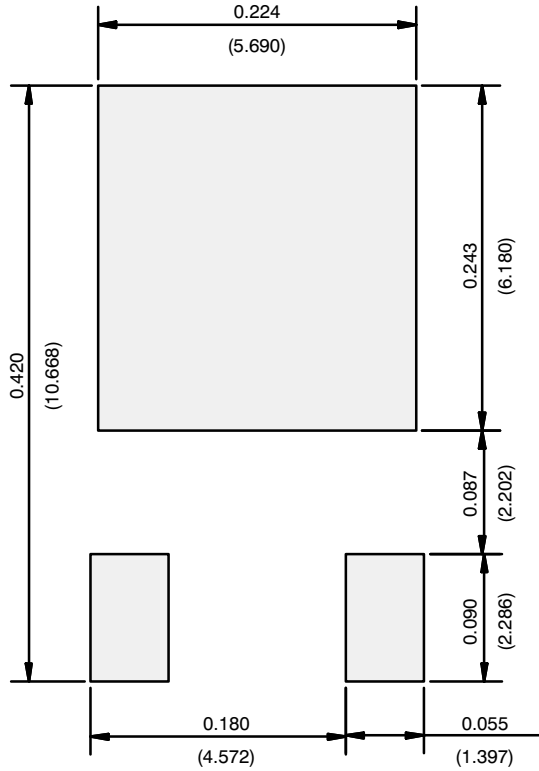
Notes

- 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



RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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