

## P-Channel 40-V (D-S) MOSFET

### PRODUCT SUMMARY

V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)	Q <sub>g</sub> (TYP.)
-40	0.0081 at V <sub>GS</sub> = -10 V	-50 <sup>d</sup>	60
	0.0117 at V <sub>GS</sub> = -4.5 V	-48 <sup>d</sup>	

### FEATURES

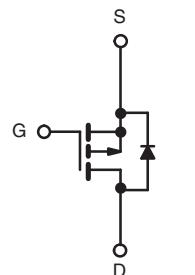
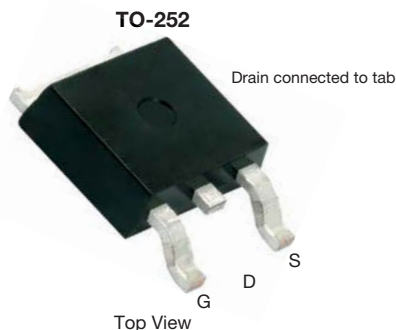
- TrenchFET® power MOSFET
- 100 % R<sub>g</sub> and UIS tested
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Power switch
- Load switch in high current applications
- DC/DC converters



P-Channel MOSFET

### Ordering Information:

SUD50P04-08-GE3 (lead (Pb)-free and halogen-free)

### ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V <sub>DS</sub>	-40	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C -50 <sup>d</sup>	A
		T <sub>C</sub> = 70 °C -50 <sup>d</sup>	
Pulsed Drain Current	I <sub>DM</sub>	-100	
Avalanche Current	I <sub>AS</sub>	-46	
Single Avalanche Energy <sup>a</sup>	E <sub>AS</sub>	106	mJ
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>C</sub> = 25 °C 73.5 <sup>b</sup>	W
		T <sub>A</sub> = 25 °C <sup>c</sup> 2.5	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

### THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) <sup>c</sup>	R <sub>thJA</sub>	50	°C/W
Junction-to-Case (Drain)	R <sub>thJC</sub>	1.7	

### Notes

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).
- Package limited.

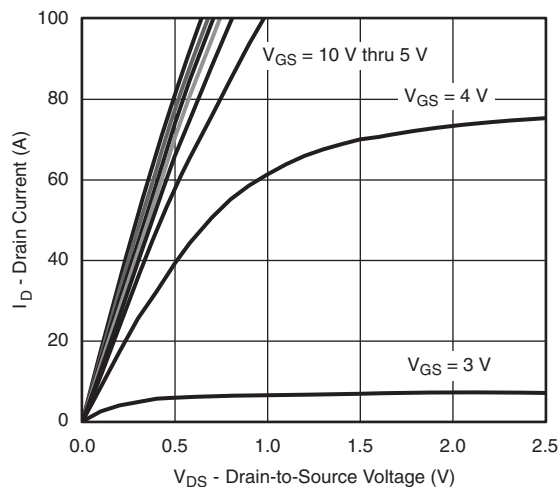
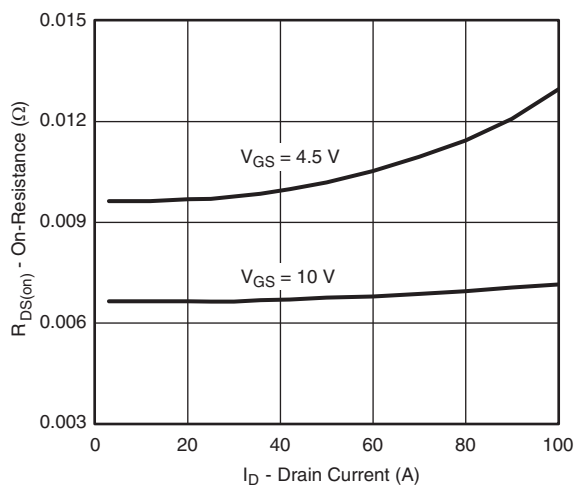
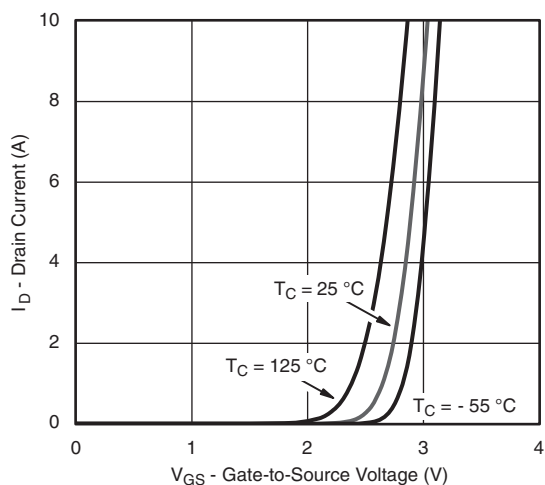
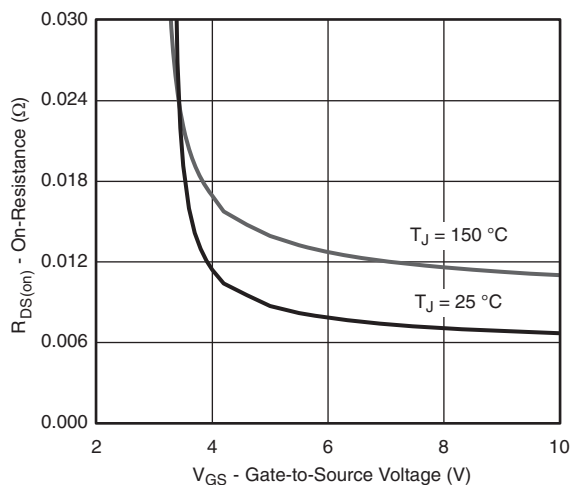
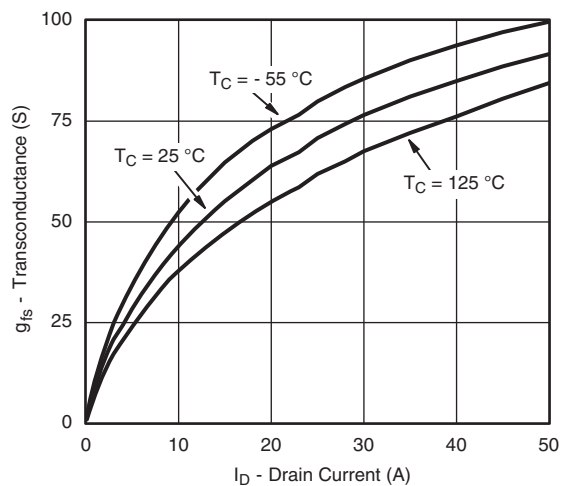
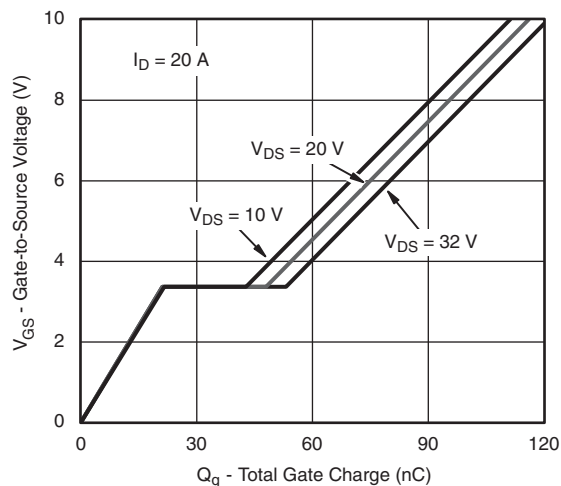


SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-40	-	-	V	
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-1	-	-2.5		
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V	-	-	± 250	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -40 V, V <sub>GS</sub> = 0 V	-	-	-1	μA	
		V <sub>DS</sub> = -40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C	-	-	-50		
		V <sub>DS</sub> = -40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 150 °C	-	-	-250		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≤ -10 V, V <sub>GS</sub> = -10 V	-50	-	-	A	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -22 A	-	0.0067	0.0081	Ω	
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -19 A	-	0.0097	0.0117		
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -22 A	-	45	-	S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -20 V, f = 1 MHz	-	5380	-	pF	
Output Capacitance	C <sub>oss</sub>		-	570	-		
Reverse Transfer Capacitance	C <sub>rss</sub>		-	500	-		
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -20 A	-	106	159	nC	
			-	60	90		
	Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -20 A	-	22		-
			Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>	-		27
Gate Resistance	R <sub>g</sub>	f = 1 MHz			0.4	1.8	3.6
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = -20 V, R <sub>L</sub> = 2 Ω I <sub>D</sub> ≅ -10 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω	-	15	23	ns	
Rise Time <sup>c</sup>	t <sub>r</sub>		-	12	18		
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>		-	70	105		
Fall Time <sup>c</sup>	t <sub>f</sub>		-	18	27		
Drain-Source Body Diode Ratings and Characteristics (T <sub>C</sub> = 25 °C) <sup>b</sup>							
Continuous Current	I <sub>S</sub>		-	-	-50	A	
Pulsed Current	I <sub>SM</sub>		-	-	-100		
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = -10 A, V <sub>GS</sub> = 0 V	-	-0.8	-1.5	V	
Reverse Recovery Time	trr	I <sub>F</sub> = -10 A, dI/dt = 100 A/μs	-	35	53	ns	
Peak Reverse Recovery Current	I <sub>RM(REC)</sub>		-	-2	-3	A	
Reverse Recovery Charge	Q <sub>rr</sub>		-	33	50	nC	

**Notes**

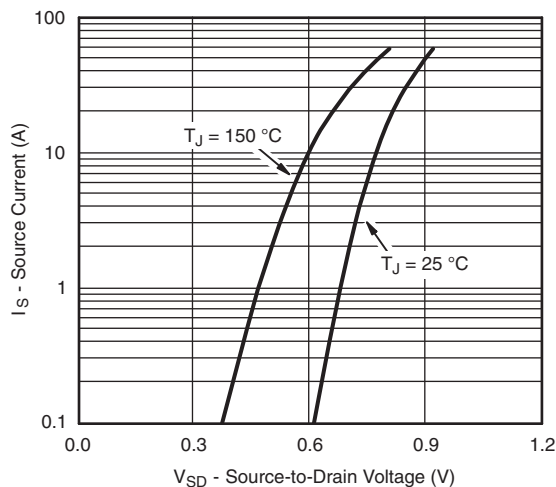
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.  
c. Independent of operating temperature.

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.

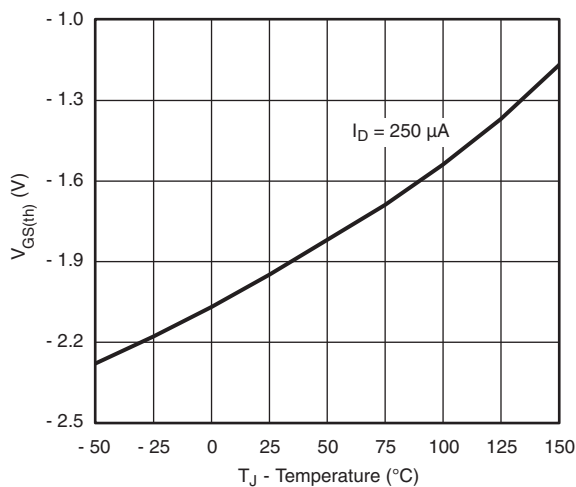
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Output Characteristics**

**On-Resistance vs. Drain Current**

**Transfer Characteristics**

**On-Resistance vs. Gate-to-Source Voltage**

**Transconductance**

**Gate Charge**



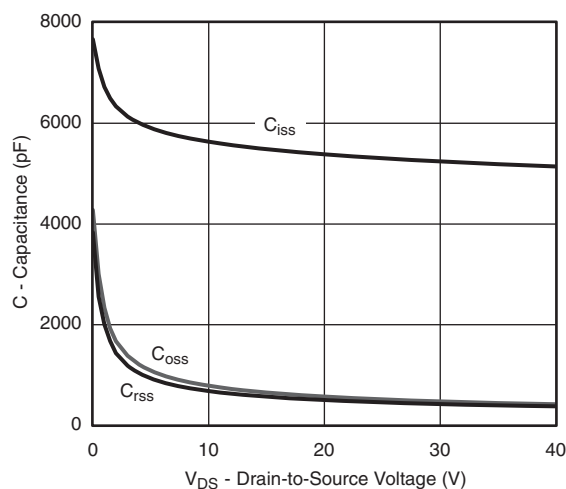
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



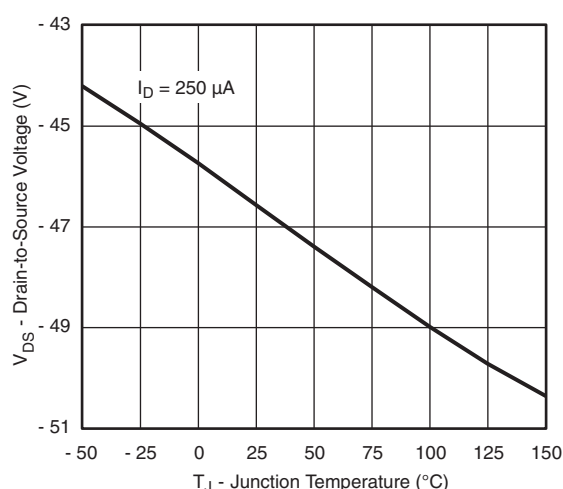
**Source-Drain Diode Forward Voltage**



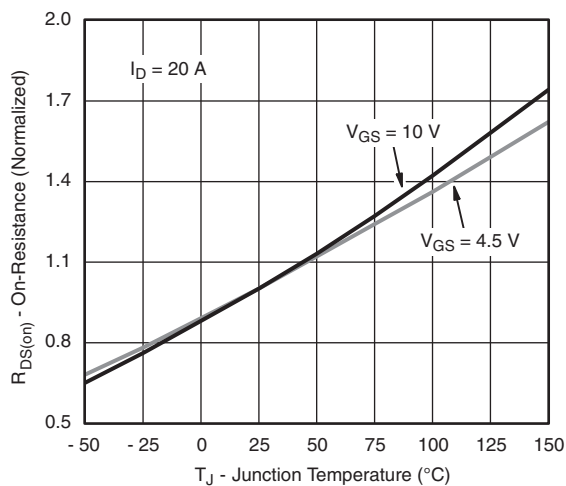
**Threshold Voltage**



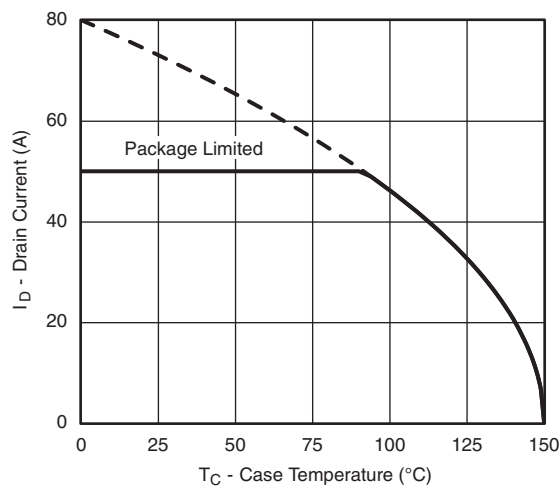
**Capacitance**



**Drain Source Breakdown vs. Junction Temperature**



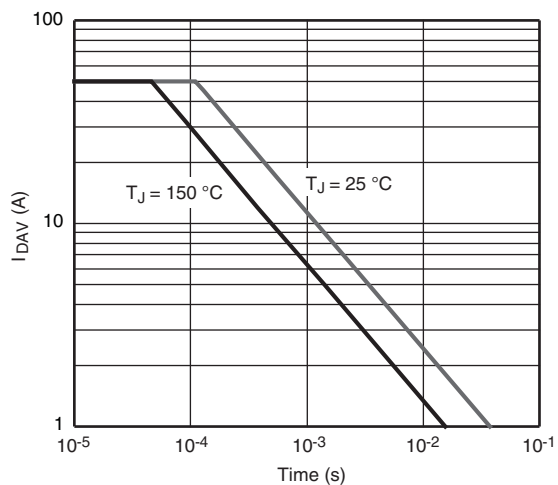
**On-Resistance vs. Junction Temperature**



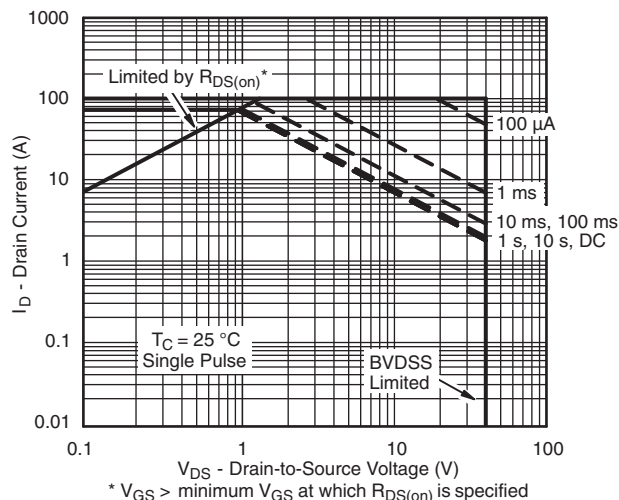
**Current Derating**



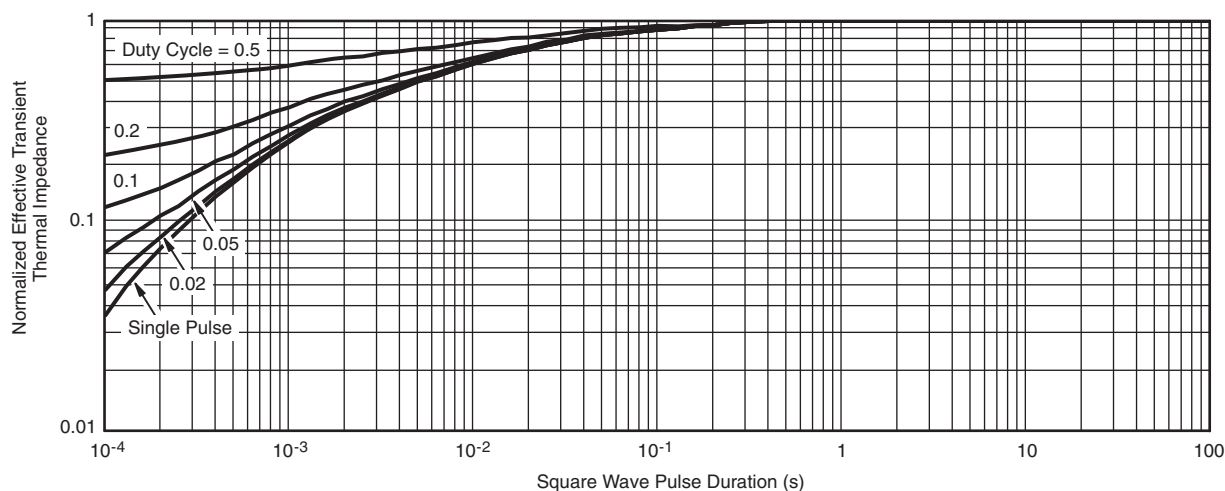
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



**Single Pulse Avalanche Current Capability vs. Time**



**Safe Operating Area**

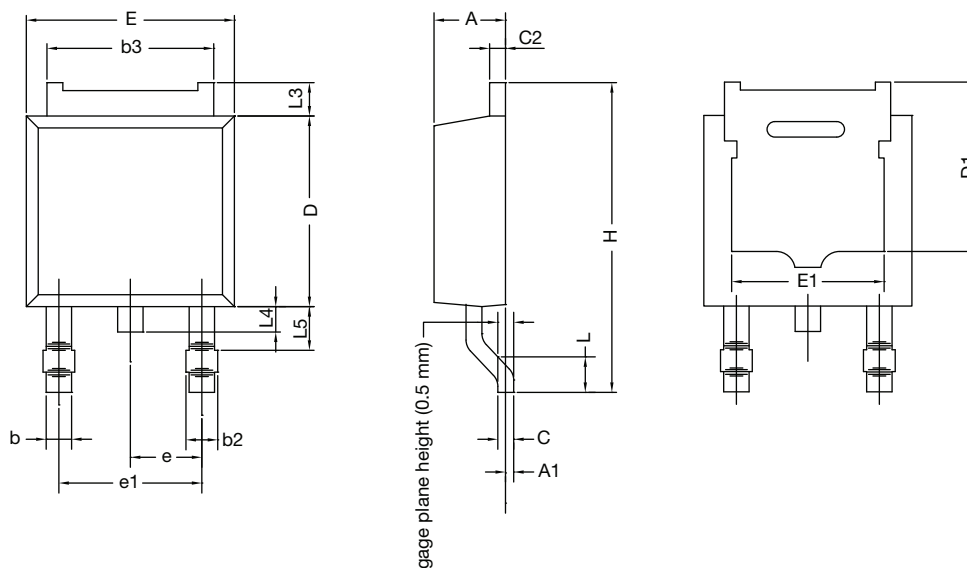


**Normalized Thermal Transient Impedance, Junction-to-Case**

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## TO-252AA Case Outline

### VERSION 1: FACILITY CODE = Y



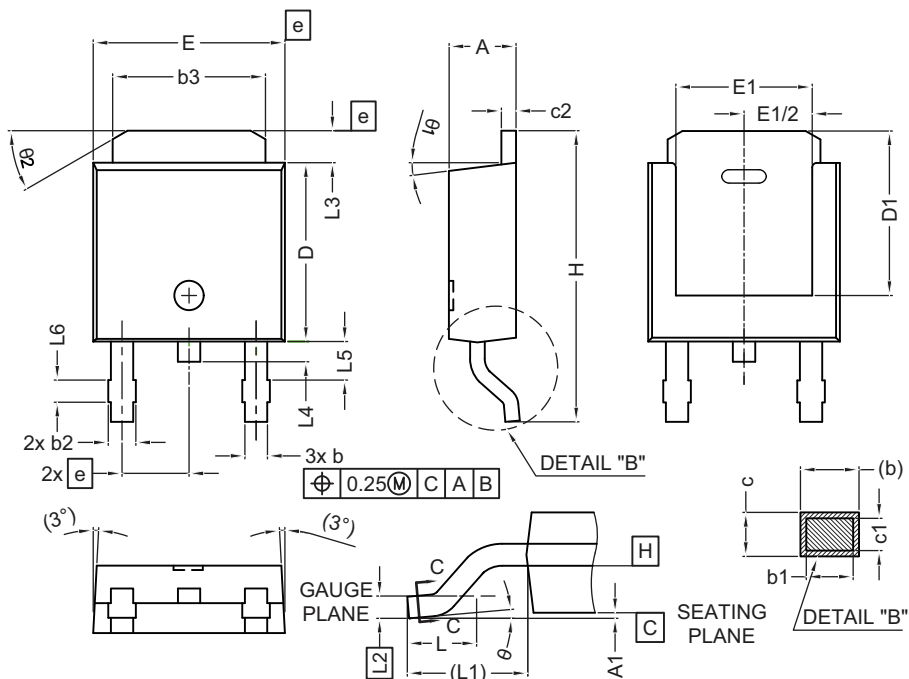
MILLIMETERS		
DIM.	MIN.	MAX.
A	2.18	2.38
A1	-	0.127
b	0.64	0.88
b2	0.76	1.14
b3	4.95	5.46
C	0.46	0.61
C2	0.46	0.89
D	5.97	6.22
D1	4.10	-
E	6.35	6.73
E1	4.32	-
H	9.40	10.41
e	2.28 BSC	
e1	4.56 BSC	
L	1.40	1.78
L3	0.89	1.27
L4	-	1.02
L5	1.01	1.52

#### Note

- Dimension L3 is for reference only



## 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

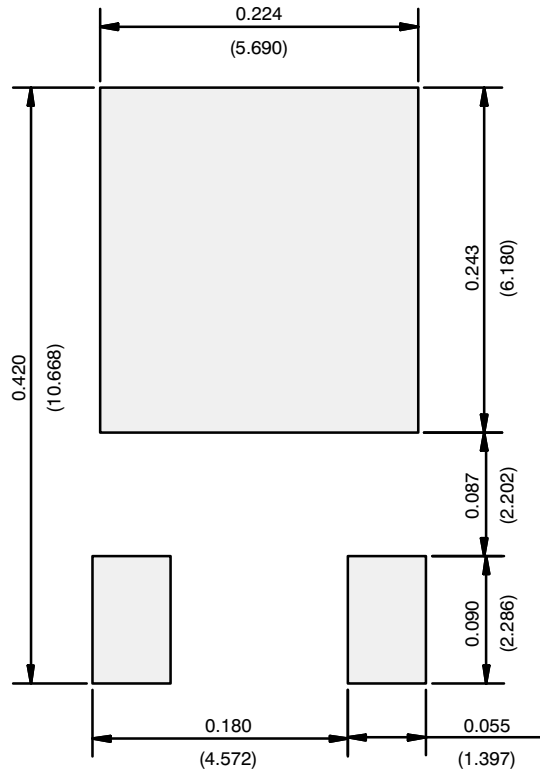
DIM.	MILLIMETERS	
	MIN.	MAX.
L	1.50	1.78
L1	2.74 ref.	
L2	0.51 BSC	
L3	0.89	1.27
L4	-	1.02
L5	1.14	1.49
L6	0.65	0.85
θ	0°	10°
θ1	0°	15°
θ2	25°	35°

### 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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