

N-Channel 20-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^a
20	0.0045 at $V_{GS} = 10$ V	60
	0.0065 at $V_{GS} = 4.5$ V	60

FEATURES

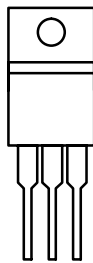
- TrenchFET® Power MOSFET
- 175 °C Junction Temperature
- 100 % R_g Tested
- 100 % UIS Tested



APPLICATIONS

- OR-ing

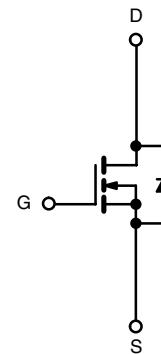
TO-220AB



G D S

Top View

DRAIN connected to TAB



N-Channel MOSFET

Ordering Information: SUP60N02-4m5P-E3 (Lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 175$ °C)	I_D	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed Drain Current	I_{DM}	120	
Single Pulse Avalanche Current	I_{AS}	50	
Single Pulse Avalanche Energy	E_{AS}	125	mJ
Maximum Power Dissipation ^b	P_D	$T_C = 25$ °C	W
		$T_A = 25$ °C ^d	
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) ^d	R_{thJA}	40	°C/W
Junction-to-Case	R_{thJC}	1.25	

Notes:

a. Package limited.

b. Duty cycle ≤ 1 %.

c. See SOA curve for voltage derating.

d. When mounted on 1" square PCB (FR-4 material).

SPECIFICATIONS T _J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{DS} = 0 V, I _D = 250 μA	20			V
Gate-Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.0		3	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V			1	μA
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 125 °C			50	
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 175 °C			250	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	100			A
Drain-Source On-State Resistance ^a	r _{DS(on)}	V _{GS} = 10 V, I _D = 20 A		0.0036	0.0045	Ω
		V _{GS} = 10 V, I _D = 20 A, T _J = 125 °C			0.0068	
		V _{GS} = 10 V, I _D = 20 A, T _J = 175 °C			0.008	
		V _{GS} = 4.5 V, I _D = 20 A		0.0052	0.0065	
Forward Transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 20 A		95		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 10 V, f = 1 MHz		5950		pF
Output Capacitance	C _{oss}			985		
Reverse Transfer Capacitance	C _{rss}			365		
Total Gate Charge ^b	Q _g	V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 50 A		33	50	nC
Gate-Source Charge ^b	Q _{gs}			18		
Gate-Drain Charge ^b	Q _{gd}			7		
Gate Resistance	R _g		0.75	1.5	2.3	Ω
Turn-On Delay Time ^b	t _{d(on)}	V _{DD} = 10 V, R _L = 0.2 Ω I _D ≅ 50 A, V _{GEN} = 10 V, R _g = 1.0 Ω		15	25	ns
Rise Time ^b	t _r			7	11	
Turn-Off Delay Time ^b	t _{d(off)}			35	55	
Fall Time ^b	t _f			8	12	
Source-Drain Diode Ratings and Characteristics T _C = 25 °C ^c						
Continuous Current	I _S				60	A
Pulsed Current	I _{SM}				100	
Forward Voltage ^a	V _{SD}	I _F = 20 A, V _{GS} = 0 V		0.85	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 20 A, di/dt = 100 A/μs		45	90	ns
Peak Reverse Recovery Current	I _{RM}			1.7	3.4	A
Reverse Recovery Charge	Q _{rr}				0.039	0.155

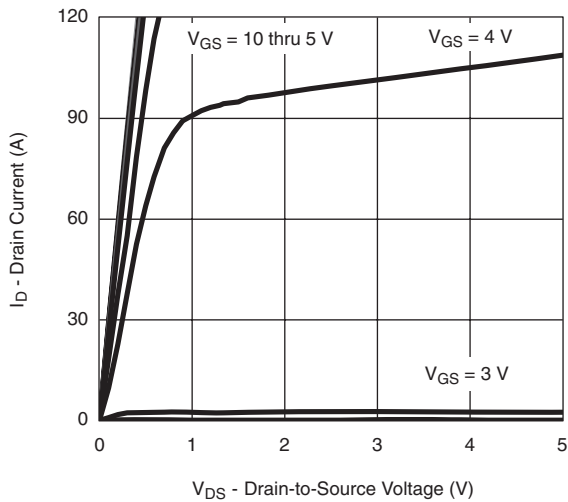
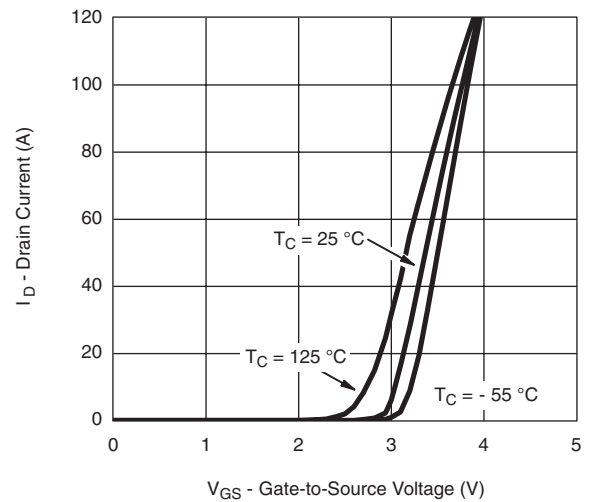
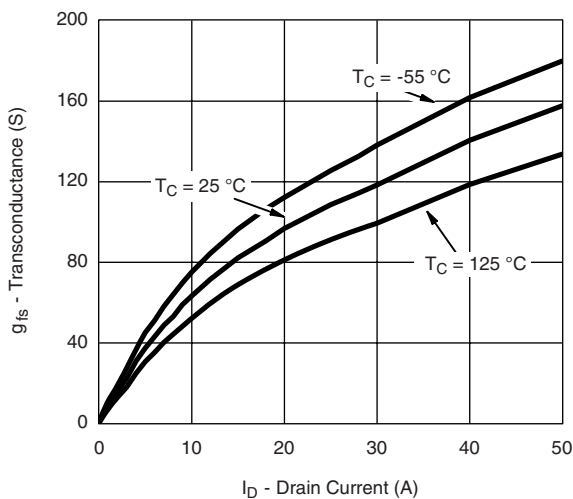
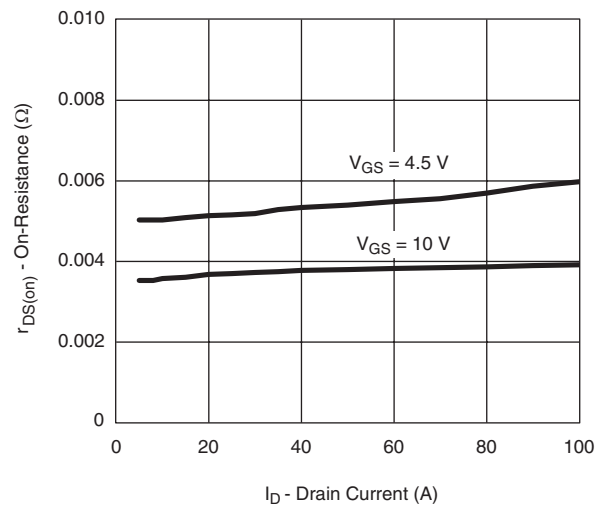
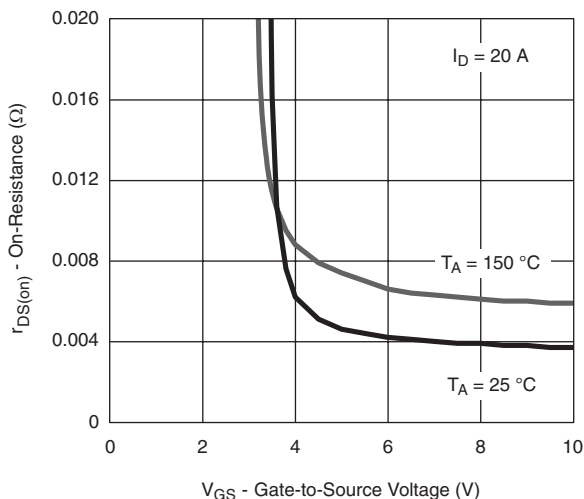
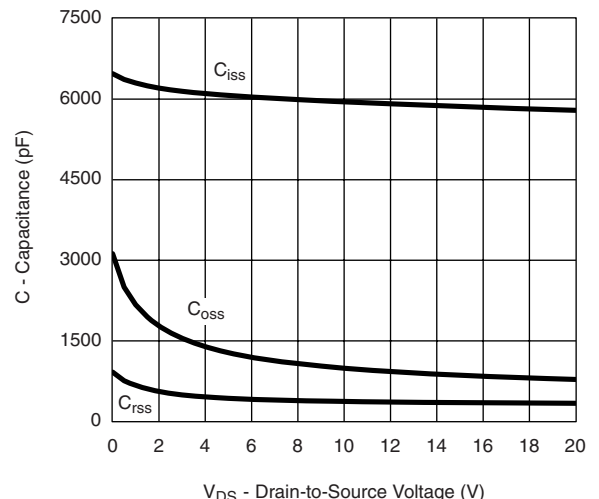
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

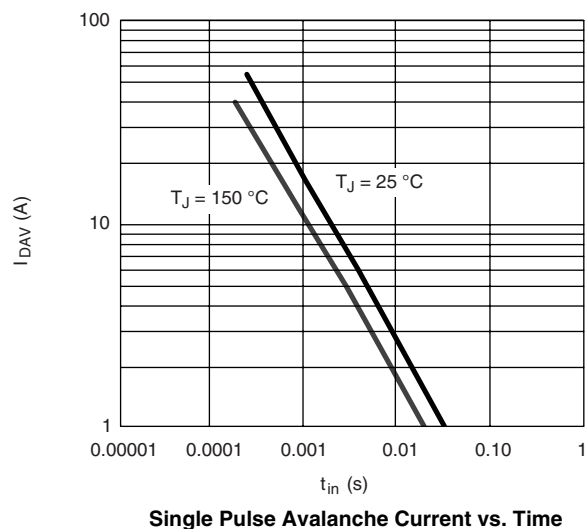
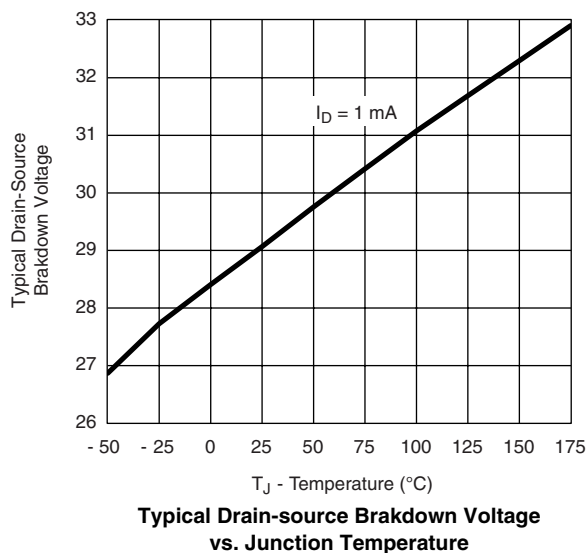
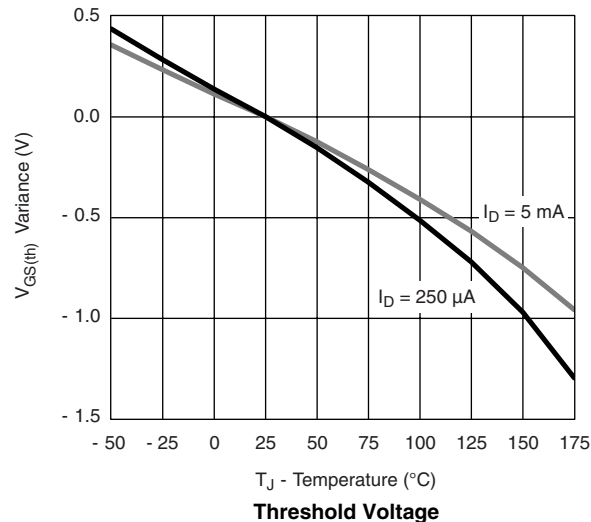
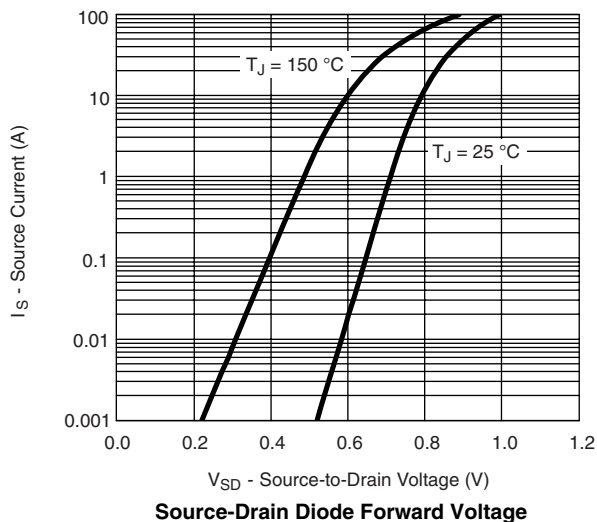
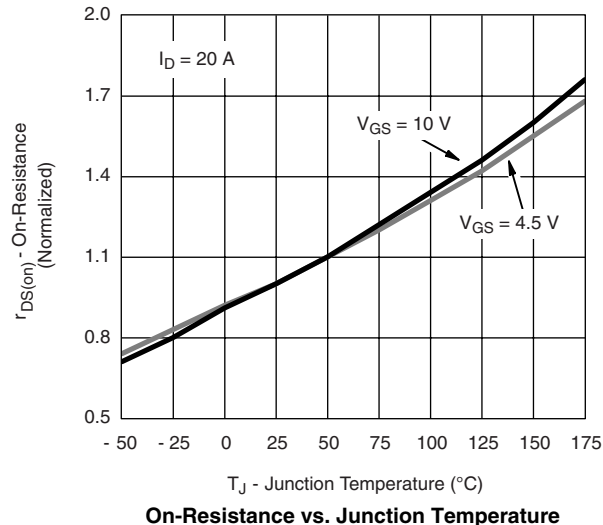
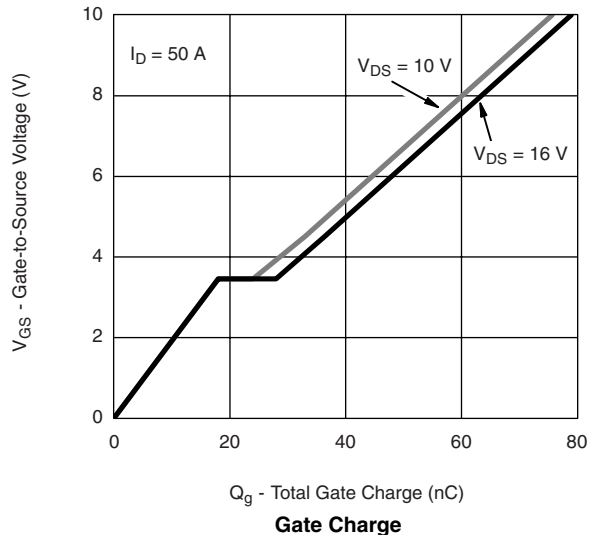
b. Independent of operating temperature.

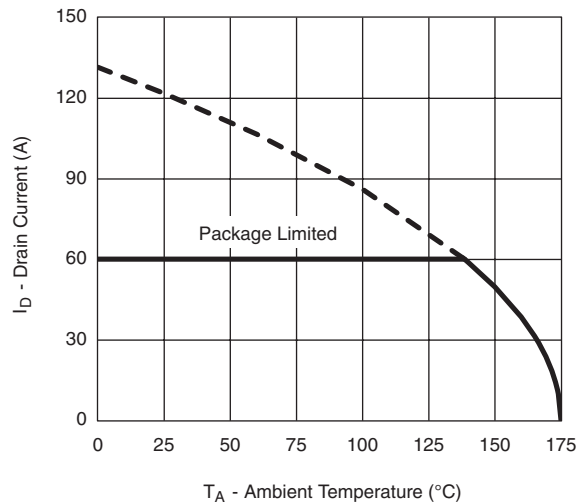
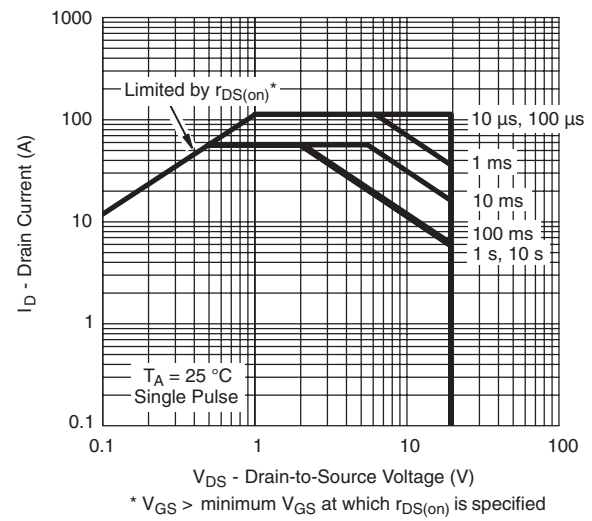
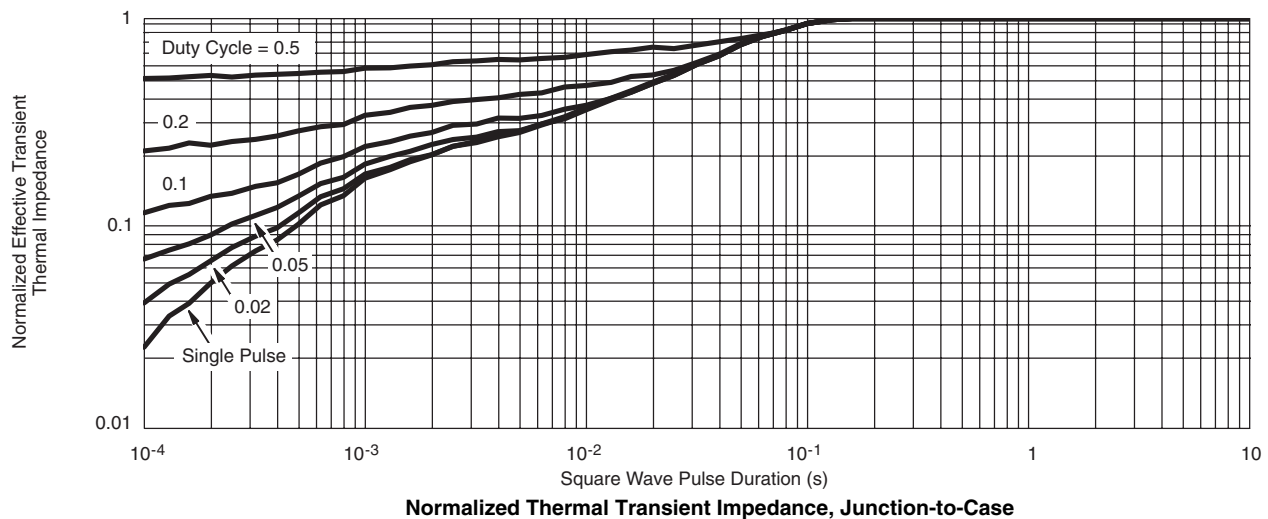
c. Guaranteed by design, not subject to production testing.

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** 25 °C, unless otherwise noted**Output Characteristics****Transfer Characteristics****Transconductance****On-Resistance vs. Drain Current****On-Resistance vs. Gate-to-Source Voltage****Capacitance**

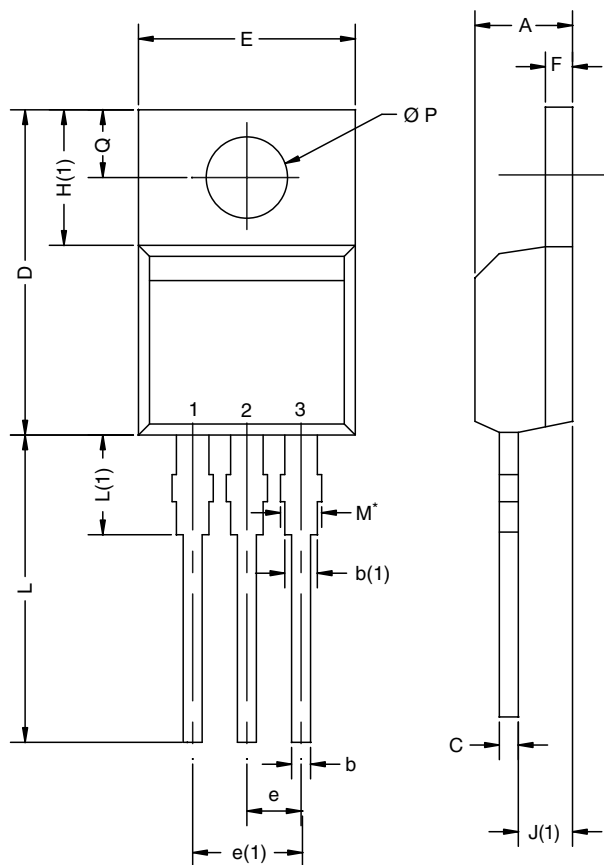
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted**Drain Current vs. Ambient Temperature****Safe Operating Area****Normalized Thermal Transient Impedance, Junction-to-Case**

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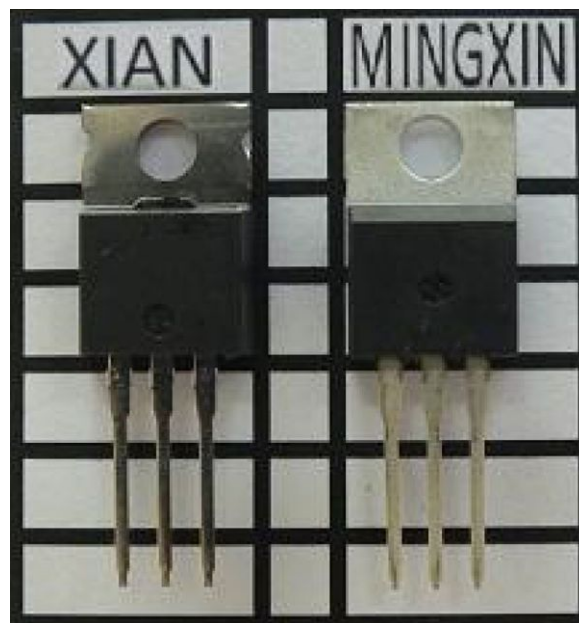


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	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: X12-0208-Rev. N, 08-Oct-12
DWG: 5471

Notes

- * $M = 1.32$ mm to 1.62 mm (dimension including protrusion)
Heatsink hole for HVM
- Xi'an and Mingxin actual photo





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