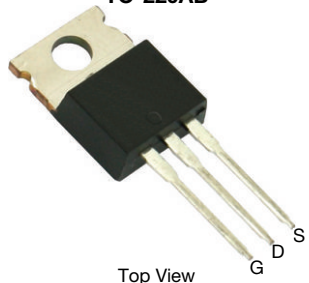


Automotive P-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

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

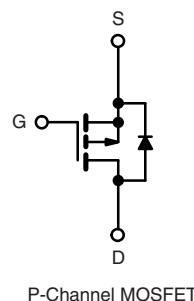
TO-220AB


Top View

FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- AEC-Q101 qualified ^d
- 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


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 _{DS}	-60	V
Gate-Source Voltage		V _{GS}	± 20	
Continuous Drain Current ^a	T _C = 25 °C ^a	I _D	-120	A
	T _C = 125 °C		-87	
Continuous Source Current (Diode Conduction) ^a		I _S	-120	
Pulsed Drain Current ^b		I _{DM}	-480	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	-80	
Single Pulse Avalanche Energy		E _{AS}	320	mJ
Maximum Power Dissipation ^b	T _C = 25 °C	P _D	300	W
	T _C = 125 °C		100	
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}	40	°C/W
Junction-to-Case (Drain)	R_{thJC}	0.5	

Notes

- Package limited.
- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.
- When mounted on 1" square Pcb (Fr-4 material).
- Parametric verification ongoing.



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, I _D = -250 μA		-60	-	-	V
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA		-1.5	-2.0	-2.5	
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V		-	-	± 100	
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V	V _{DS} = -60 V	-	-	-1	μA
		V _{GS} = 0 V	V _{DS} = -60 V, T _J = 125 °C	-	-	-50	
		V _{GS} = 0 V	V _{DS} = -60 V, T _J = 175 °C	-	-	-250	
On-State Drain Current ^a	I _{D(on)}	V _{GS} = -10 V	V _{DS} ≤ -5 V	-120	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = -10 V	I _D = -30 A	-	0.0056	0.0067	Ω
		V _{GS} = -10 V	I _D = -30 A, T _J = 125 °C	-	-	0.0110	
		V _{GS} = -10 V	I _D = -30 A, T _J = 175 °C	-	-	0.0130	
		V _{GS} = -4.5 V	I _D = -20 A	-	0.0070	0.0088	
Forward Transconductance ^b	g _{fs}	V _{DS} = -15 V, I _D = -30 A		-	90	-	S
Dynamic ^b							
Input Capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = -25 V, f = 1 MHz	-	11 423	14 280	pF
Output Capacitance	C _{oss}			-	1034	1295	
Reverse Transfer Capacitance	C _{rss}			-	809	1015	
Total Gate Charge ^c	Q _g	V _{GS} = -10 V	V _{DS} = -30 V, I _D = -110 A	-	180	270	nC
Gate-Source Charge ^c	Q _{gs}			-	31	-	
Gate-Drain Charge ^c	Q _{gd}			-	43	-	
Gate Resistance	R _g	f = 1 MHz		1.1	2.27	3.5	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = -30 V, R _L = 0.27 Ω I _D ≅ -110 A, V _{GEN} = -10 V, R _g = 1 Ω		-	15	23	ns
Rise Time ^c	t _r			-	23	35	
Turn-Off Delay Time ^c	t _{d(off)}			-	97	146	
Fall Time ^c	t _f			-	32	48	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed Current ^a	I _{SM}			-	-	-480	A
Forward Voltage	V _{SD}	I _F = -100 A, V _{GS} = 0		-	-0.95	-1.5	V

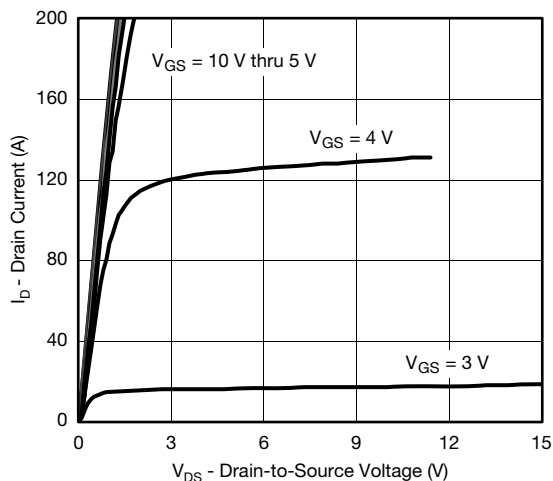
Notes

- 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.

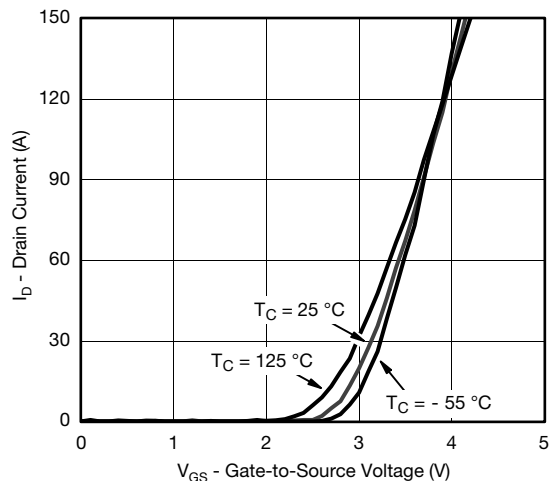
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



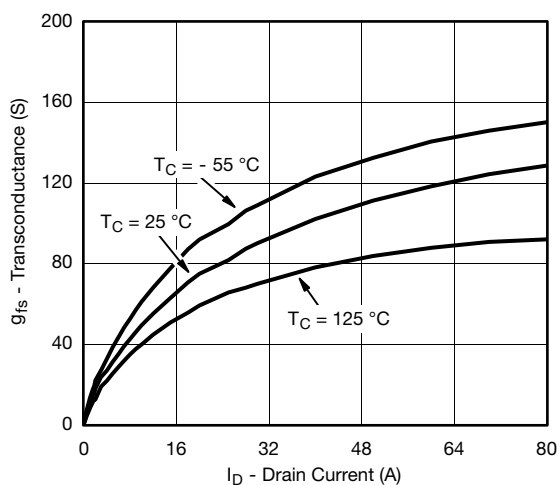
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



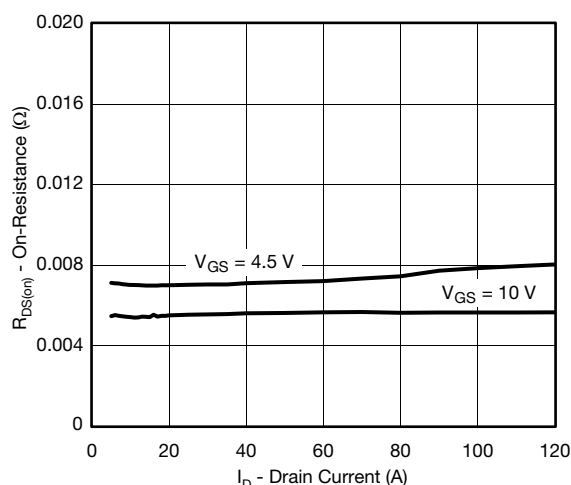
Output Characteristics



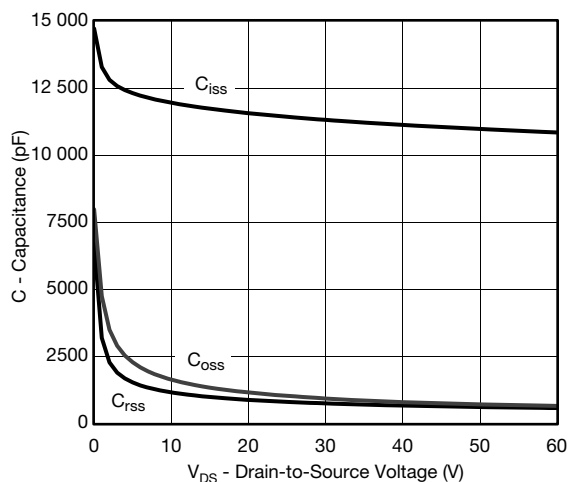
Transfer Characteristics



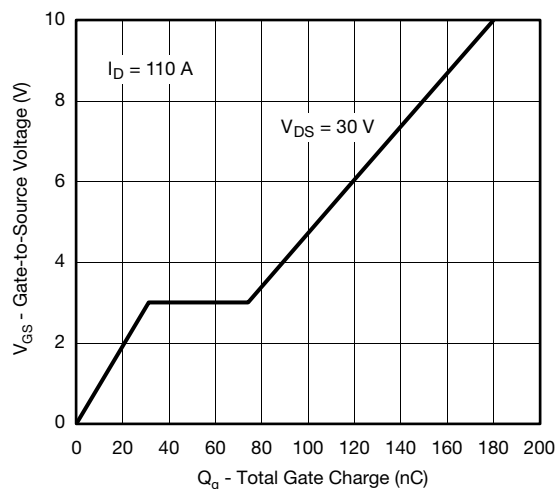
Transconductance



On-Resistance vs. Drain Current



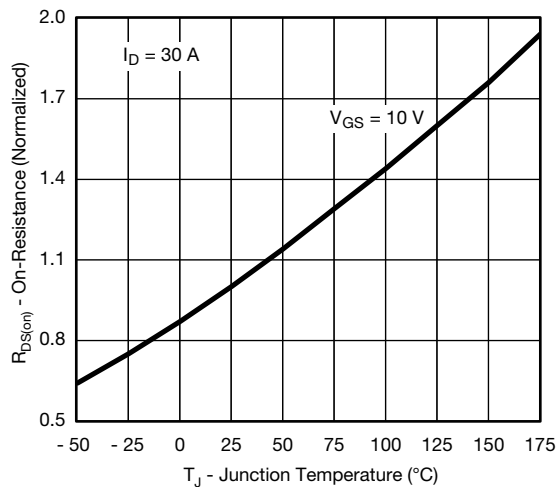
Capacitance



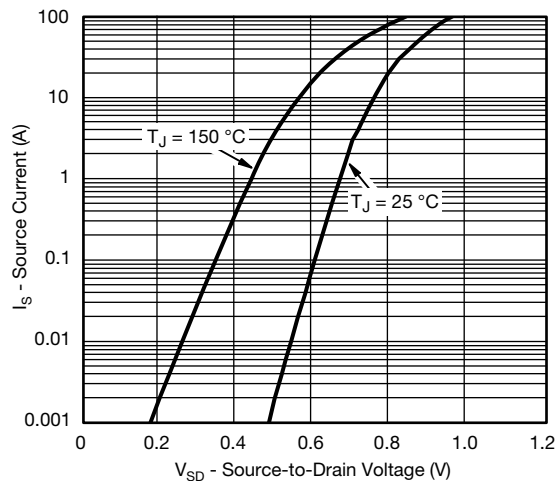
Gate Charge



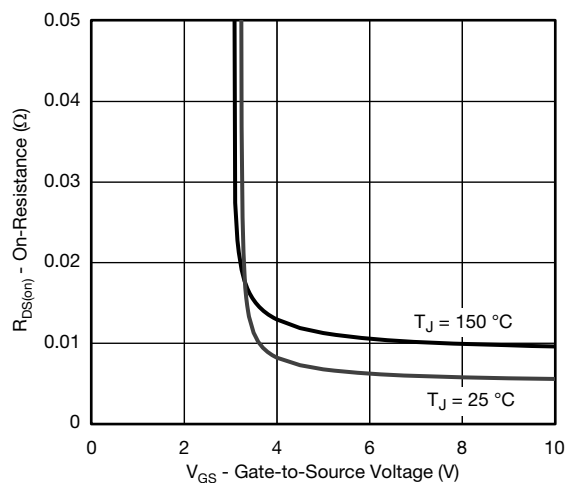
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



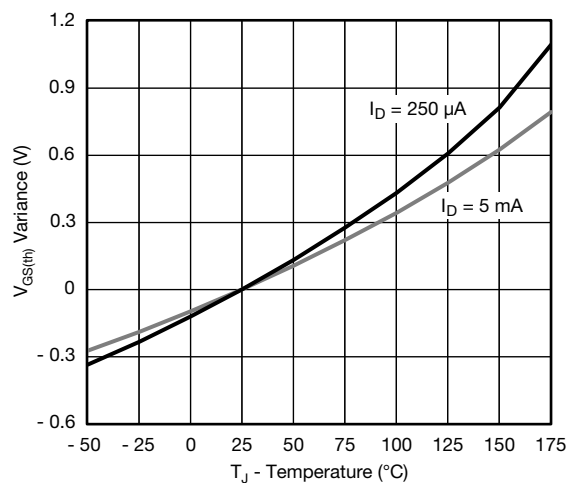
On-Resistance vs. Junction Temperature



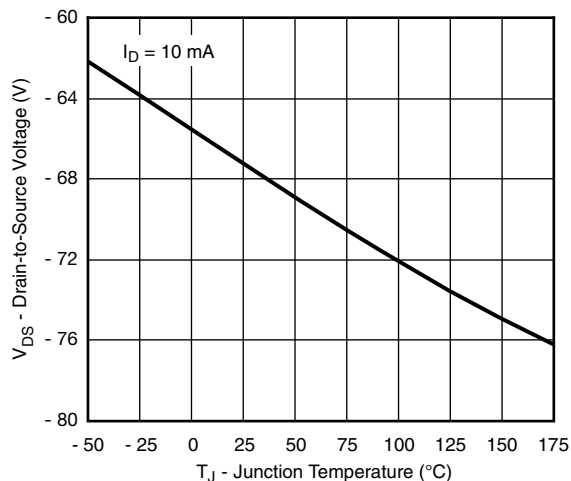
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



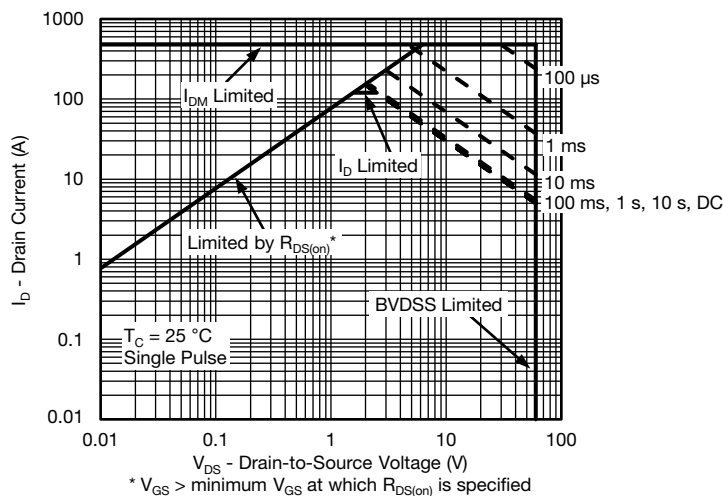
Threshold Voltage



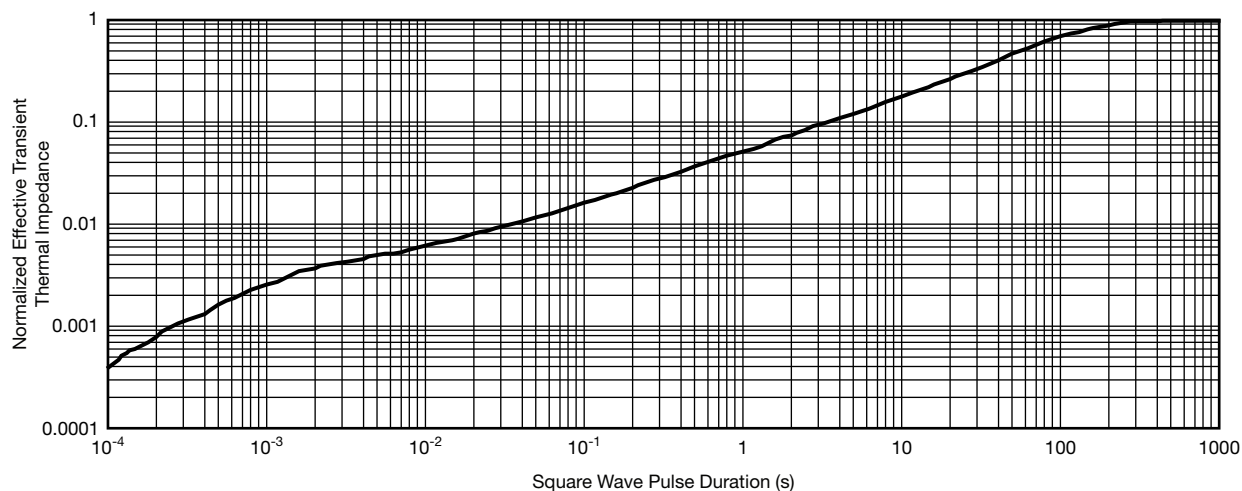
Drain Source Breakdown vs. Junction Temperature



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



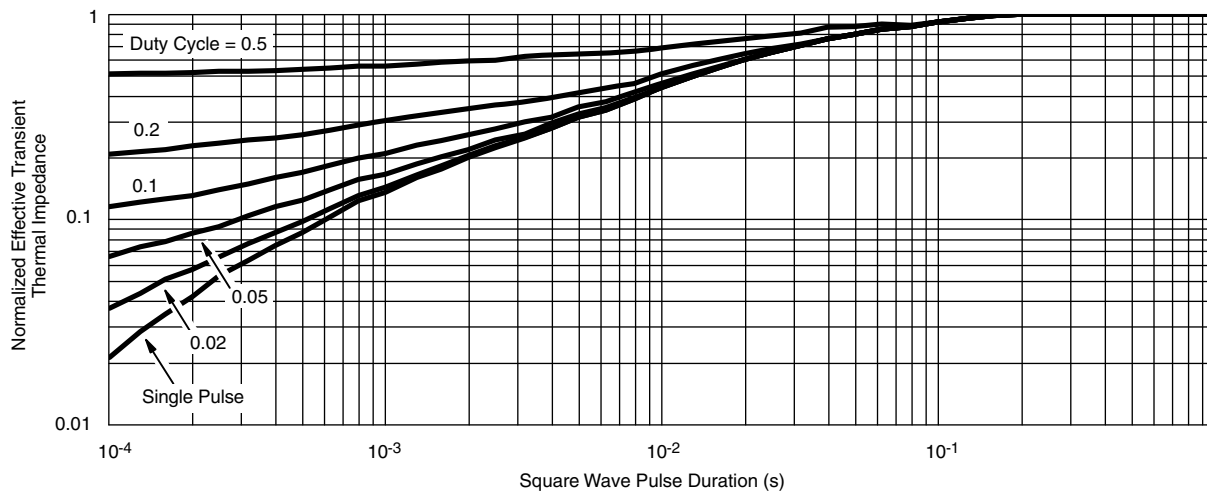
Safe Operating Area



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.

**TO-220**

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

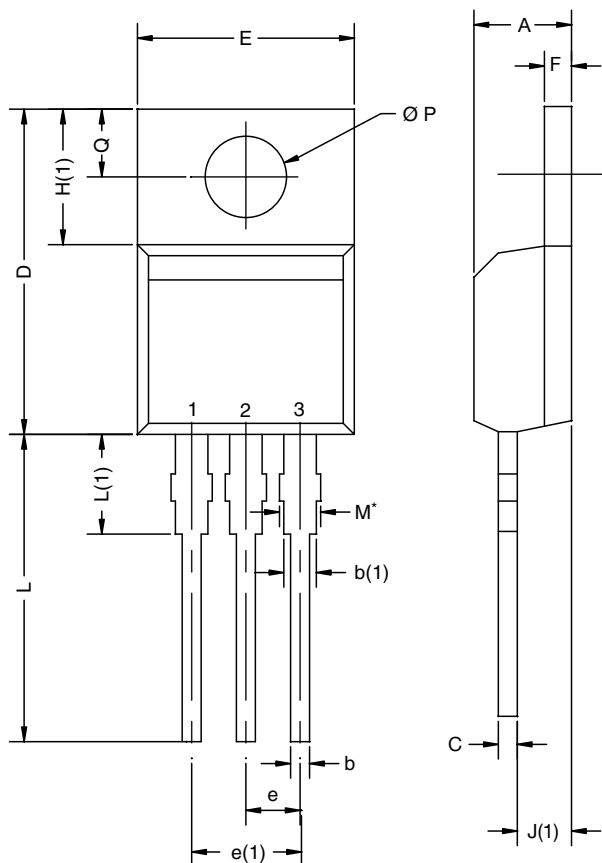
DATASHEET PART NUMBER	OLD ORDERING CODE ^a	NEW ORDERING CODE
SQP100P06-9m3L	-	SQP100P06-9M3L_GE3
SQP120N06-06	-	SQP120N06-06_GE3
SQP120N06-3m5L	SQP120N06-3M5L-GE3	SQP120N06-3M5L_GE3
SQP120N10-09	SQP120N10-09-GE3	SQP120N10-09_GE3
SQP120N10-3m8	SQP120N10-3M8-GE3	SQP120N10-3M8_GE3
SQP25N15-52	-	SQP25N15-52_GE3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

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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