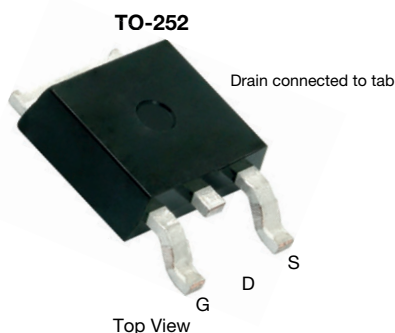


Automotive P-Channel 40 V (D-S) 175 °C MOSFET

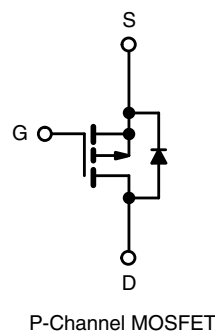


FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- 100 % R_g and UIS tested
- AEC-Q101 qualified
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE



PRODUCT SUMMARY

V_{DS} (V)	-40
$R_{DS(on)}$ (Ω) at $V_{GS} = -10$ V	0.0115
$R_{DS(on)}$ (Ω) at $V_{GS} = -4.5$ V	0.0150
I_D (A)	-50
Configuration	Single
Package	TO-252

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	-40	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current	I_D	$T_C = 25$ °C ^a	-50
		$T_C = 125$ °C	-31
Continuous source current (diode conduction) ^a	I_S	-50	A
Pulsed drain current ^b	I_{DM}	-180	A
Single pulse avalanche current	I_{AS}	-27	A
Single pulse avalanche energy	E_{AS}	36.4	mJ
Maximum power dissipation ^b	P_D	$T_C = 25$ °C	62
		$T_C = 125$ °C	20
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-ambient	R_{thJA}	50	°C/W
Junction-to-case (drain)	R_{thJC}	2.4	°C/W

Notes

- a. Package limited
- b. Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %
- c. When mounted on 1" square PCB (FR4 material)

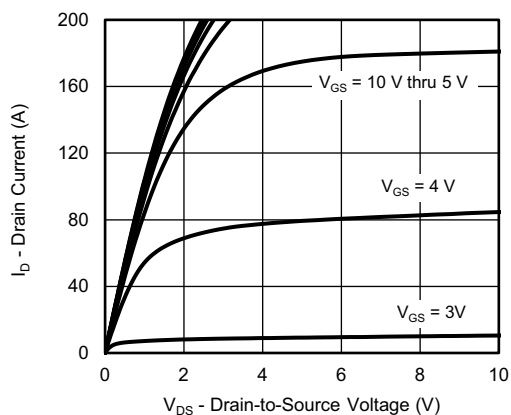
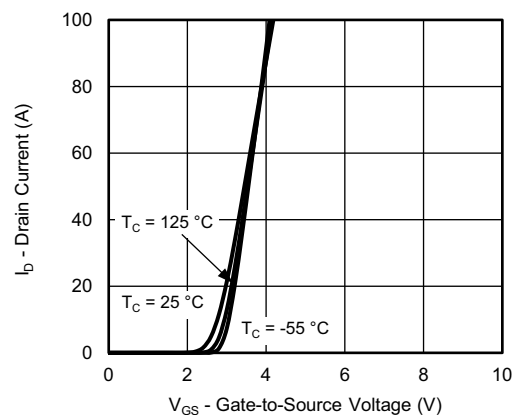
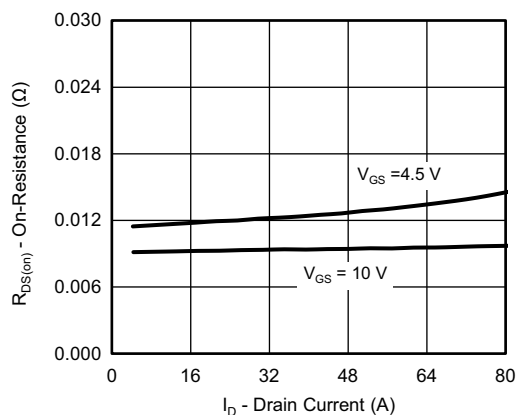
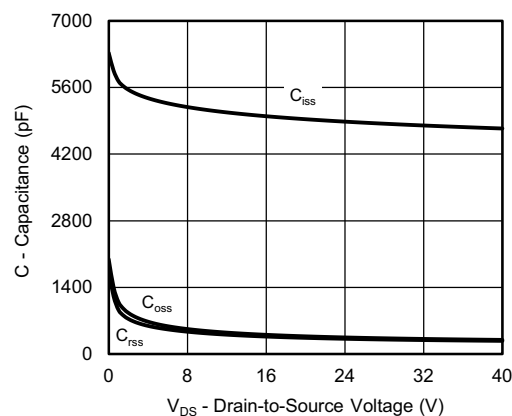
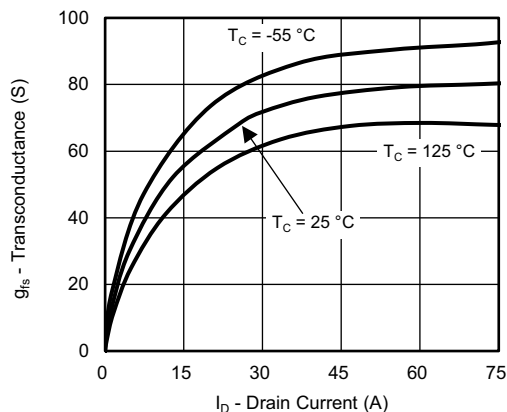
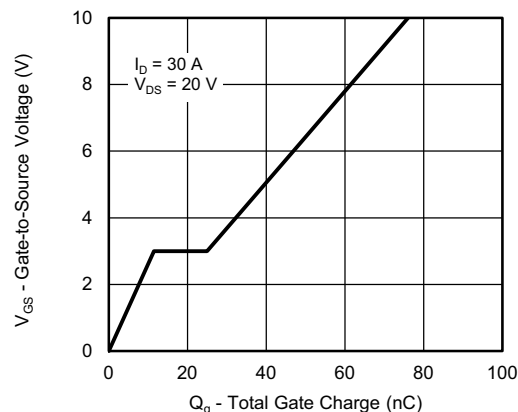


SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = -250 μA		-40	-	-	V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA		-1.5	-2	-2.5	
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{GS} = 0 V	V _{DS} = -40 V	-	-	-1	μA
		V _{GS} = 0 V	V _{DS} = -40 V, T _J = 125 °C	-	-	-50	
		V _{GS} = 0 V	V _{DS} = -40 V, T _J = 175 °C	-	-	-250	
On-state drain current ^a	I _{D(on)}	V _{GS} = -10 V	V _{DS} ≥ 5 V	-30	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = -10 V	I _D = -30 A	-	0.0095	0.0115	Ω
		V _{GS} = -10 V	I _D = -30 A, T _J = 125 °C	-	-	0.0171	
		V _{GS} = -10 V	I _D = -30 A, T _J = 175 °C	-	-	0.0203	
		V _{GS} = -4.5 V	I _D = -25 A	-	0.0121	0.0150	
Forward transconductance ^b	g _{fs}	V _{DS} = -15 V, I _D = -30 A		-	71	-	S
Dynamic ^b							
Input capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = -25 V, f = 1 MHz	-	4872	6600	pF
Output capacitance	C _{oss}			-	344	500	
Reverse transfer capacitance	C _{rss}			-	316	450	
Total gate charge ^c	Q _g	V _{GS} = -10 V	V _{DS} = -20 V, I _D = -30 A	-	76	115	nC
Gate-source charge ^c	Q _{gs}			-	11.5	-	
Gate-drain charge ^c	Q _{gd}			-	13.5	-	
Gate resistance	R _g	f = 1 MHz		2	4	6	Ω
Turn-on delay time ^c	t _{d(on)}	V _{DD} = -20 V, R _L = 0.7 Ω I _D ≡ -30 A, V _{GEN} = -10 V, R _g = 1 Ω		-	13	20	ns
Rise time ^c	t _r			-	7	15	
Turn-off delay time ^c	t _{d(off)}			-	66	100	
Fall time ^c	t _f			-	28	45	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed current ^a	I _{SM}			-	-	-180	A
Forward voltage	V _{SD}	I _F = -30 A, V _{GS} = 0 V		-	-0.9	-1.5	V
Body diode reverse recovery time	t _{rr}	I _F = -30 A, di/dt = 100 A/μs		-	43	90	ns
Body diode reverse recovery charge	Q _{rr}			-	45	100	nC
Reverse recovery fall time	t _a			-	26	-	ns
Reverse recovery rise time	t _b			-	17	-	
Body diode peak reverse recovery current	I _{RM(REC)}					-	-2.8

Notes

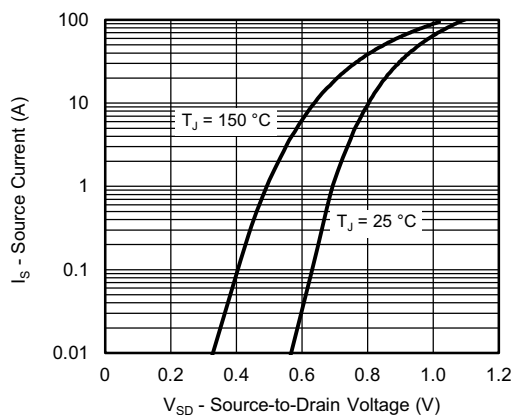
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

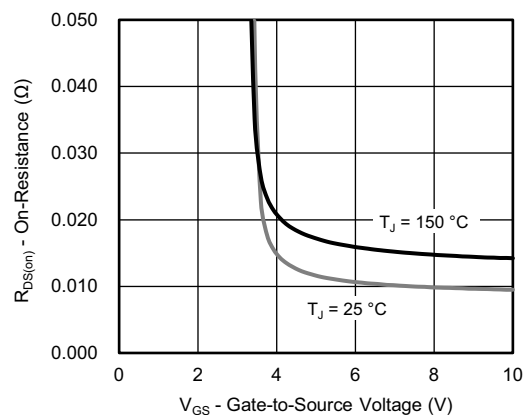
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Transconductance

Gate Charge



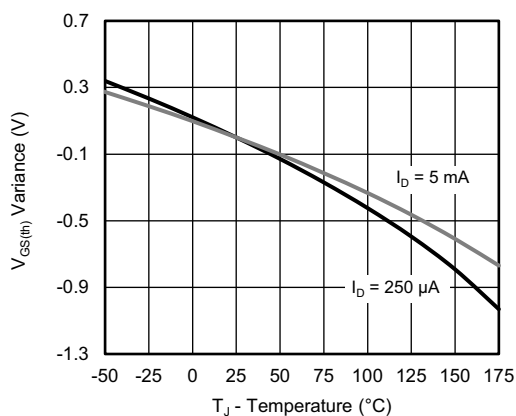
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



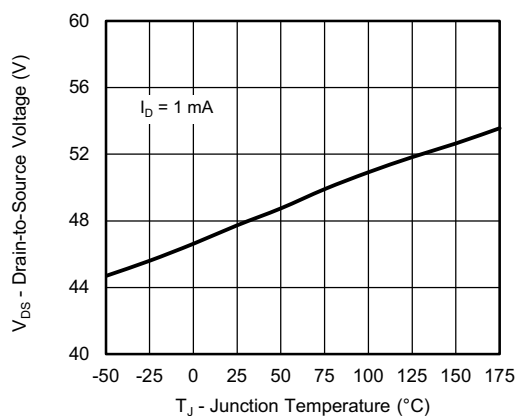
Source Drain Diode Forward Voltage



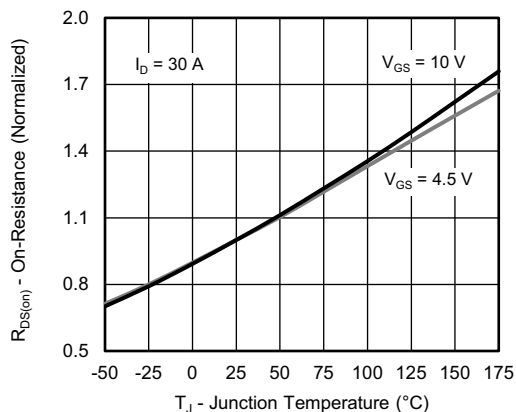
On-Resistance vs. Gate-to-Source Voltage



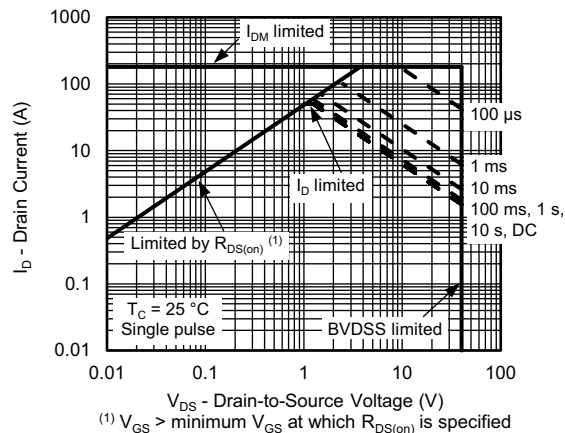
Threshold Voltage



Drain Source Breakdown vs. Junction Temperature



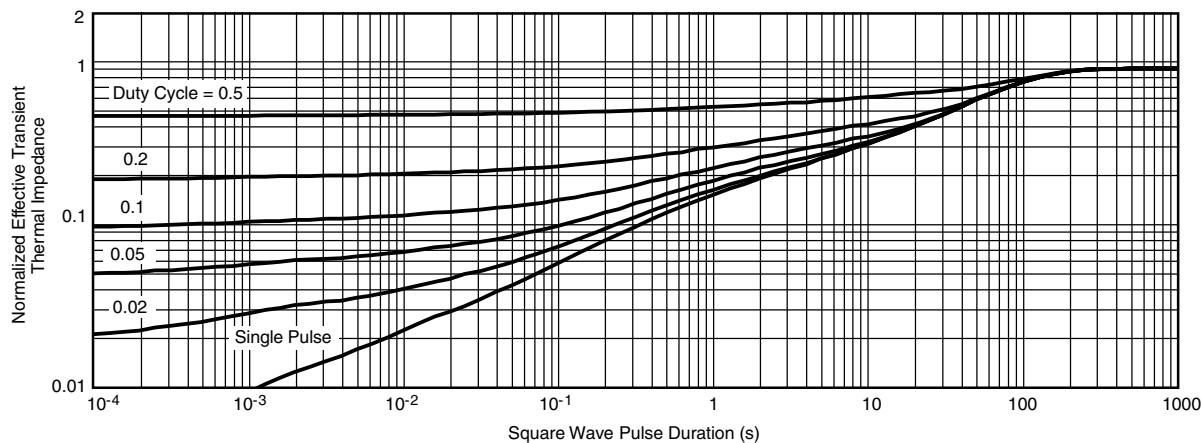
On-Resistance vs. Junction Temperature



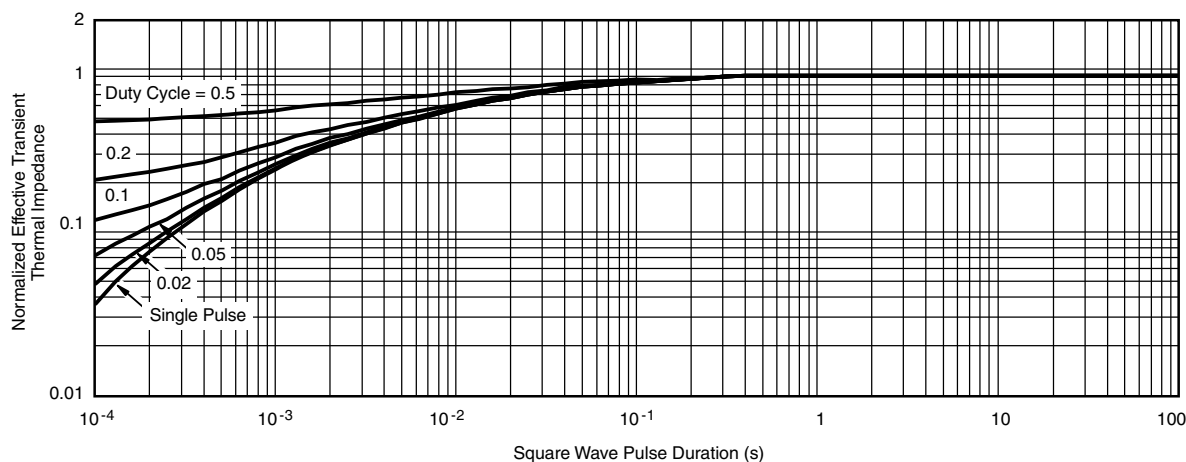
Safe Operating Area



THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



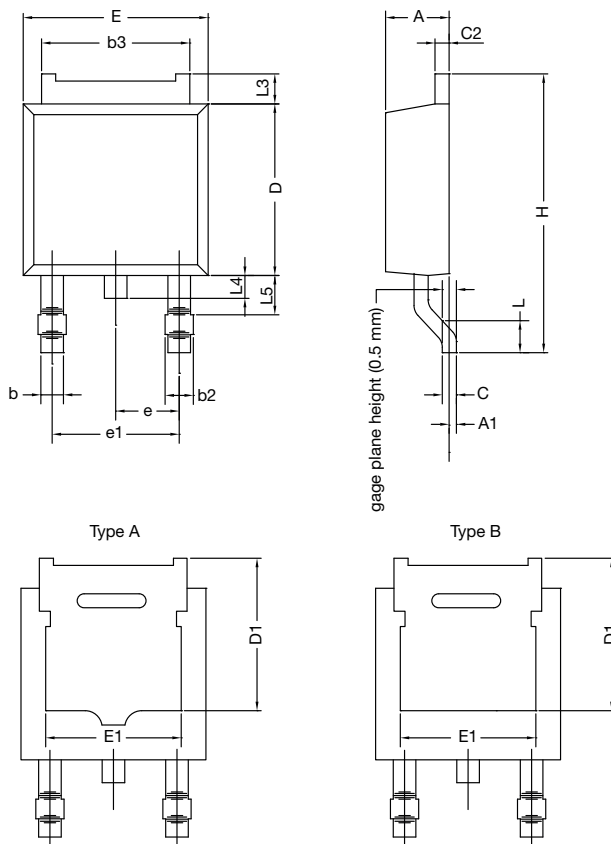
Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction to Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction to Case ($25\text{ }^{\circ}\text{C}$)are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

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TO-252AA Case Outline



DIM.	MILLIMETERS		INCHES	
	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: T24-0298-Rev. B, 29-Jul-2024
DWG: 6019

Notes

- Dimension L3 is for reference only
- Dimension D1 and E1 on type A and B is the same

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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