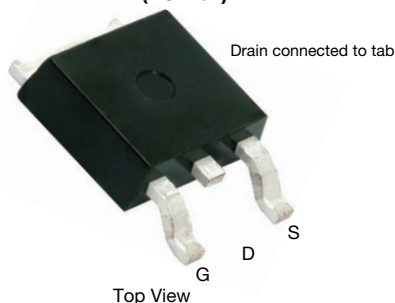
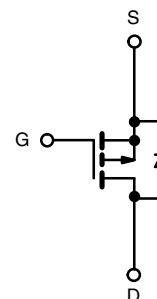


# P-Channel 40 V (D-S), 175 °C MOSFET

**DPAK (TO-252)**


## FEATURES

- TrenchFET® power MOSFETs
- 175 °C junction temperature
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT


P-Channel MOSFET

## PRODUCT SUMMARY

$V_{DS}$ (V)	-40
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -10$ V	0.0094
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.0145
$I_D$ (A) <sup>d</sup>	-50
Configuration	Single

## ORDERING INFORMATION

Package	DPAK (TO-252)
Lead (Pb)-free	SUD50P04-09L-E3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	-40	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current ( $T_J = 175$ °C)	$I_D$	$T_C = 25$ °C	-50 <sup>d</sup>
		$T_C = 125$ °C	-50 <sup>d</sup>
Pulsed drain current	$I_{DM}$	-100	A
Avalanche current	$I_{AS}$	-50	A
Single avalanche energy <sup>a</sup>	$E_{AS}$	125	mJ
Power dissipation	$P_D$	$T_C = 25$ °C	136 <sup>c</sup>
		$T_A = 25$ °C	3 <sup>b, c</sup>
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +175	°C

## THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-ambient <sup>b</sup>	$R_{thJA}$	$t \leq 10$ s	15	°C/W
		Steady state	40	
Junction-to-case	$R_{thJC}$	0.82	1.1	

### Notes

- Duty cycle  $\leq 1\%$
- When mounted on 1" square PCB (FR4 material)
- See SOA curve for voltage derating
- 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	-	-3	
Gate-body leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V	-	-	± 100	nA
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = -32 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
		V <sub>DS</sub> = -32 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C	-	-	-50	
		V <sub>DS</sub> = -32 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C	-	-	-150	
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = -5 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> = -24 A	-	0.0075	0.0094	Ω
		V <sub>GS</sub> = -10 V, I <sub>D</sub> = -50 A, T <sub>J</sub> = 125 °C	-	-	0.0140	
		V <sub>GS</sub> = -10 V, I <sub>D</sub> = -50 A, T <sub>J</sub> = 175 °C	-	-	0.0170	
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -18 A	-	0.0115	0.0145	
Forward transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -5 V, I <sub>D</sub> = -24 A	-	73	-	S
Dynamic <sup>b</sup>						
Input capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -25 V, f = 1 MHz	-	4800	-	pF
Output capacitance	C <sub>OSS</sub>		-	700	-	
Reverse transfer capacitance	C <sub>RSS</sub>		-	550	-	
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> = -50 A	-	102	150	nC
Gate-source charge <sup>c</sup>	Q <sub>gs</sub>		-	18.5	-	
Gate-drain charge <sup>c</sup>	Q <sub>gd</sub>		-	27	-	
Turn-on delay time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = -20 V, R <sub>L</sub> = 0.4 Ω I <sub>D</sub> ≅ -50 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 6 Ω	-	10	15	ns
Rise time <sup>c</sup>	t <sub>r</sub>		-	60	90	
Turn-off delay time <sup>c</sup>	t <sub>d(off)</sub>		-	145	220	
Fall time <sup>c</sup>	t <sub>f</sub>		-	140	220	
Source Drain-Diode Ratings and Characteristics <sup>b</sup> (T <sub>C</sub> = 25 °C)						
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> = -50 A, V <sub>GS</sub> = 0 V	-	-1	-1.5	V
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = -50 A, di/dt = 100 A/μs	-	55	85	ns

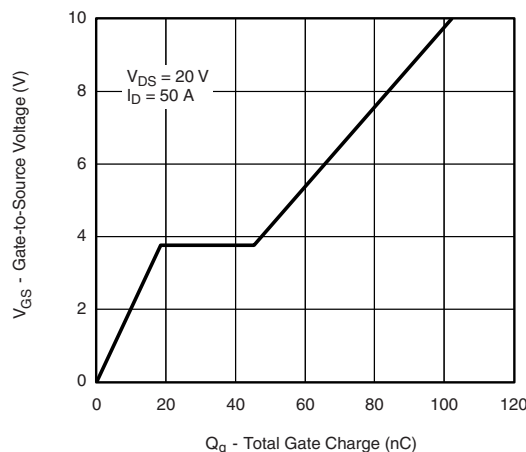
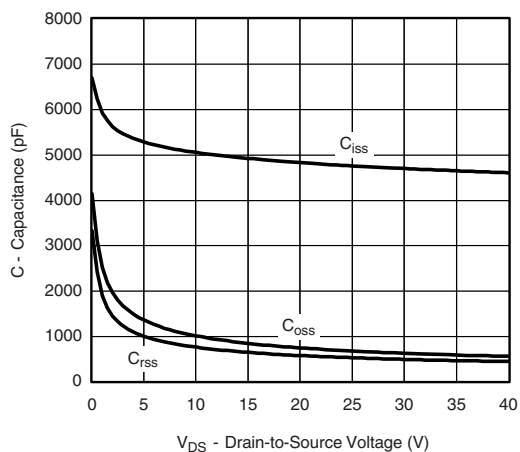
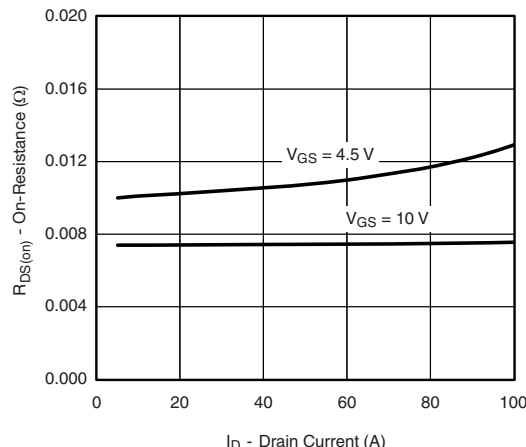
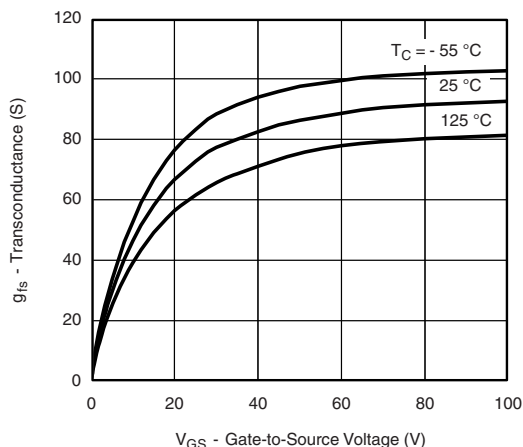
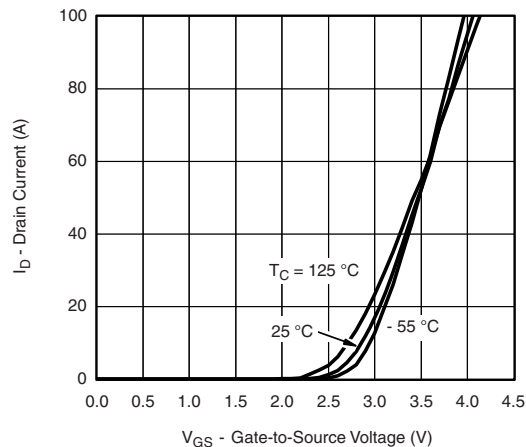
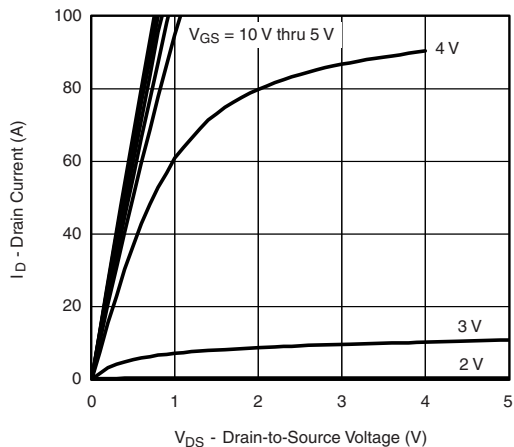
**Notes**

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

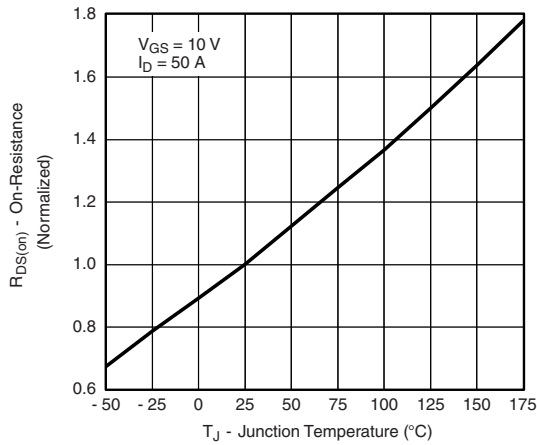


**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

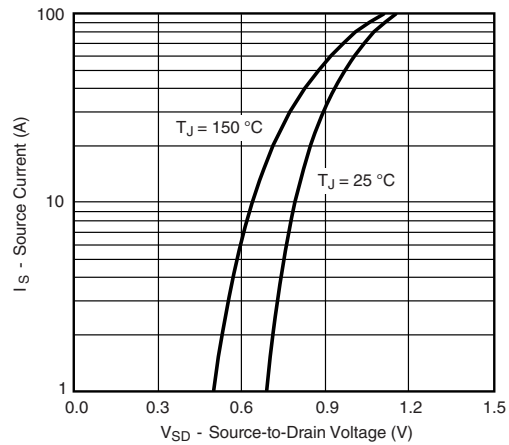




**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

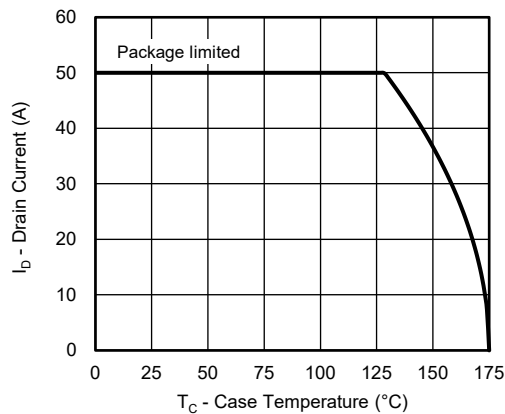


**On-Resistance vs. Junction Temperature**

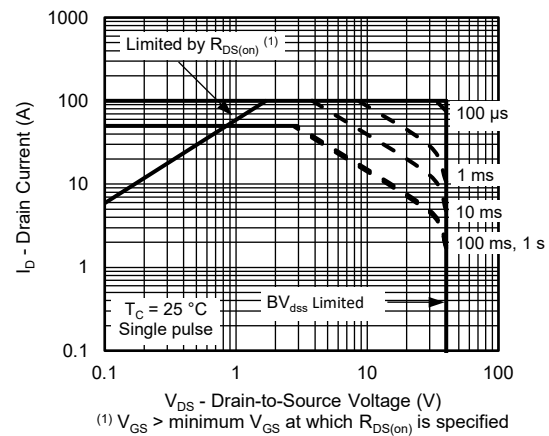


**Source-Drain Diode Forward Voltage**

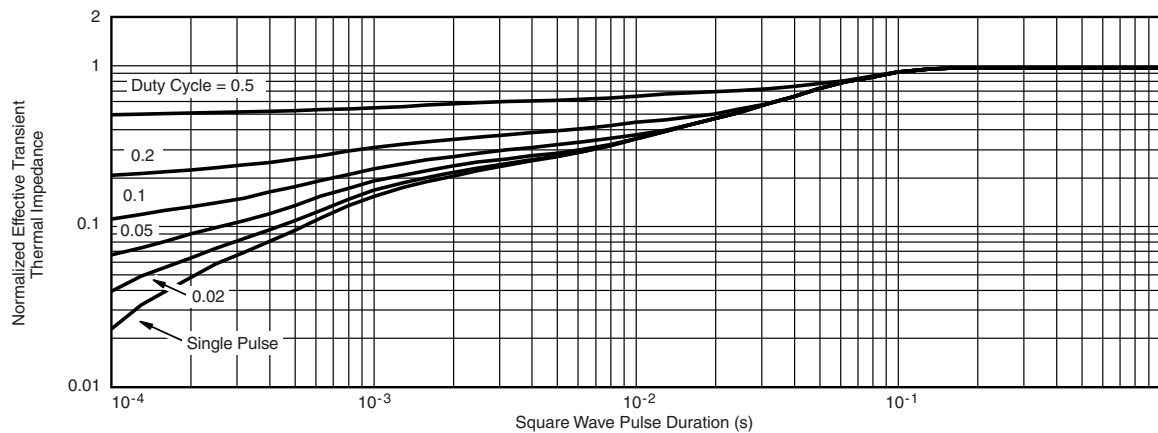
**THERMAL RATINGS**



**Max. Avalanche and Drain Current vs. Case Temperature**



**Safe Operating Area**

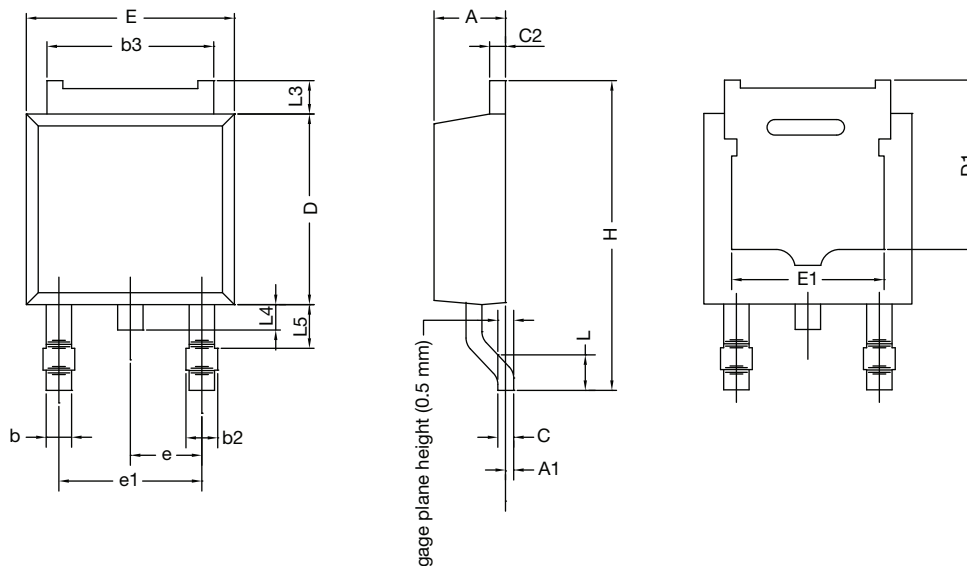


**Normalized Thermal Transient Impedance, Junction-to-Case**

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for silicon technology and package reliability represent a composite of all qualified locations. For related documents such as package / tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?72243](http://www.vishay.com/ppg?72243).

## TO-252AA Case Outline

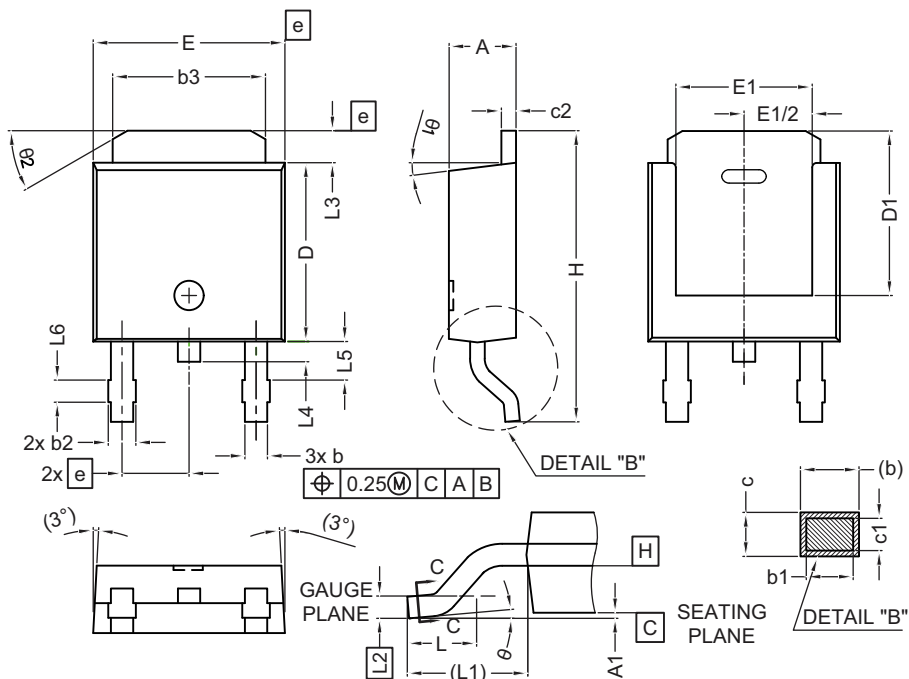
### VERSION 1: FACILITY CODE = Y



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**


	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

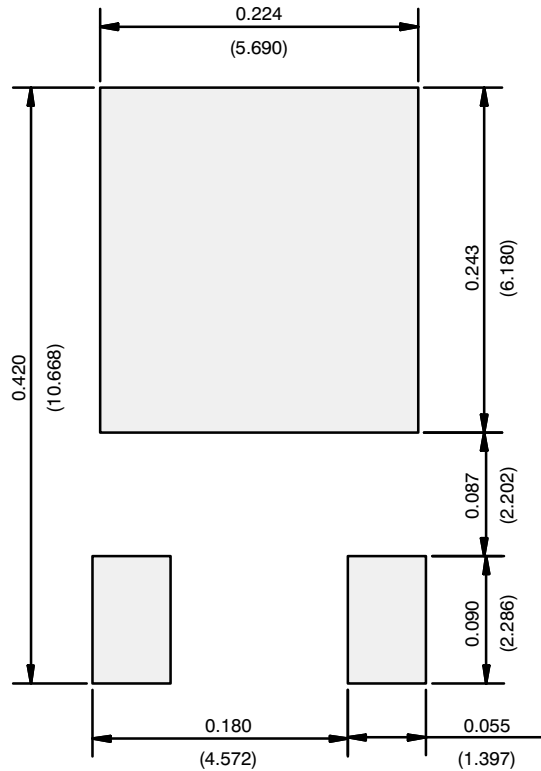
	MILLIMETERS	
DIM.	MIN.	MAX.
L	1.50	1.78
L1	2.74 ref.	
L2	0.51 BSC	
L3	0.89	1.27
L4	-	1.02
L5	1.14	1.49
L6	0.65	0.85
θ	0°	10°
θ1	0°	15°
θ2	25°	35°

**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

## RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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