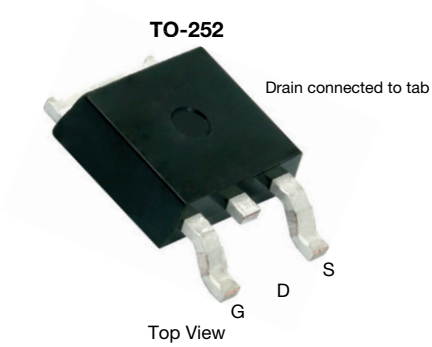
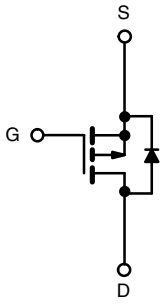
P-Channel 40 V (D-S), 175 °C MOSFET



FEATURES

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

RoHS COMPLIANT



P-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	-40
$R_{DS(on)}$ max. (Ω) at V_{GS} = -10 V	0.0094
$R_{DS(on)}$ max. (Ω) at V_{GS} = -4.5 V	0.0145
I_D (A) [d]	-50
Configuration	Single

ORDERING INFORMATION	
Package	TO-252
Lead (Pb)-free and halogen-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}	± 20	
Continuous drain current (T_J = 175 °C)	T_C = 25 °C	I_D	-50 [d]	A
	T_C = 125 °C		-50 [d]	
Pulsed drain current		I_{DM}	-100	
Avalanche current		I_{AS}	-50	
Single avalanche energy [a]	L = 0.1 mH	E_{AS}	125	mJ
Power dissipation	T_C = 25 °C	P_D	136 [c]	W
	T_A = 25 °C		3 [b, c]	
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 [b]	t ≤ 10 s	R_{thJA}	15	18	°C/W
	Steady state		40	50	
Junction-to-case		R_{thJC}	0.82	1.1	

Notes

a. Duty cycle ≤ 1%
b. When mounted on 1" square PCB (FR4 material)
c. See SOA curve for voltage derating
d. Package limited

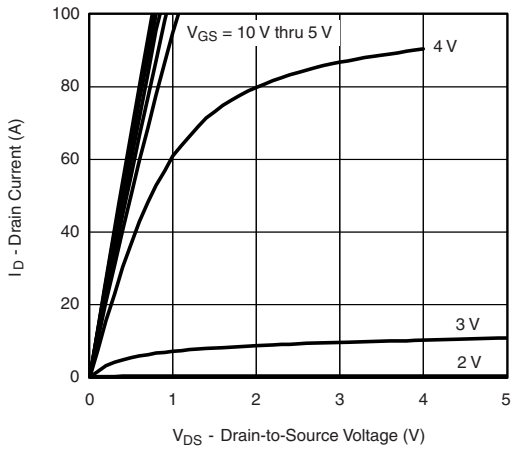
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = -250 µA	-40	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250 µA	-1	-	-3	
Gate-body leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	V_{DS} = -32 V, V_{GS} = 0 V	-	-	-1	µA
		V_{DS} = -32 V, V_{GS} = 0 V, T_J = 125 °C	-	-	-50	
		V_{DS} = -32 V, V_{GS} = 0 V, T_J = 175 °C	-	-	-150	
On-state drain current [a]	$I_{D(on)}$	V_{DS} = -5 V, V_{GS} = -10 V	-50	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = -10 V, I_D = -24 A	-	0.0075	0.0094	Ω
		V_{GS} = -10 V, I_D = -50 A, T_J = 125 °C	-	-	0.0140	
		V_{GS} = -10 V, I_D = -50 A, T_J = 175 °C	-	-	0.0170	
		V_{GS} = -4.5 V, I_D = -18 A	-	0.0115	0.0145	
Forward transconductance [a]	g_{fs}	V_{DS} = -5 V, I_D = -24 A	-	73	-	S
Dynamic [b]						
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = -25 V, f = 1 MHz	-	4800	-	pF
Output capacitance	C_{oss}		-	700	-	
Reverse transfer capacitance	C_{rss}		-	550	-	
Total gate charge [c]	Q_g	V_{DS} = -20 V, V_{GS} = -10 V, I_D = -50 A	-	102	150	nC
Gate-source charge [c]	Q_{gs}		-	18.5	-	
Gate-drain charge [c]	Q_{gd}		-	27	-	
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = -20 V, R_L = 0.4 Ω $I_D \cong$ -50 A, V_{GEN} = -10 V, R_g = 6 Ω	-	10	15	ns
Rise time [c]	t_r		-	60	90	
Turn-off delay time [c]	$t_{d(off)}$		-	145	220	
Fall time [c]	t_f		-	140	220	
Source Drain-Diode Ratings and Characteristics [b] (T_C = 25 °C)						
Continuous current	I_S		-	-	-50	A
Pulsed current	I_{SM}		-	-	-100	
Forward voltage [a]	V_{SD}	I_F = -50 A, V_{GS} = 0 V	-	-1	-1.5	V
Reverse recovery time	t_{rr}	I_F = -50 A, di/dt = 100 A/µs	-	55	85	ns

Notes

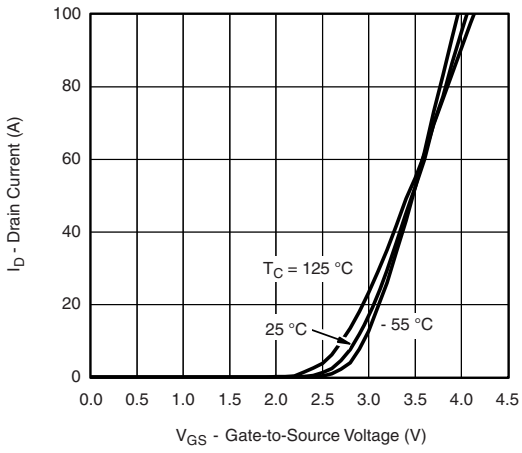
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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

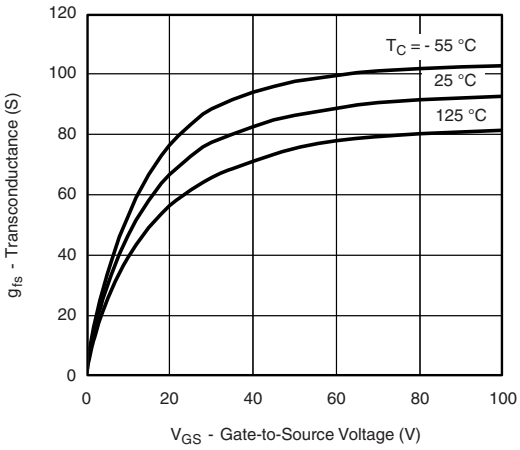
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



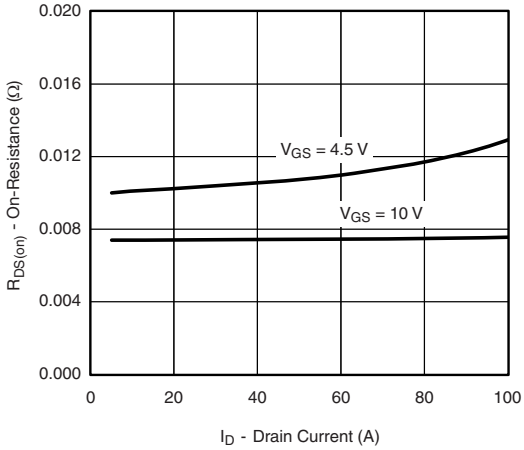
Output Characteristics



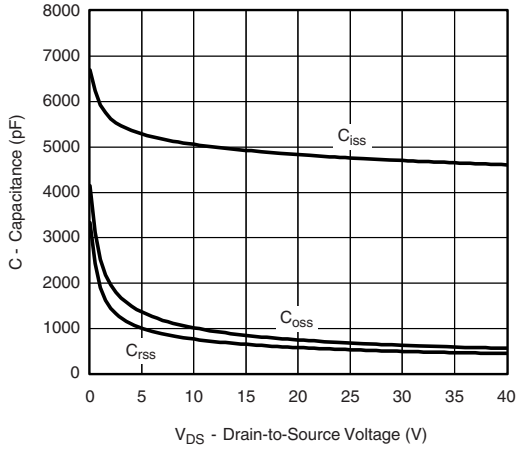
Transfer Characteristics



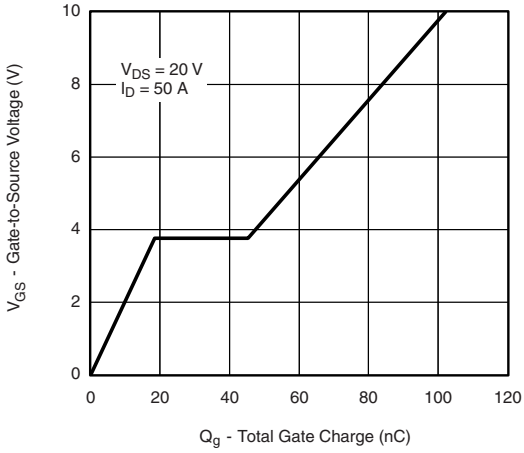
Transconductance



On-Resistance vs. Drain Current

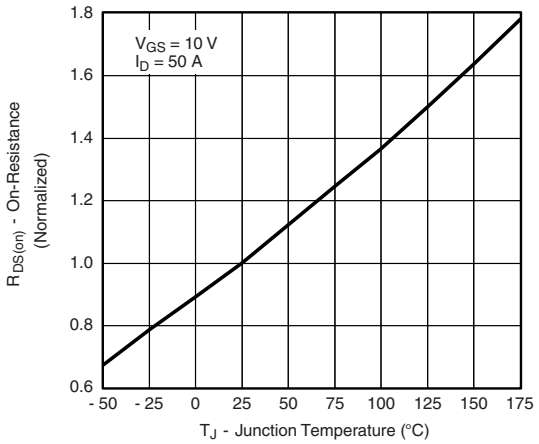


Capacitance

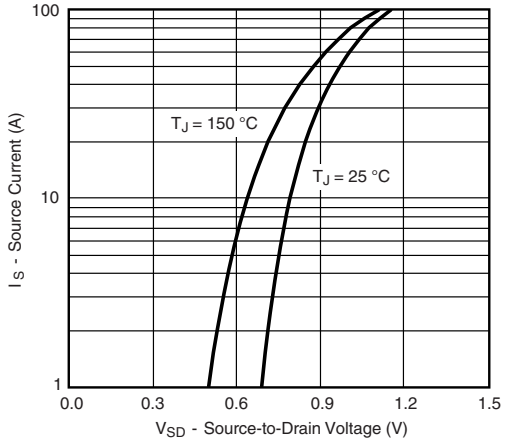


Gate Charge

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

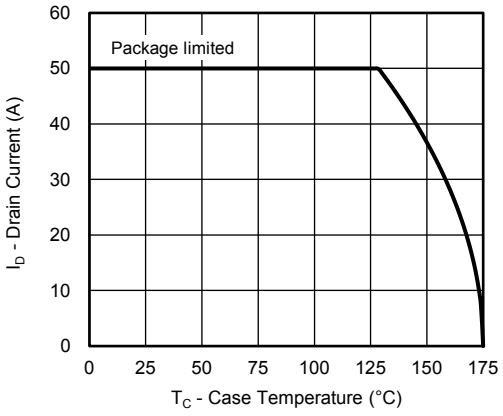


On-Resistance vs. Junction Temperature

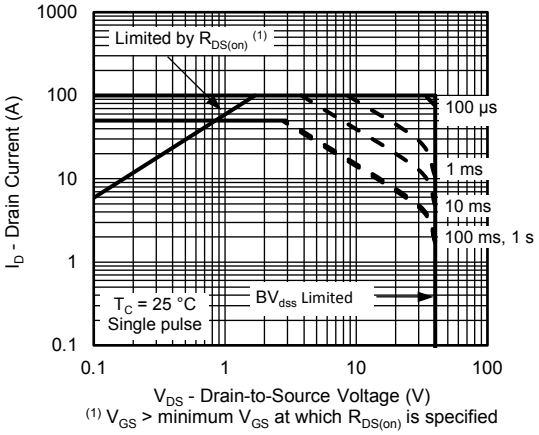


Source-Drain Diode Forward Voltage

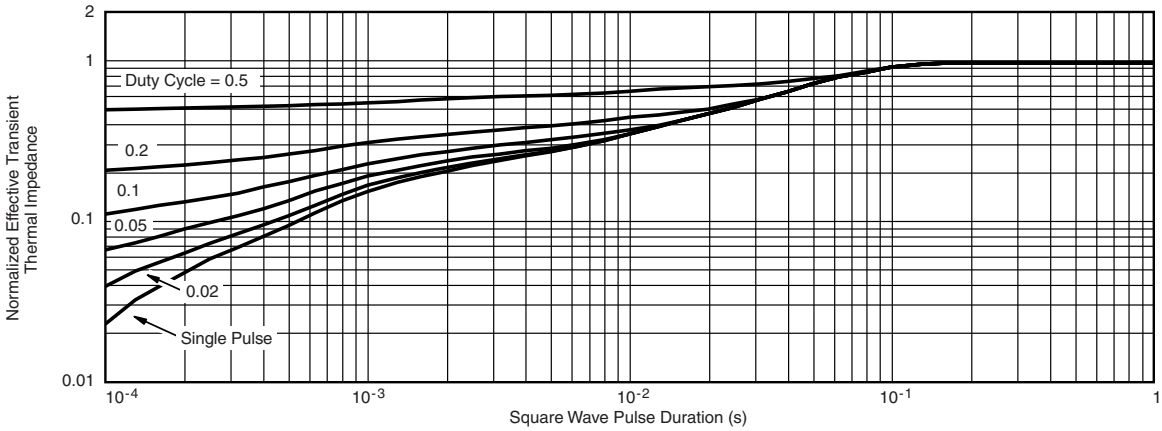
THERMAL RATINGS



Max. Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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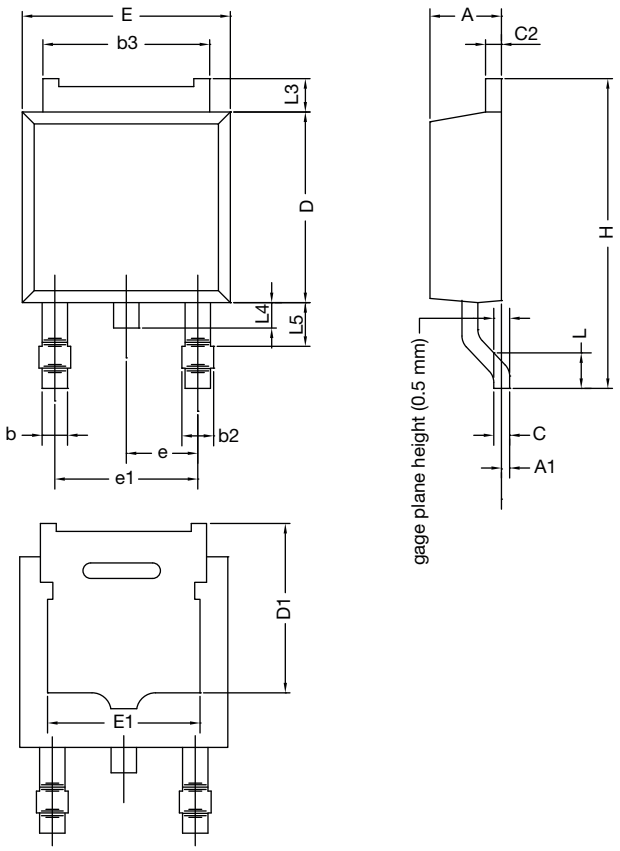
TO-252AA Case Outline

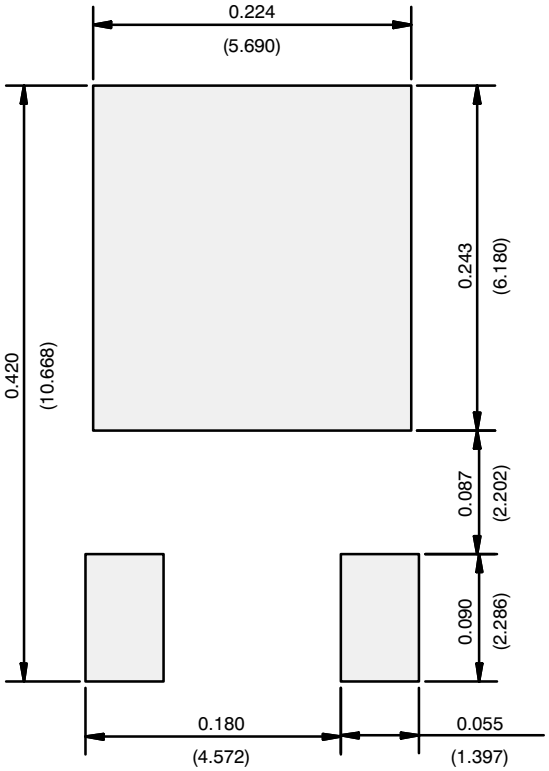


	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	4.10	-	0.161	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	10.41	0.370	0.410
e	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.01	1.52	0.040	0.060
ECN: T16-0236-Rev. P, 16-May-16 DWG: 5347				

Notes

- Dimension L3 is for reference only.

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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