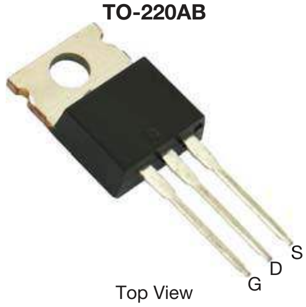
Automotive N-Channel 250 V (D-S) 175 °C MOSFET

TO-220AB

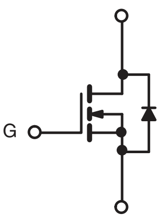


Top View

FEATURES

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

AUTOMOTIVE GRADE
RoHS COMPLIANT
HALOGEN FREE



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	250
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.0300
$R_{DS(on)}$ (Ω) at V_{GS} = 7.5 V	0.0320
I_D (A)	53
Configuration	Single
Package	TO-220

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	250	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current	T_C = 25 °C	I_D	53	A
	T_C = 125 °C		30	
Continuous source current (diode conduction) [a]		I_S	120	
Pulsed drain current [b]		I_{DM}	180	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	41	
Single pulse avalanche energy		E_{AS}	84	mJ
Maximum power dissipation [b]	T_C = 25 °C	P_D	250	W
	T_C = 125 °C		83	
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}	40	°C/W
Junction-to-case (drain)		R_{thJC}	0.6	

Notes

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

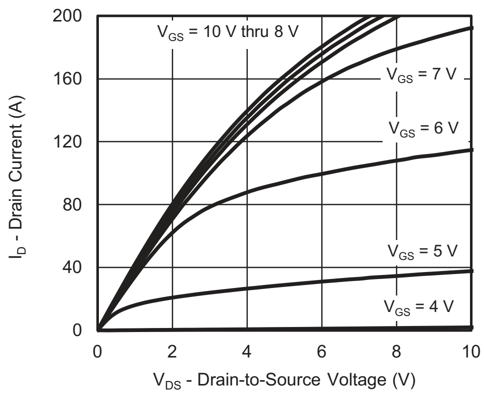
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 μA		250	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA		2.5	3.0	3.5	
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} = 250 V	-	-	1	μA
		V_{GS} = 0 V	V_{DS} = 250 V, T_J = 125 °C	-	-	50	
		V_{GS} = 0 V	V_{DS} = 250 V, T_J = 175 °C	-	-	600	
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 = 15 A	-	0.0244	0.0300	Ω
		V_{GS} = 7.5 V	I_D = 10 A	-	0.0260	0.0320	
		V_{GS} = 10 V	I_D = 15 A, T_J = 125 °C	-	-	0.0641	
		V_{GS} = 10 V	I_D = 15 A, T_J = 175 °C	-	-	0.0853	
Forward transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 15 A		-	50	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	2880	4050	pF
Output capacitance	C_{oss}			-	1480	2100	
Reverse transfer capacitance	C_{rss}			-	58	85	
Total gate charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = 125 V, I_D = 10 A	-	50	75	nC
Gate-source charge [c]	Q_{gs}			-	12	-	
Gate-drain charge [c]	Q_{gd}			-	15	-	
Gate Resistance	R_g	f = 1 MHz		1.40	2.84	4.40	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = 125 V, R_L = 12.5 Ω I_D ≅ 10 A, V_{GEN} = 10 V, R_g = 1 Ω		-	14	30	ns
Rise time [c]	t_r			-	6	15	
Turn-off delay time [c]	$t_{d(off)}$			-	38	60	
Fall time [c]	t_f			-	10	20	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed current [a]	I_{SM}			-	-	180	A
Forward voltage	V_{SD}	I_F = 20 A, V_{GS} = 0 V		-	0.82	1.5	V
Body diode reverse recovery time	t_{rr}	I_F = 10 A, di/dt = 100 A/μs		-	155	310	ns
Body diode reverse recovery charge	Q_{rr}			-	933	1900	nC
Reverse recovery fall time	t_a			-	122	-	ns
Reverse recovery rise time	t_b			-	33	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-11.6	-	A

Notes

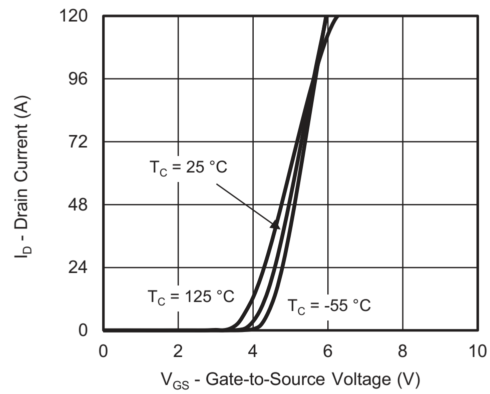
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

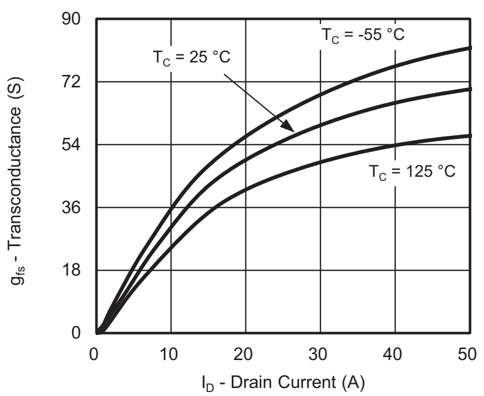
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



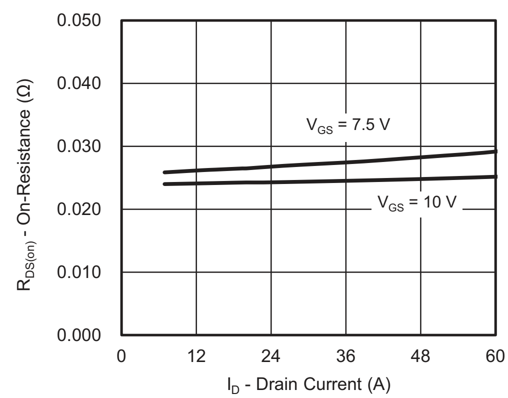
Output Characteristics



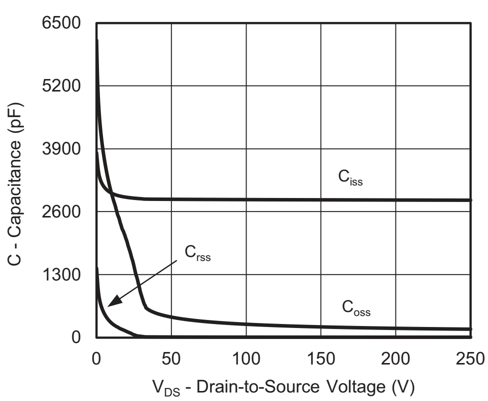
Transfer Characteristics



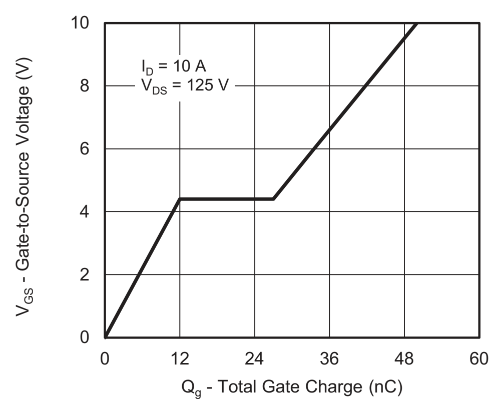
Transconductance



On-Resistance vs. Drain Current

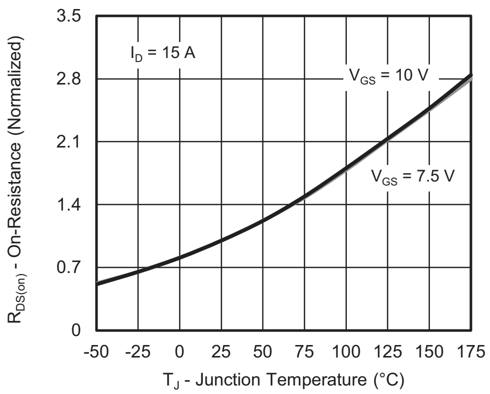


Capacitance

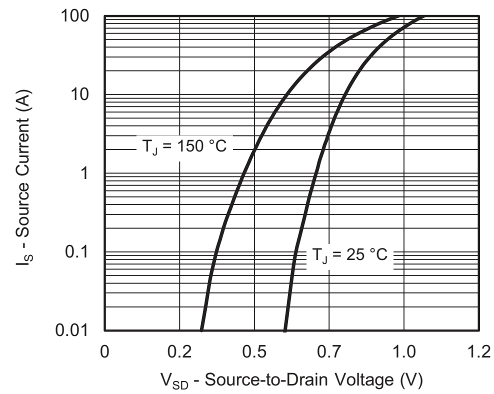


Gate Charge

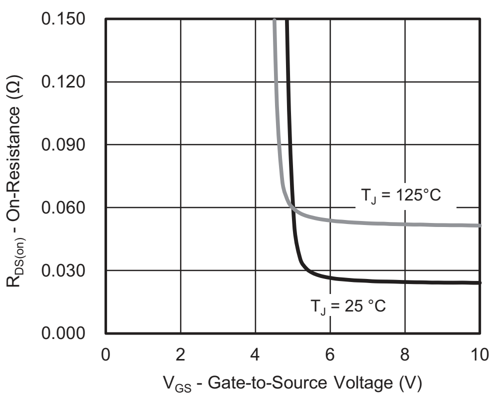
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



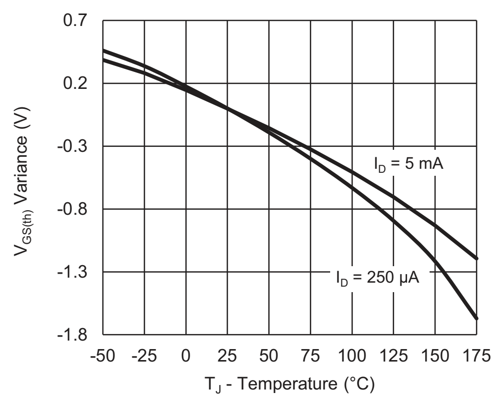
On-Resistance vs. Junction Temperature



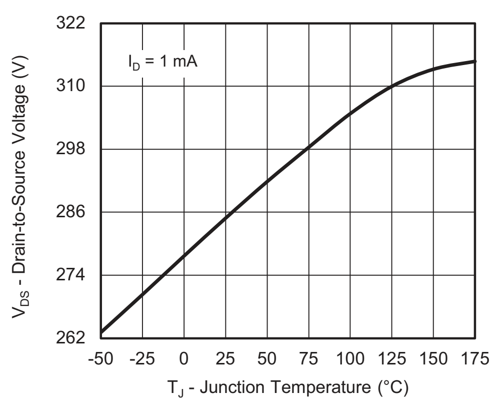
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

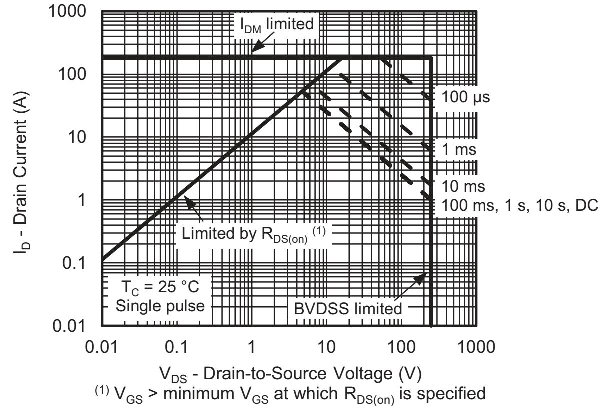


Threshold Voltage

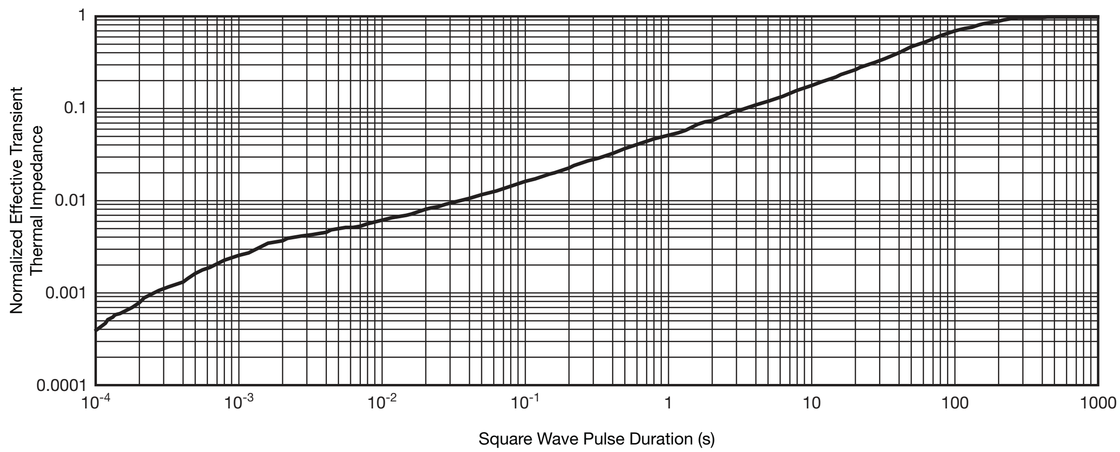


Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)

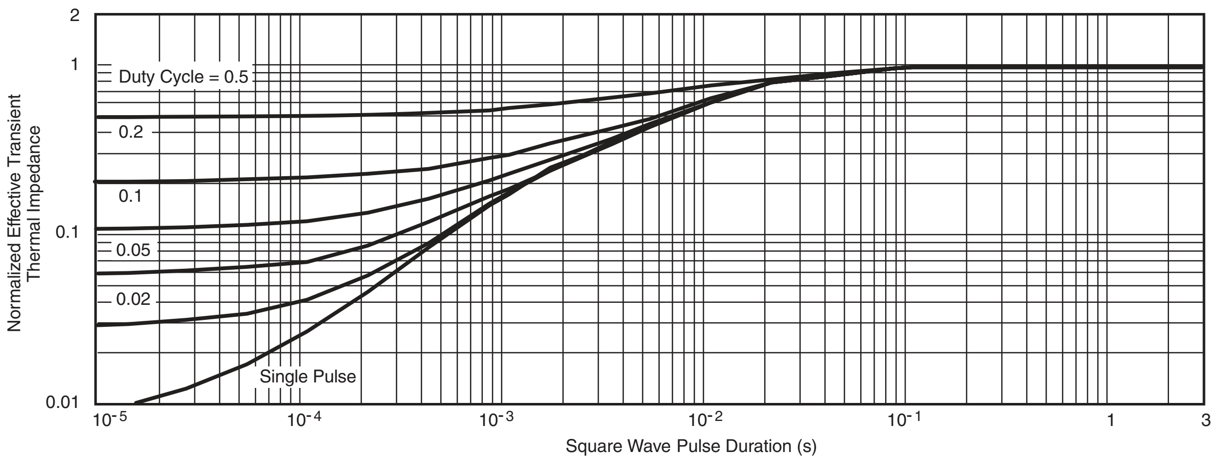


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction to Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction to Case (25 °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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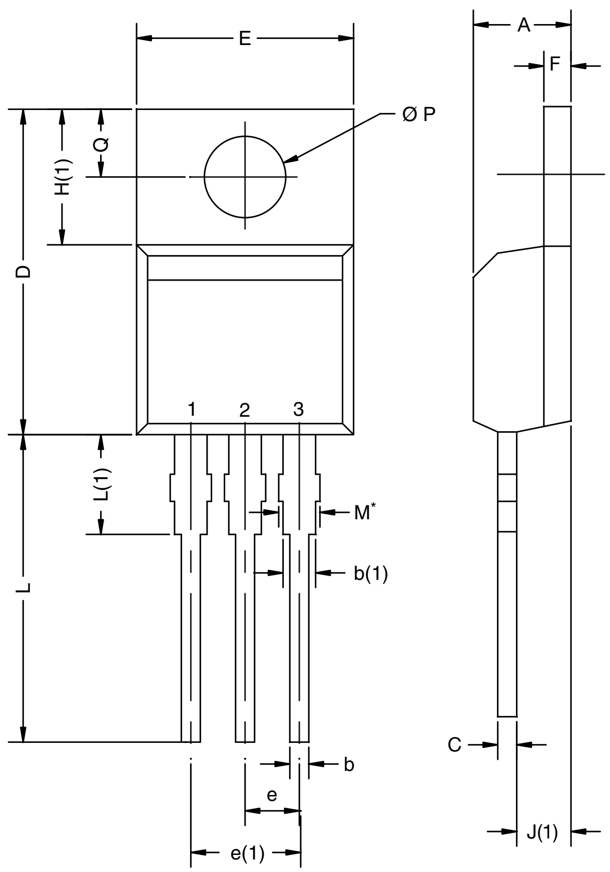

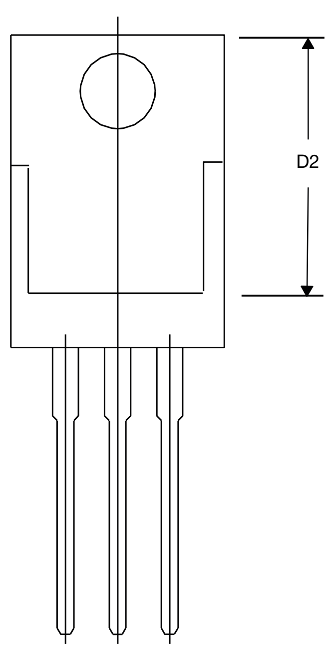

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
Ø P	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118
ECN: T14-0413-Rev. P, 16-Jun-14 DWG: 5471				

Note

* M = 1.32 mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM

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