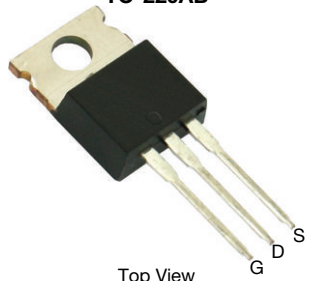


# Automotive P-Channel 60 V (D-S) 175 °C MOSFET

## PRODUCT SUMMARY

$V_{DS}$ (V)	-60
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -10$ V	0.0067
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.0088
$I_D$ (A)	-120
Configuration	Single

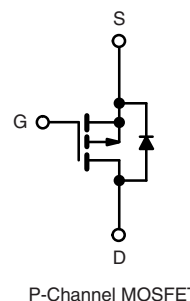
**TO-220AB**


Top View

## FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- AEC-Q101 qualified <sup>d</sup>
- 100 %  $R_g$  and UIS tested
- 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**


P-Channel MOSFET

## ORDERING INFORMATION

Package	TO-220
Lead (Pb)-free and Halogen-free	SQP90P06-07L-GE3

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V <sub>DS</sub>	-60	V
Gate-Source Voltage		V <sub>GS</sub>	± 20	
Continuous Drain Current <sup>a</sup>	T <sub>C</sub> = 25 °C <sup>a</sup>	I <sub>D</sub>	-120	A
	T <sub>C</sub> = 125 °C		-87	
Continuous Source Current (Diode Conduction) <sup>a</sup>		I <sub>S</sub>	-120	
Pulsed Drain Current <sup>b</sup>		I <sub>DM</sub>	-480	
Single Pulse Avalanche Current	L = 0.1 mH	I <sub>AS</sub>	-80	
Single Pulse Avalanche Energy		E <sub>AS</sub>	320	mJ
Maximum Power Dissipation <sup>b</sup>	T <sub>C</sub> = 25 °C	P <sub>D</sub>	300	W
	T <sub>C</sub> = 125 °C		100	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C

## THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	$R_{thJA}$	40	°C/W
Junction-to-Case (Drain)	$R_{thJC}$	0.5	

### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square Pcb (Fr-4 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, I <sub>D</sub> = -250 μA		-60	-	-	V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA		-1.5	-2.0	-2.5	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	-	± 100	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = -60 V	-	-	-1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = -60 V, T <sub>J</sub> = 125 °C	-	-	-50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = -60 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	-120	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V	I <sub>D</sub> = -30 A	-	0.0056	0.0067	Ω
		V <sub>GS</sub> = -10 V	I <sub>D</sub> = -30 A, T <sub>J</sub> = 125 °C	-	-	0.0110	
		V <sub>GS</sub> = -10 V	I <sub>D</sub> = -30 A, T <sub>J</sub> = 175 °C	-	-	0.0130	
		V <sub>GS</sub> = -4.5 V	I <sub>D</sub> = -20 A	-	0.0070	0.0088	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -30 A		-	90	-	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	-	11 423	14 280	pF
Output Capacitance	C <sub>oss</sub>			-	1034	1295	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	809	1015	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = -10 V	V <sub>DS</sub> = -30 V, I <sub>D</sub> = -110 A	-	180	270	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			-	31	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	43	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.1	2.27	3.5	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = -30 V, R <sub>L</sub> = 0.27 Ω I <sub>D</sub> ≅ -110 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω		-	15	23	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			-	23	35	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	97	146	
Fall Time <sup>c</sup>	t <sub>f</sub>			-	32	48	
Source-Drain Diode Ratings and Characteristics <sup>b</sup>							
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	-480	A
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> = -100 A, V <sub>GS</sub> = 0		-	-0.95	-1.5	V

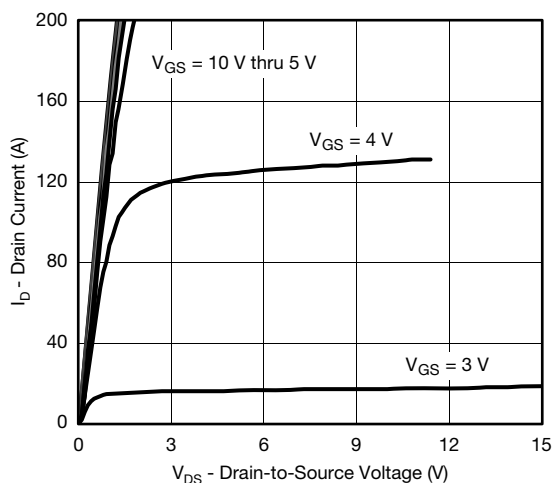
**Notes**

- 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.

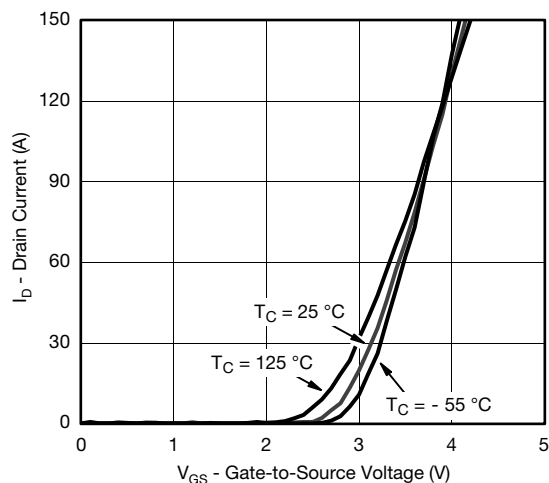
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



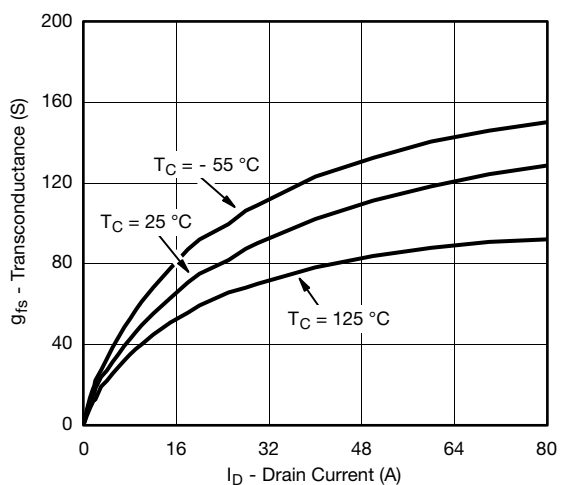
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



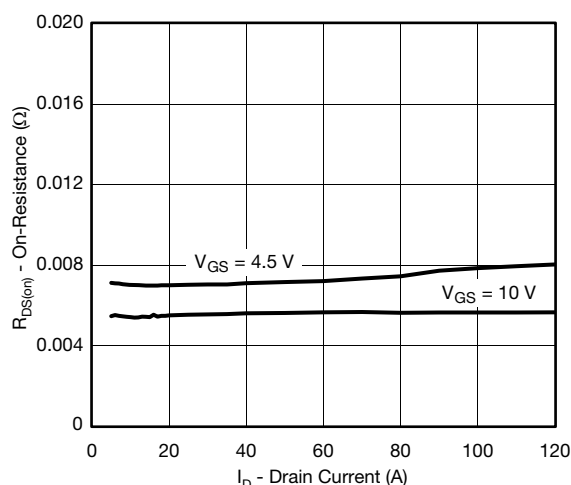
**Output Characteristics**



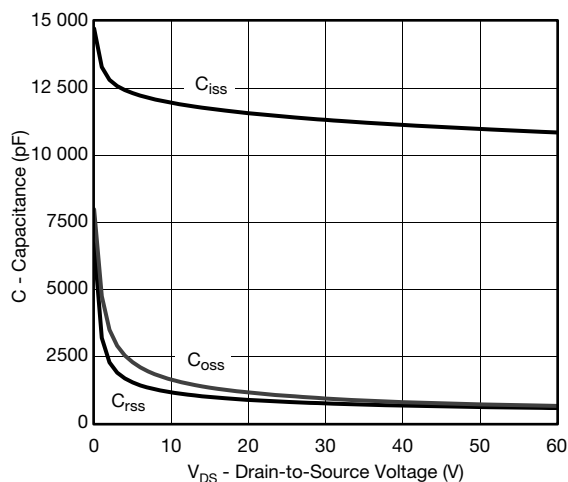
**Transfer Characteristics**



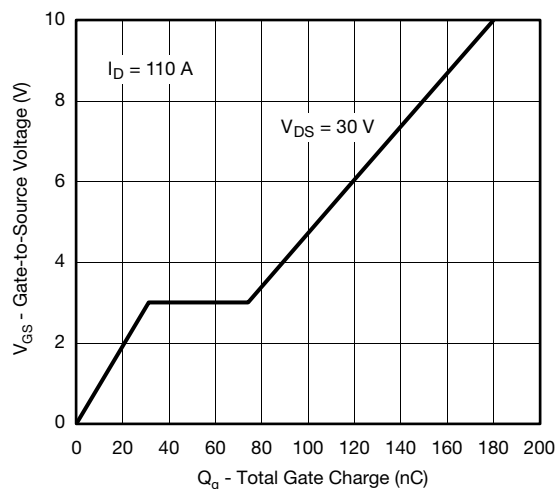
**Transconductance**



**On-Resistance vs. Drain Current**



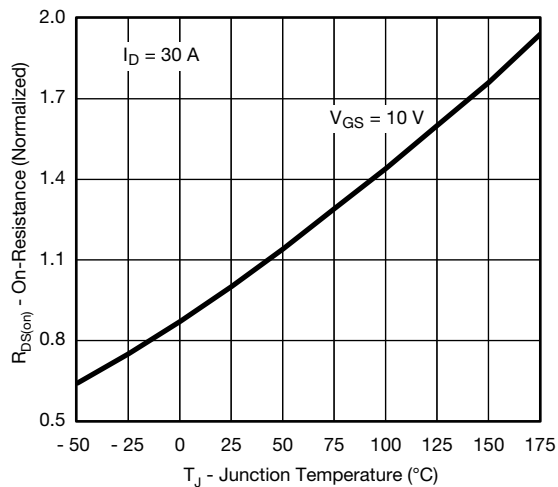
**Capacitance**



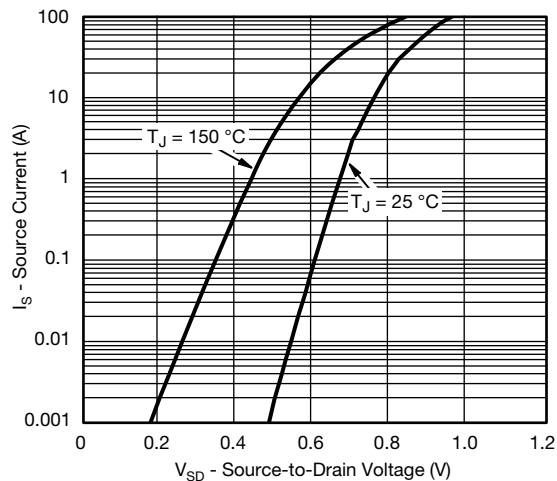
**Gate Charge**



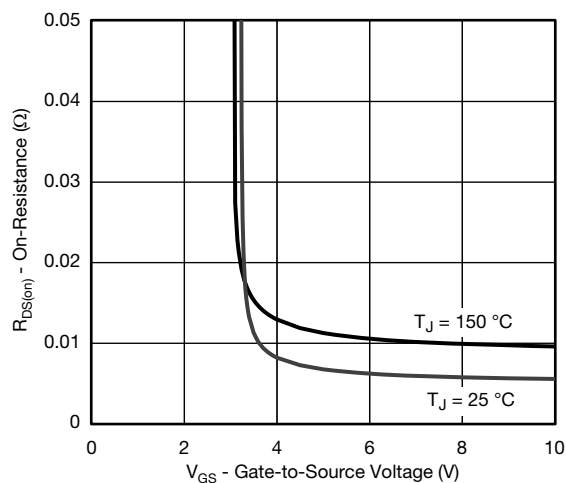
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



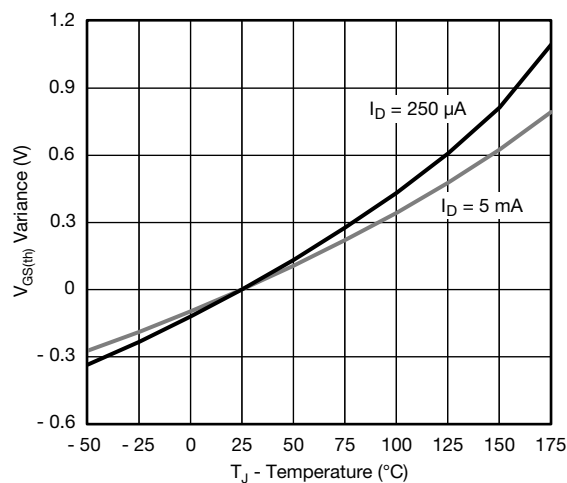
**On-Resistance vs. Junction Temperature**



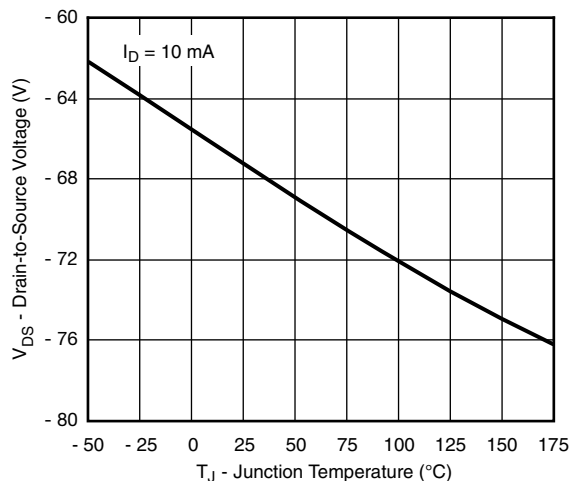
**Source Drain Diode Forward Voltage**



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



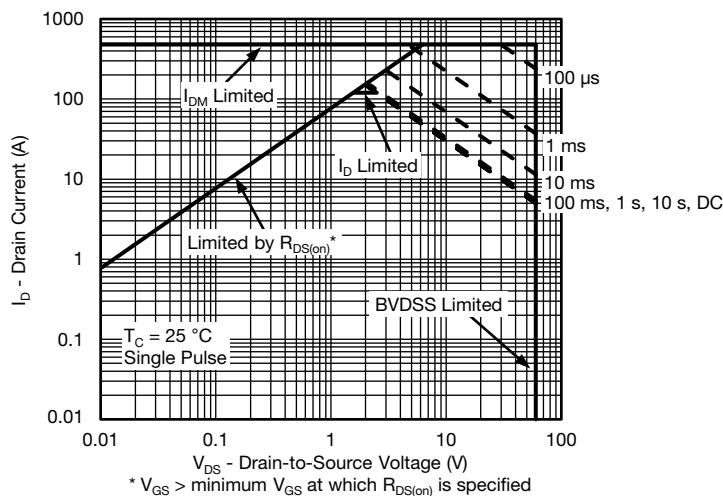
**Threshold Voltage**



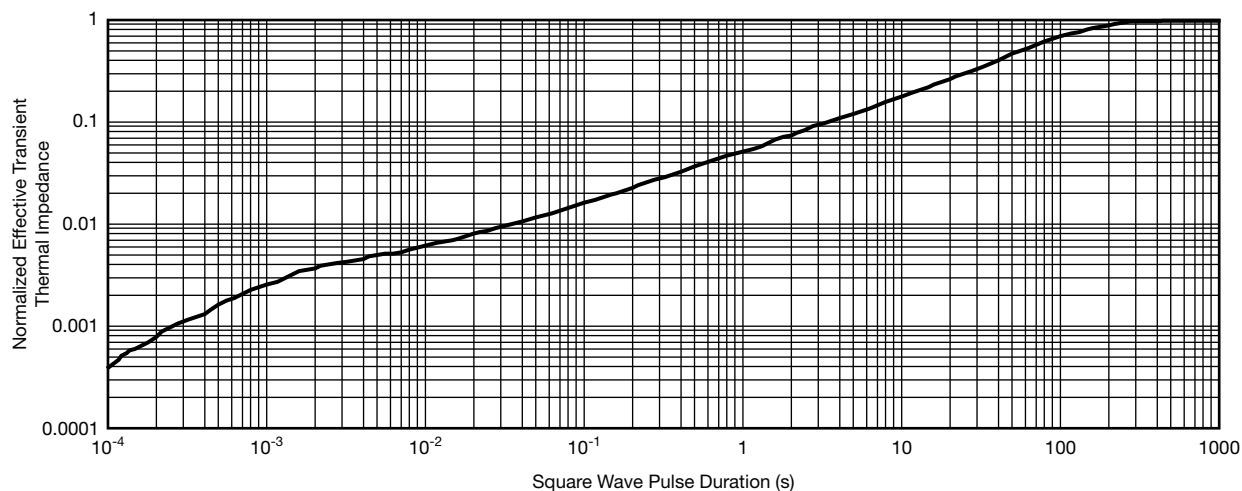
**Drain Source Breakdown vs. Junction Temperature**



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



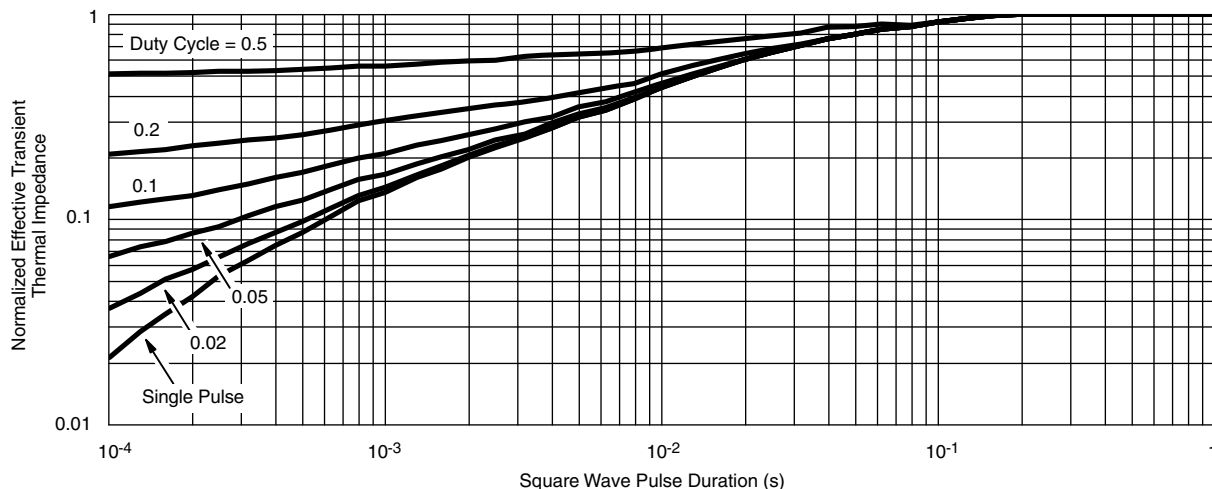
**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**THERMAL RATINGS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , 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 ( $25\text{ }^{\circ}\text{C}$ )
  - 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?62665](http://www.vishay.com/ppg?62665).



## TO-220AB

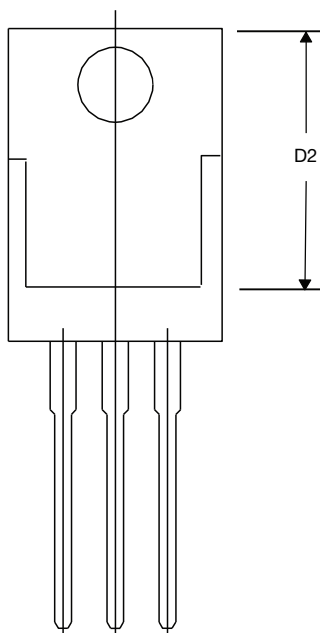


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)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





## Disclaimer

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