

Automotive N-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

 AUTOMOTIVE
GRADE

RoHS
COMPLIANT
HALOGEN
FREE


PRODUCT SUMMARY	
V _{DS} (V)	40
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.00233
I _D (A)	100
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	
Continuous drain current	T _C = 25 °C ^a	I _D	100	A
	T _C = 125 °C		87.5	
Continuous source current (diode conduction)		I _S	97	
Pulsed drain current ^b		I _{DM}	280	
Single pulse avalanche current	L = 0.1 mH	I _{AS}	46	
Single pulse avalanche energy		E _{AS}	105.8	mJ
Maximum power dissipation ^b	T _C = 25 °C	P _D	107	W
	T _C = 125 °C		35	
Operating junction and storage temperature range		T _J , T _{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount ^c	R _{thJA}	50	°C/W
Junction-to-case (drain)		R _{thJC}	1.4	

Notes

- Package limited
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
- When mounted on 1" square PCB (FR4 material)



SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.5	3.0	3.5	
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}$	-	-	1	μA
		$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	500	μA
On-state drain current ^a	$I_{D(on)}$	$V_{GS} = 10\text{ V}, V_{DS} \geq 5\text{ V}$	50	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	-	0.00190	0.00233	
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	-	0.00390	Ω
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	-	0.00470	
Forward transconductance ^b	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	-	84	-	S
Dynamic ^b						
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	-	5405	8000	μF
Output capacitance	C_{oss}		-	1942	2700	
Reverse transfer capacitance	C_{rss}		-	175	250	
Total gate charge ^c	Q_g	$V_{GS} = 10\text{ V}, V_{DS} = 20\text{ V}, I_D = 50\text{ A}$	-	84	130	nC
Gate-source charge ^c	Q_{gs}		-	29.5	-	
Gate-drain charge ^c	Q_{gd}		-	19.5	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	1	2	3	Ω
Turn-on delay time ^c	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.4\text{ }\Omega, I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	17	30	ns
Rise time ^c	t_r		-	17	30	
Turn-off delay time ^c	$t_{d(off)}$		-	34	60	
Fall time ^c	t_f		-	18	35	
Source-Drain Diode Ratings and Characteristics ^b						
Pulsed current ^a	I_{SM}		-	-	280	A
Forward voltage	V_{SD}	$I_F = 25\text{ A}, V_{GS} = 0\text{ V}$	-	0.8	1.5	V
Body diode reverse recovery time	t_{rr}	$I_F = 50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	-	41	85	ns
Body diode reverse recovery charge	Q_{rr}		-	28	60	nC
Reverse recovery fall time	t_a		-	24	-	ns
Reverse recovery rise time	t_b		-	17	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-1.36	-

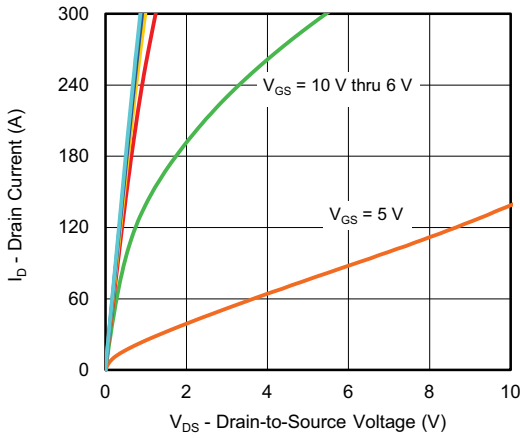
Notes

- 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

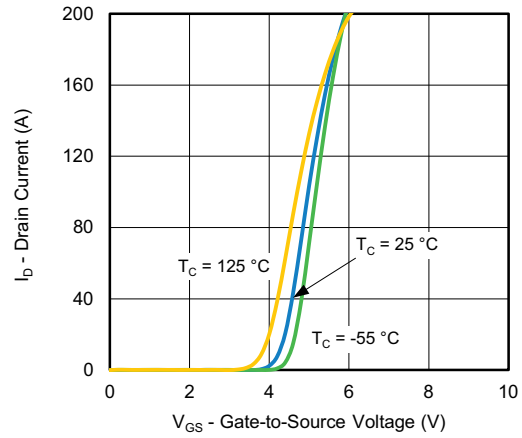
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



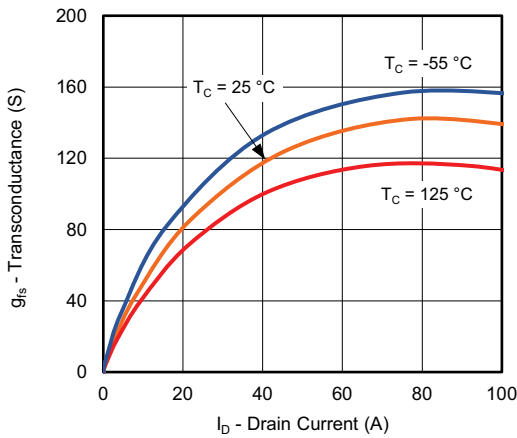
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



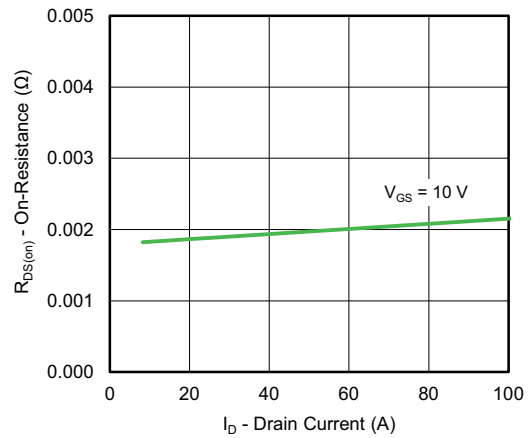
Output Characteristics



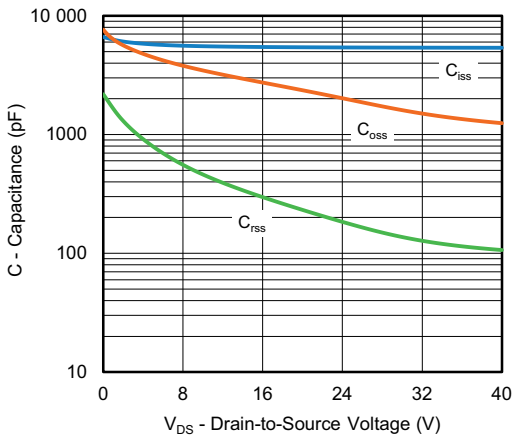
Transfer Characteristics



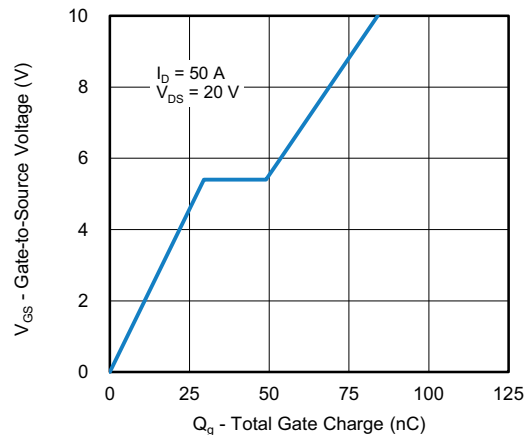
Transconductance



On-Resistance vs. Drain Current



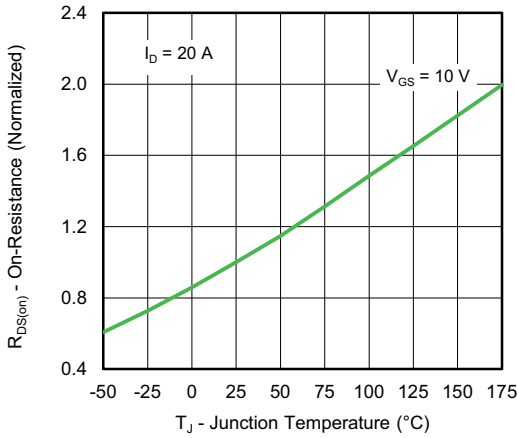
Capacitance



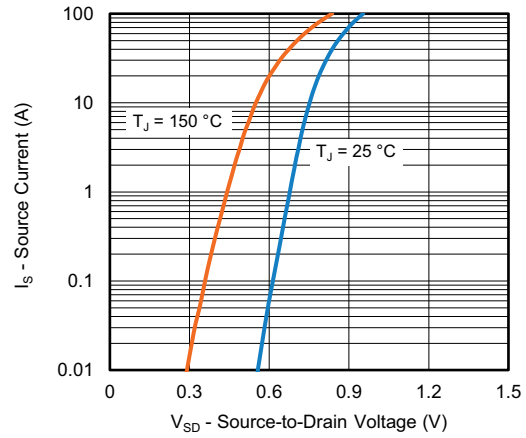
Gate Charge



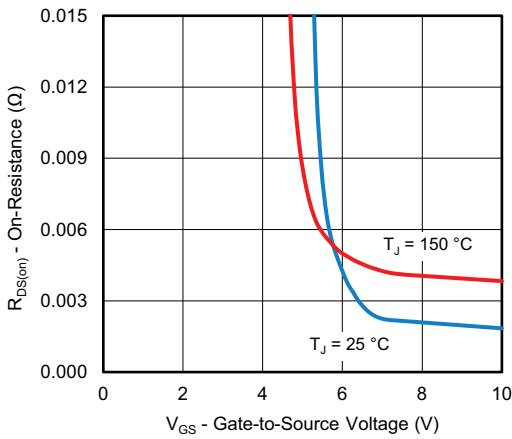
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



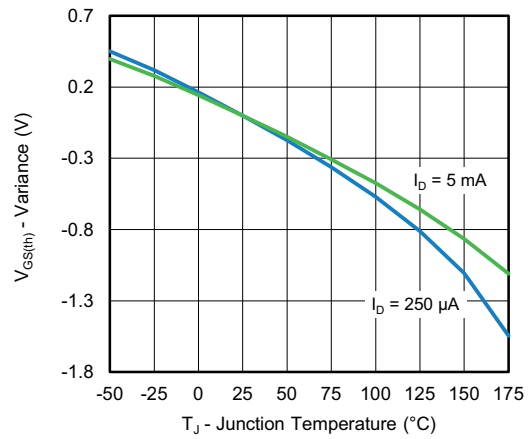
On-Resistance vs. Junction Temperature



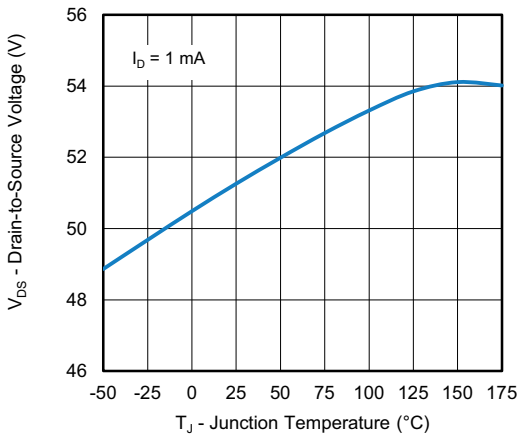
Source Drain Diode Forward Voltage



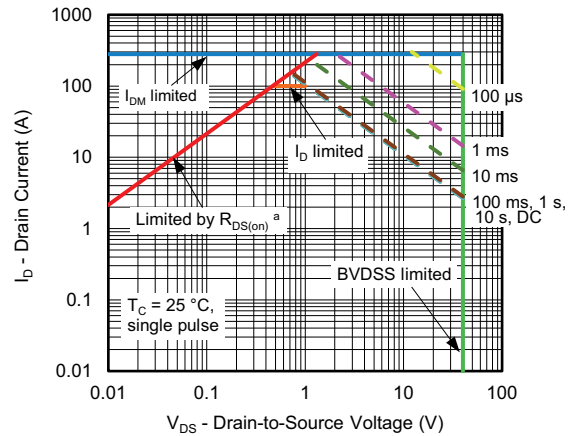
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



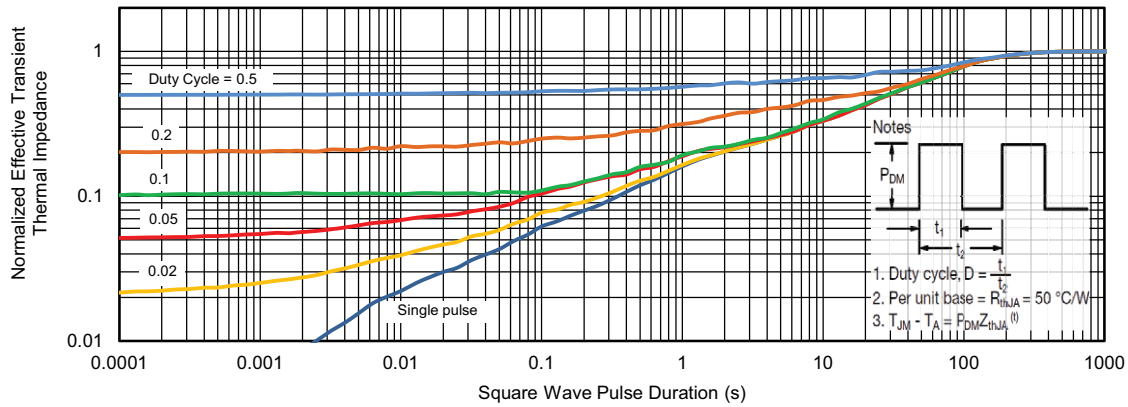
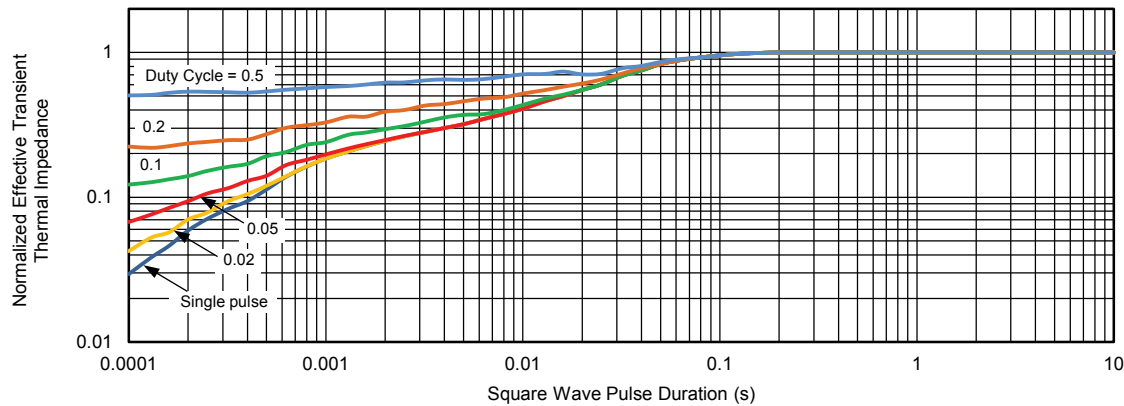
Drain Source Breakdown vs. Junction Temperature



Safe Operating Area

Note

a. V_{GS} > minimum V_{GS} at which R_{DS(on)} is specified

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: T13-0592-Rev. A, 02-Sep-13 DWG: 6019				

Note

- Dimension L3 is for reference only.

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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