

# Automotive N-Channel 150 V (D-S) 175 °C MOSFET

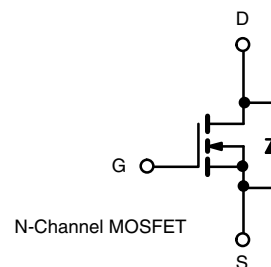
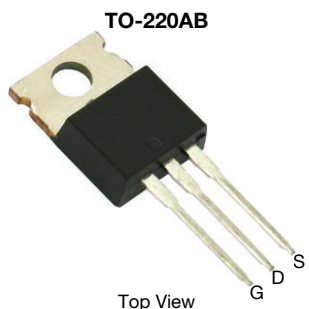
## PRODUCT SUMMARY

$V_{DS}$ (V)	150
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.052
$I_D$ (A)	25
Configuration	Single
Package	TO-220

## FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- 100 %  $R_g$  and UIS tested
- AEC-Q101 qualified <sup>d</sup>
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**


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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	150	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current	$I_D$	$T_C = 25$ °C	A
		$T_C = 125$ °C	
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	50	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	65	
Single Pulse Avalanche Energy	$I_{AS}$	30	
Single Pulse Avalanche Current	$E_{AS}$	45	mJ
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	W
		$T_C = 125$ °C	
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)	$R_{thJC}$	1.4	

### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR4 material).
- Parametric verification ongoing.



SPECIFICATIONS (T <sub>C</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		150	-	-	V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA		2.5	3	4	
Gate-Source 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>GS</sub> = 0 V	V <sub>DS</sub> = 150 V	-	-	1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 150 V, T <sub>J</sub> = 125 °C	-	-	50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 150 V, T <sub>J</sub> = 175 °C	-	-	250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> ≥ 5 V	30	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 15 A	-	0.041	0.052	Ω
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 15 A, T <sub>J</sub> = 125 °C	-	-	0.106	
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 15 A, T <sub>J</sub> = 175 °C	-	-	0.138	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 15 A		-	33	-	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	-	1886	2360	pF
Output Capacitance	C <sub>oss</sub>			-	215	270	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	97	125	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> = 75 V, I <sub>D</sub> = 25 A	-	37.9	60	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			-	8.5	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	12.2	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz		0.35	1.0	3.2	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 75 V, R <sub>L</sub> = 3 Ω I <sub>D</sub> ≅ 25 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω		-	11	17	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			-	21	33	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	20	30	
Fall Time <sup>c</sup>	t <sub>f</sub>			-	12	20	
Source-Drain Diode Ratings and Characteristics <sup>b</sup>							
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	65	A
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V		-	0.85	1.5	V

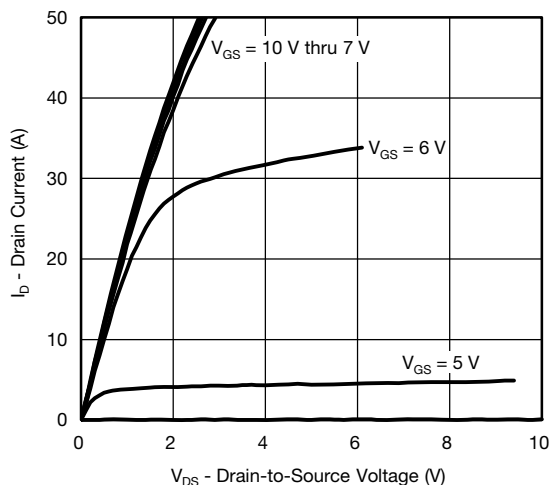
**Notes**

- 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.

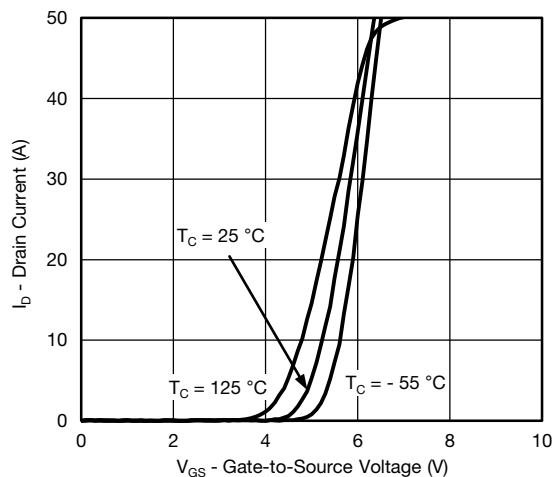
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



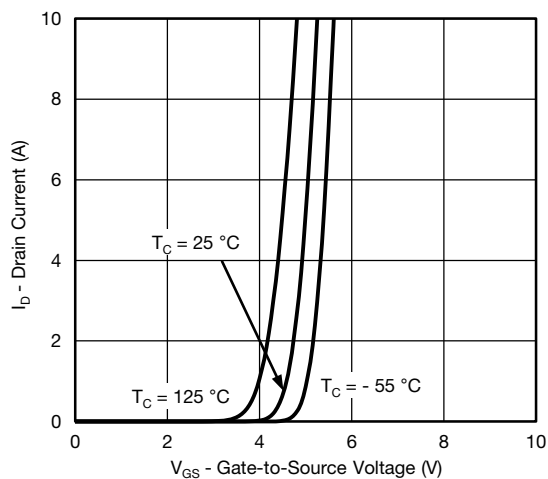
**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



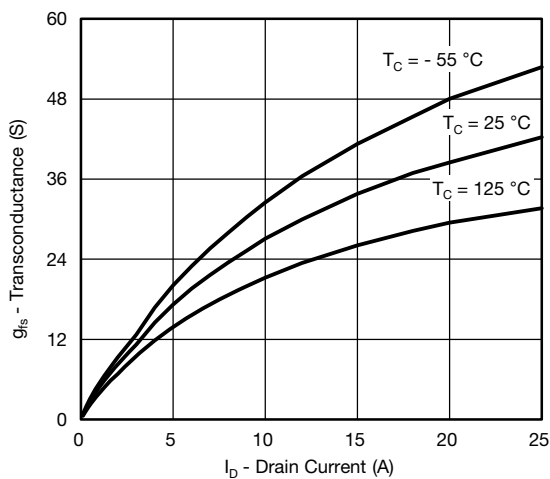
**Output Characteristics**



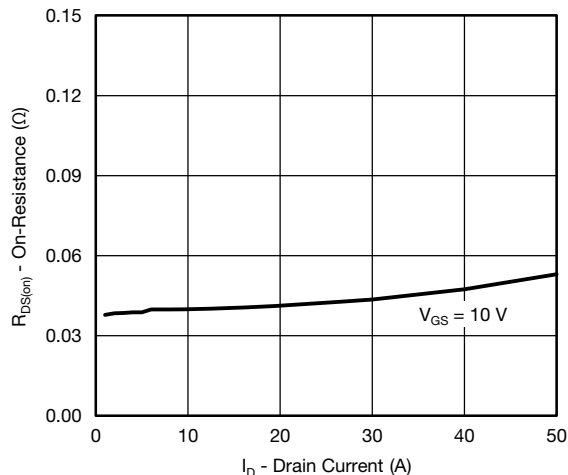
**Transfer Characteristics**



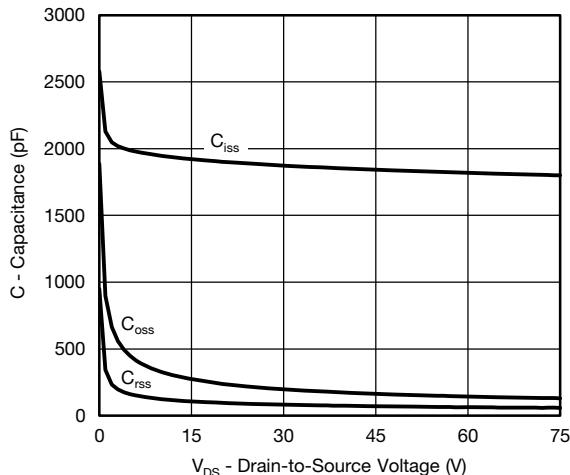
**Transfer Characteristics**



**Transconductance**



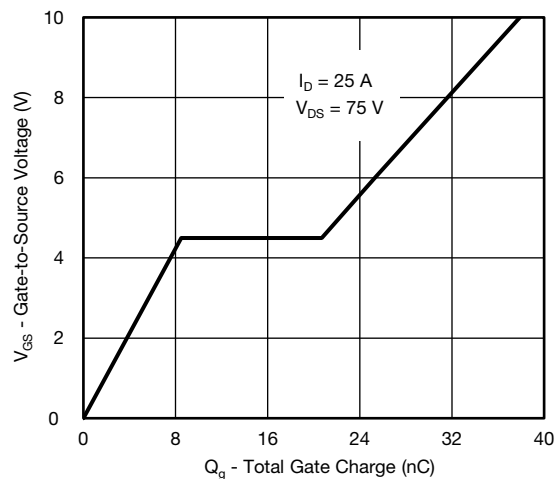
**On-Resistance vs. Drain Current**



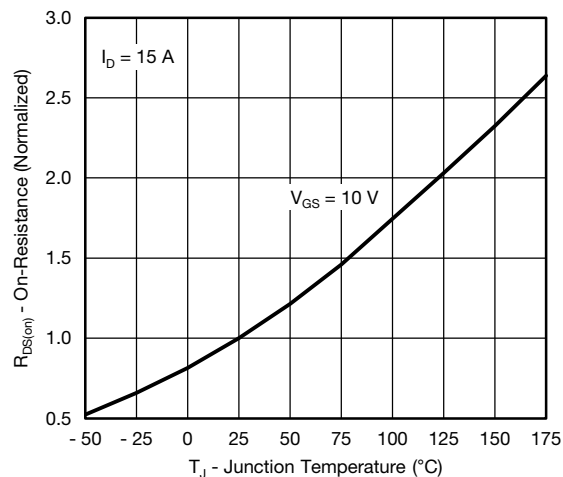
**Capacitance**



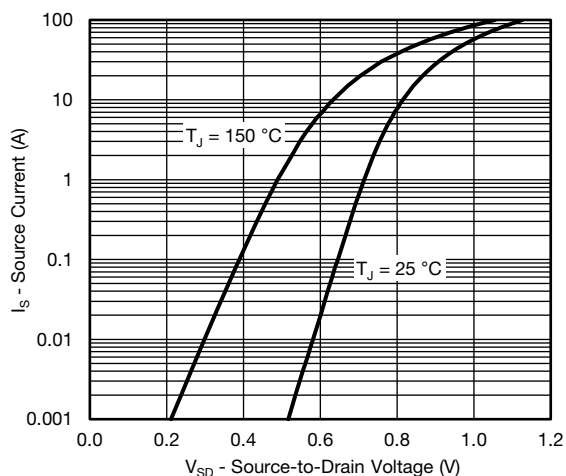
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



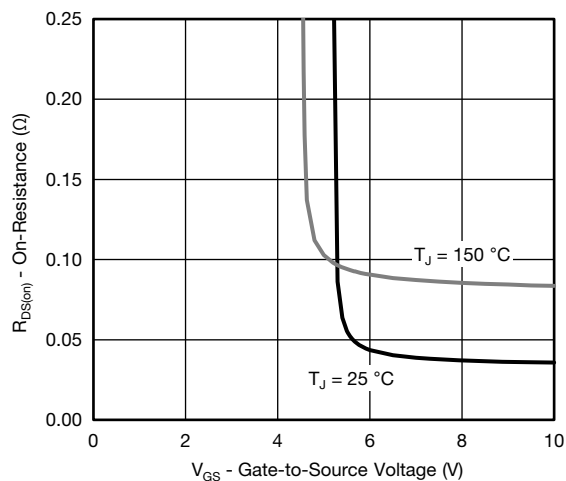
**Gate Charge**



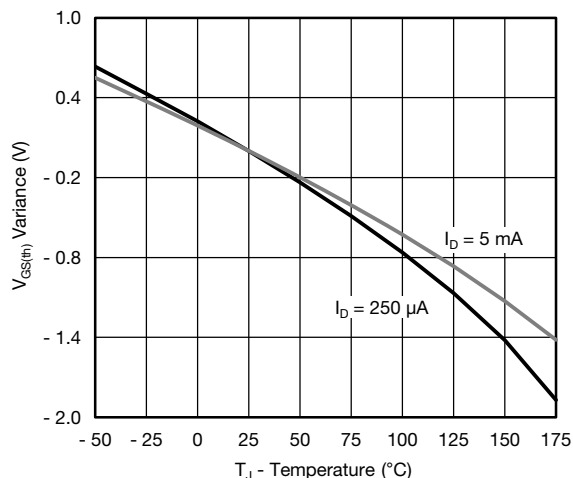
**On-Resistance vs. Junction Temperature**



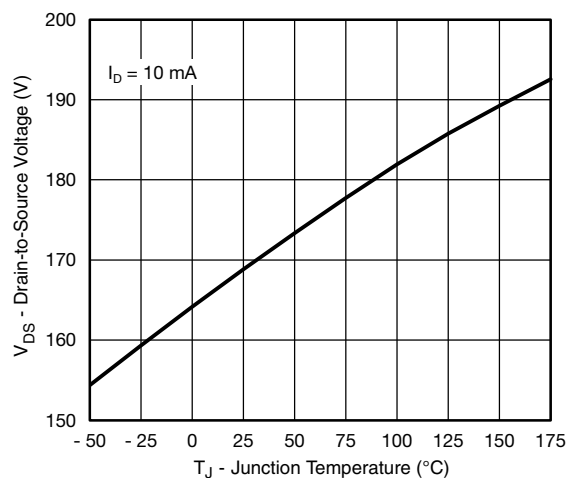
**Source Drain Diode Forward Voltage**



**On-Resistance vs. Gate-to-Source Voltage**



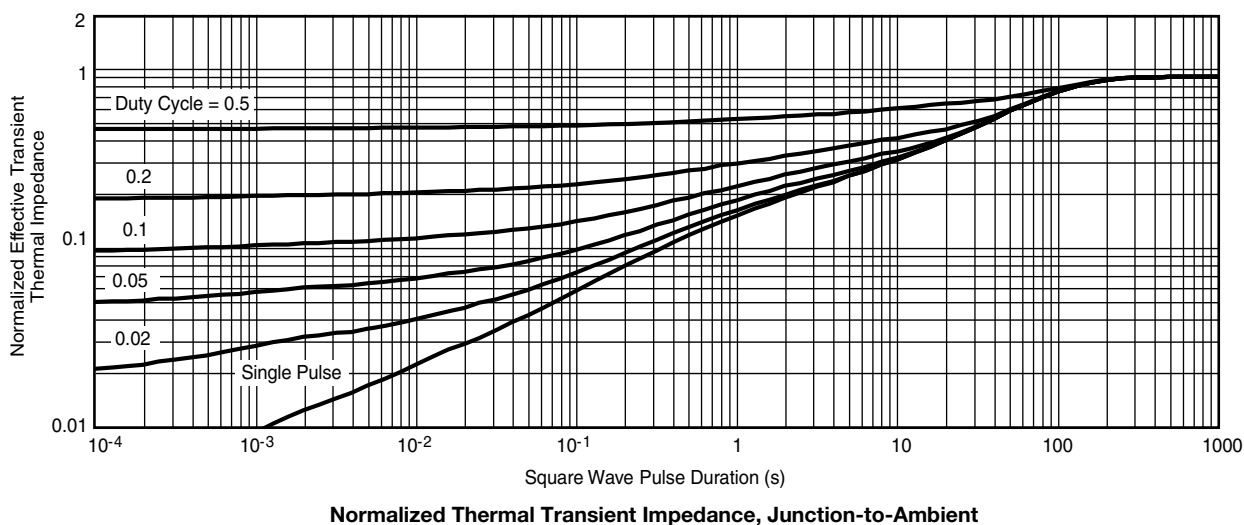
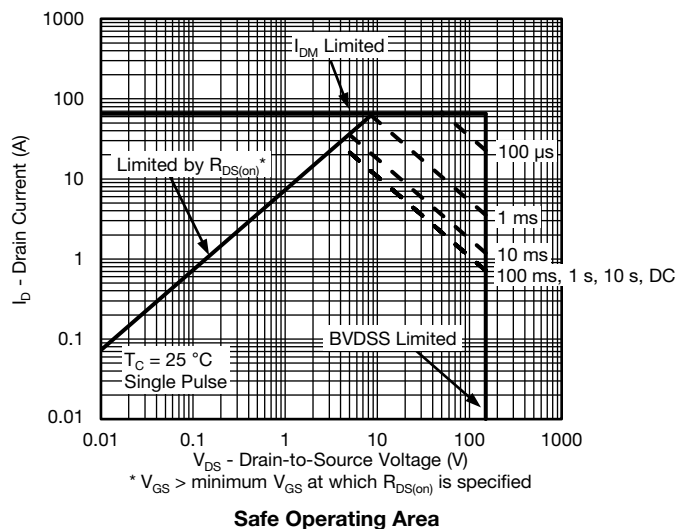
**Threshold Voltage**



**Drain Source Breakdown vs. Junction Temperature**

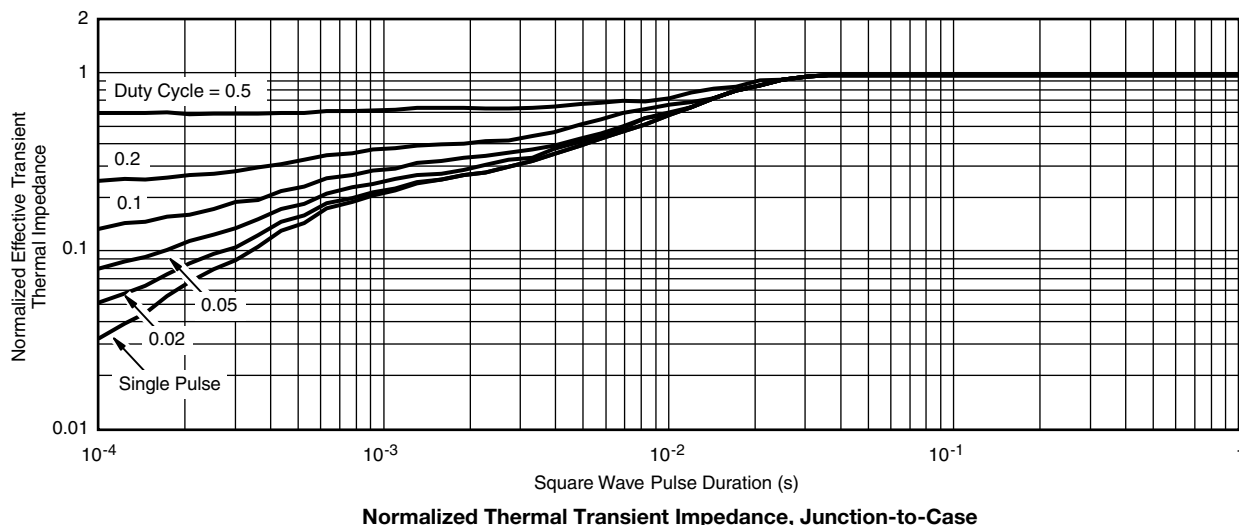


**THERMAL RATINGS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)





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



**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.

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?66974](http://www.vishay.com/ppg?66974).

**TO-220**

Ordering codes for the SQ rugged series power MOSFETs in the TO-220 package:

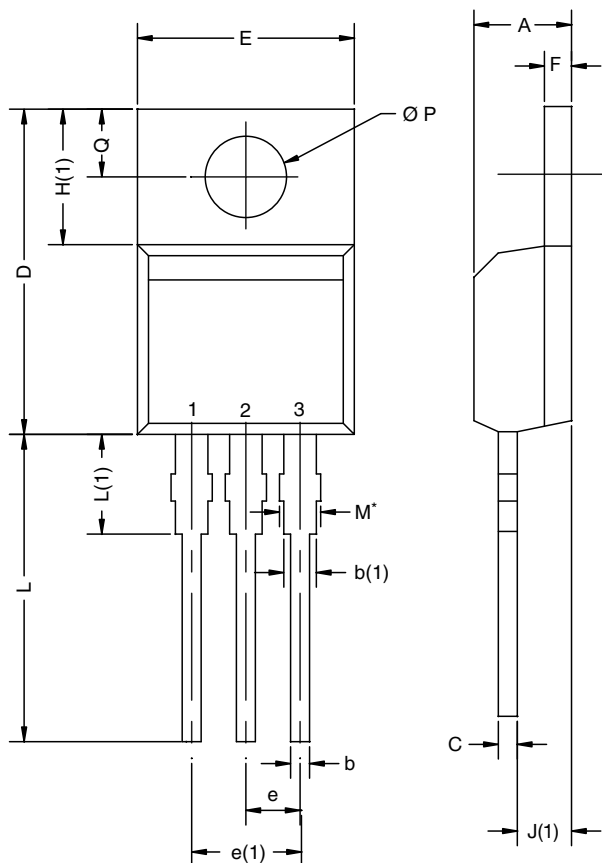
DATASHEET PART NUMBER	OLD ORDERING CODE <sup>a</sup>	NEW ORDERING CODE
SQP100P06-9m3L	-	<b>SQP100P06-9M3L_GE3</b>
SQP120N06-06	-	<b>SQP120N06-06_GE3</b>
SQP120N06-3m5L	SQP120N06-3M5L-GE3	<b>SQP120N06-3M5L_GE3</b>
SQP120N10-09	SQP120N10-09-GE3	<b>SQP120N10-09_GE3</b>
SQP120N10-3m8	SQP120N10-3M8-GE3	<b>SQP120N10-3M8_GE3</b>
SQP25N15-52	-	<b>SQP25N15-52_GE3</b>
SQP50N06-09L	SQP50N06-09L-GE3	<b>SQP50N06-09L_GE3</b>
SQP50P03-07	SQP50P03-07-GE3	<b>SQP50P03-07_GE3</b>
SQP60N06-15	SQP60N06-15-GE3	<b>SQP60N06-15_GE3</b>
SQP90P06-07L	SQP90P06-07L-GE3	<b>SQP90P06-07L_GE3</b>

**Note**

a. Old ordering code is obsolete and no longer valid for new orders



## TO-220AB



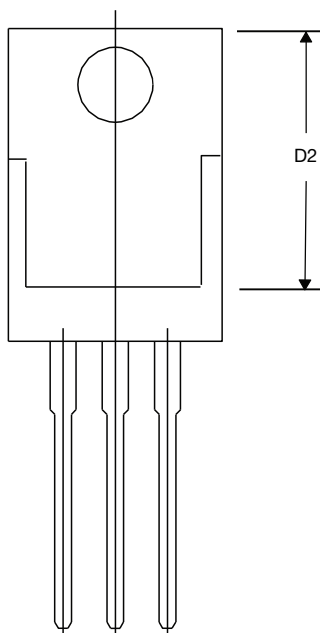
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	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
$\varnothing P$	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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