

40V N-ch Power MOSFET

General Features

- Proprietary New Trench Technology
- $R_{DS(ON),typ.} = 3.0m\Omega @ V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

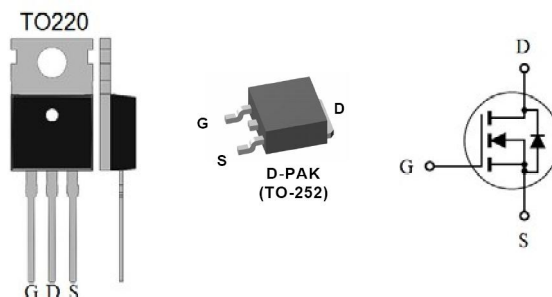
Applications

- High efficiency DC/DC Converters
- Synchronous Rectification
- UPS Inverter

Ordering Information

Part Number	Package	Marking
MXP43P9AT	TO-220	MXP43P9AT
MXP43P9AD	TO-252	MXP43P9AD

BV_{DSS}	$R_{DS(ON),max.}$	$I_D^{[2]}$
40V	4.0m Ω	142A



Absolute Maximum Ratings

$T_C=25^{\circ}C$ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage ^[1]	40	V
V_{GSS}	Gate-to-Source Voltage	± 20	
I_D	Continuous Drain Current ^[2]	142	A
	Continuous Drain Current ^[3]	130	
	Continuous Drain Current at $T_C=100^{\circ}C$ ^[2]	101	
I_{DM}	Pulsed Drain Current at $V_{GS}=10V$ ^[2,4]	569	
E_{AS}	Single Pulse Avalanche Energy ($V_{DD}=30V$, $V_{GS}=10V$, $R_G=25\Omega$, $L=1mH$)	215	mJ
P_D	Power Dissipation	149	W
	Derating Factor above $25^{\circ}C$	1.0	W/ $^{\circ}C$
T_L	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300	$^{\circ}C$
$T_J \& T_{STG}$	Operating and Storage Temperature Range	-55 to 175	

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case			1.00	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient			75	

Electrical Characteristics

OFF Characteristics

 $T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	40			V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current			1	μA	$V_{DS}=32V, V_{GS}=0V$
I_{GSS}	Gate-to-Source Leakage Current			± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$

ON Characteristics

 $T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	3.0	4.0	m Ω	$V_{GS}=10V, I_D=130A^{[5]}$
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS} = V_{GS}, I_D=250\mu A$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance		3.42		nF	$V_{GS}=0V,$ $V_{DS}=25V,$ $f=1.0MHz$
C_{rss}	Reverse Transfer Capacitance		0.16			
C_{oss}	Output Capacitance		0.47			
R_g	Gate Series Resistance		2.55		Ω	$f=1.0MHz$
Q_g	Total Gate Charge		57		nC	$V_{DD}=20V,$ $I_D=130A, V_{GS}=10V$
Q_{gs}	Gate-to-Source Charge		20			
Q_{gd}	Gate-to-Drain (Miller) Charge		15			

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(on)}$	Turn-on Delay Time		739		ns	$V_{DD}=20V$ $I_D=130A$ $V_{GS}=10V$ $R_G=2.5\Omega$
t_{rise}	Rise Time		19			
$t_{d(off)}$	Turn-off Delay Time		205			
t_{fall}	Fall Time		14			

Source-Drain Body Diode Characteristics

 $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current ^[2]			142	A	Maximum Ratings
I_{SM}	Pulsed Source Current at $V_{GS}=10V^{[2,4]}$			569	A	Maximum Ratings
V_{SD}	Diode Forward Voltage		1.0	1.2	V	$I_S=130A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time		31		ns	$V_{GS}=0V$ $I_F=20A, di/dt=100A/\mu s$
Q_{rr}	Reverse Recovery Charge		32		nC	

Note:

[1] $T_J=+25^\circ\text{C}$ to $+175^\circ\text{C}$

[2] Silicon limited current only

[3] Package limited current

[4] Repetitive rating, pulse width limited by both maximum junction temperature.

[5] Pulse width $\leq 380\mu s$; duty cycle $\leq 2\%$.

Typical Characteristics

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

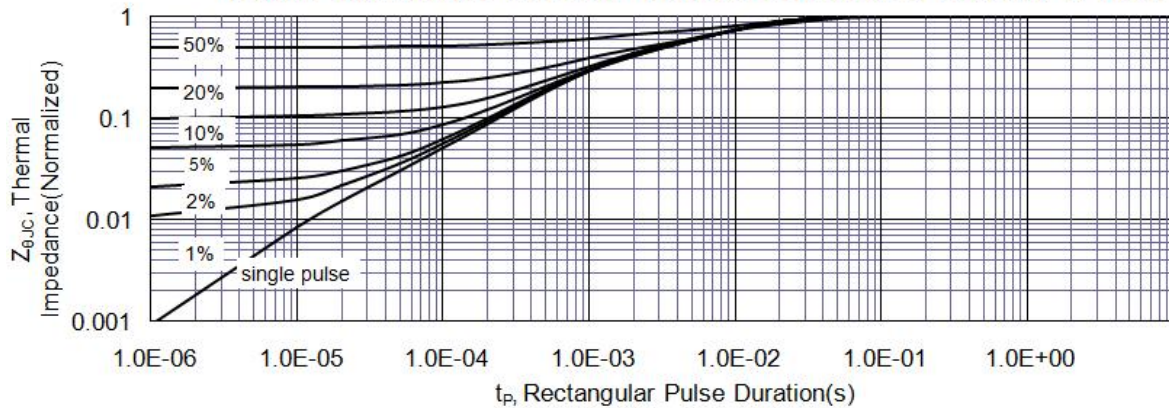


Figure 2. Maximum Power Dissipation vs. Case Temperature

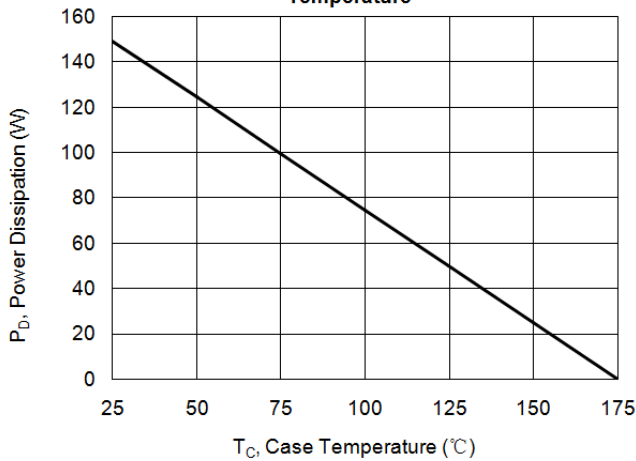


Figure 3. Maximum Continuous Drain Current vs. Case Temperature

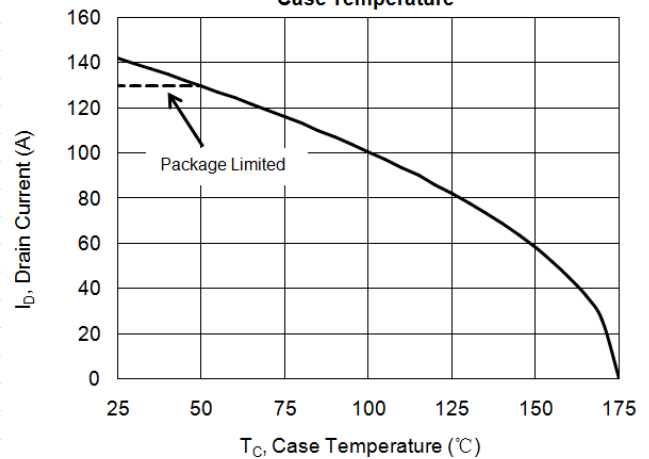


Figure 4. Typical Output Characteristics

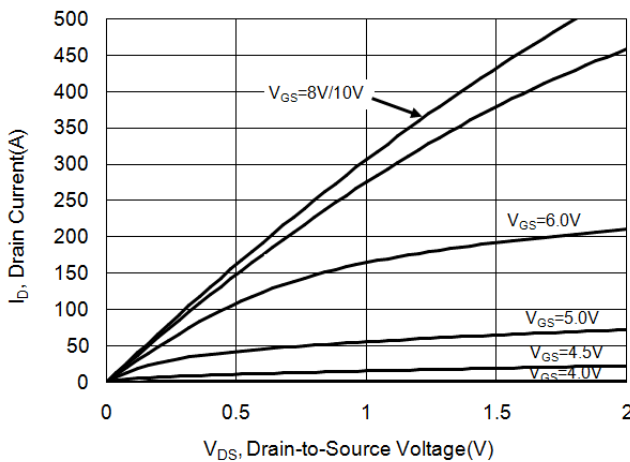


Figure 5. Typical Drain-to-Source ON Resistance vs. Gate Voltage

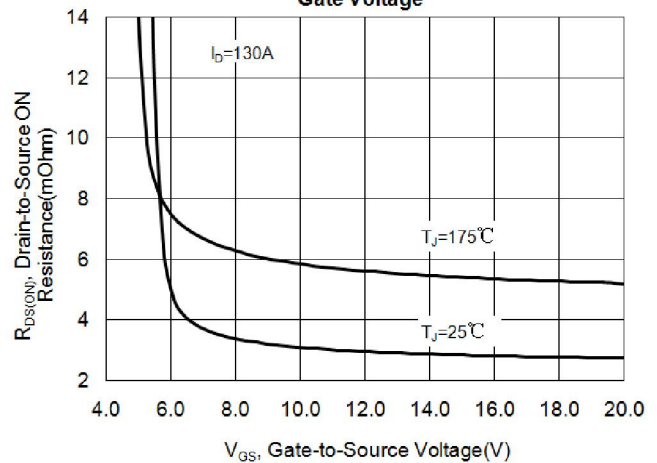


Figure 6. Maximum Peak Current Capability

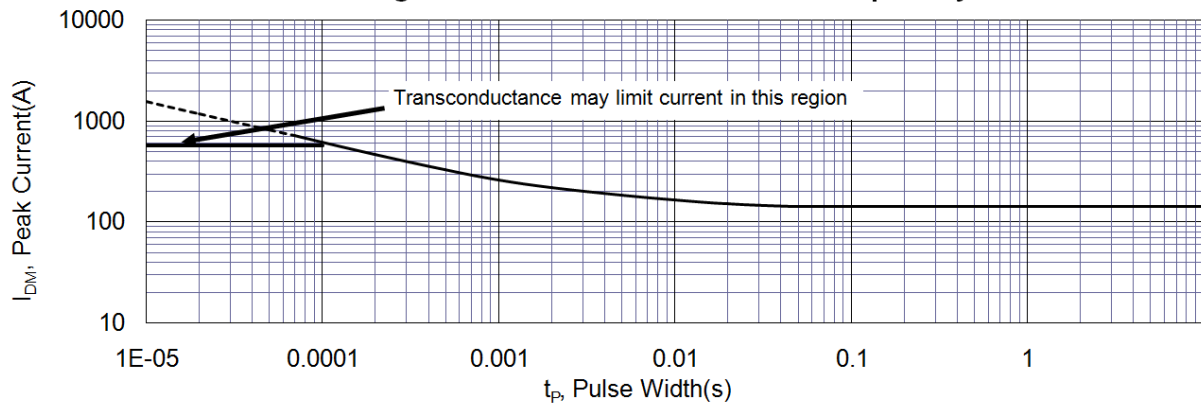


Figure 7. Typical Transfer Characteristics

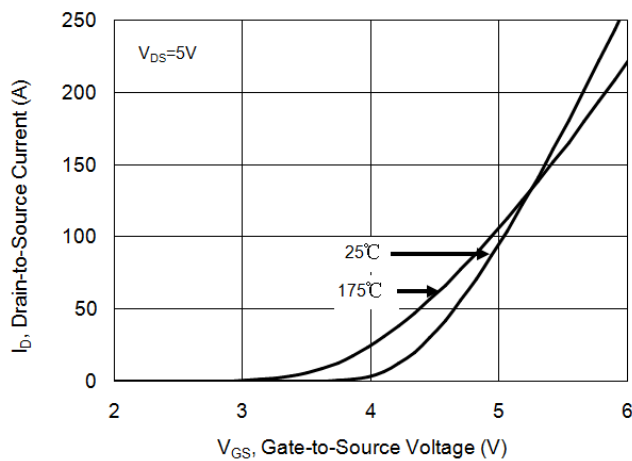


Figure 8. Unclamped Inductive Switching Capability

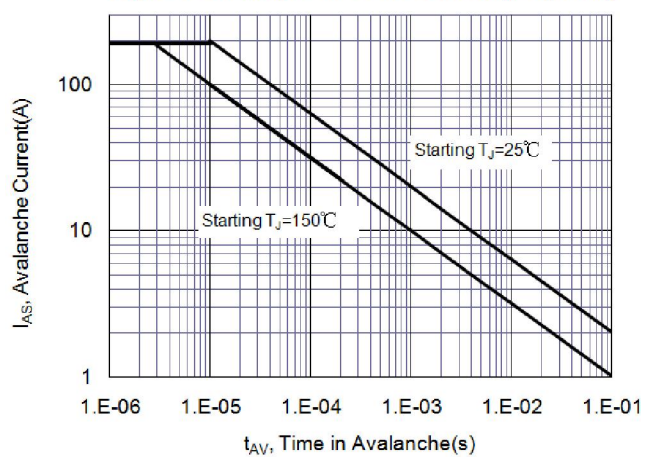


Figure 9. Typical Drain-to-Source ON Resistance

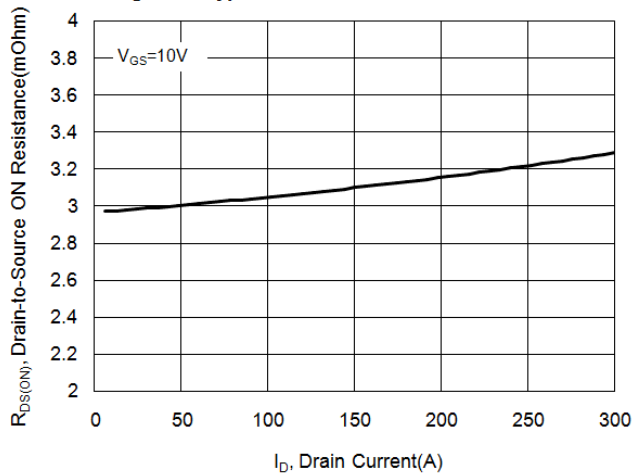


Figure 10. Typical Drain-to-Source On Resistance vs. Junction Temperature

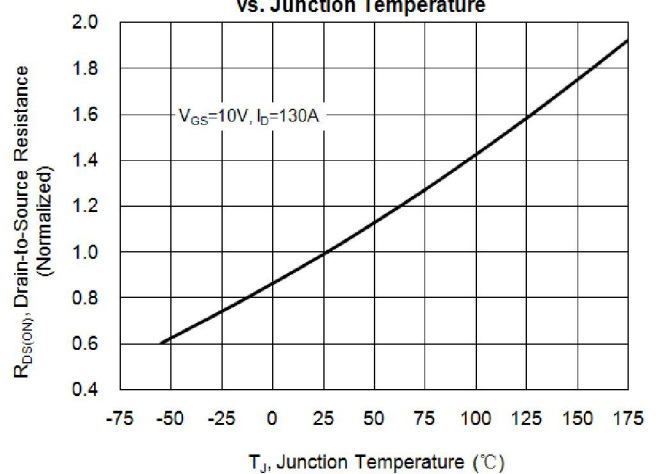
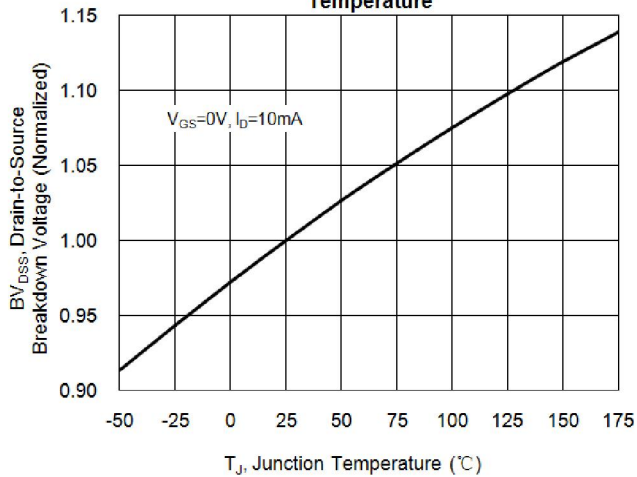
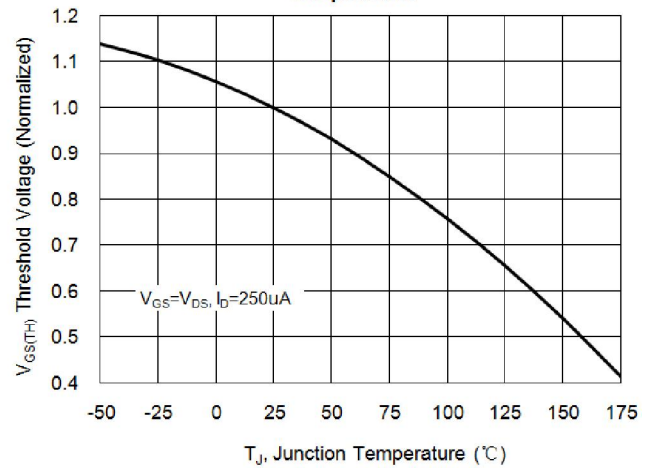
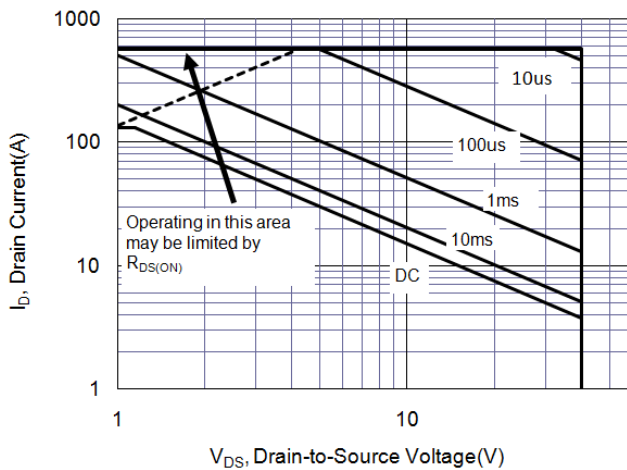
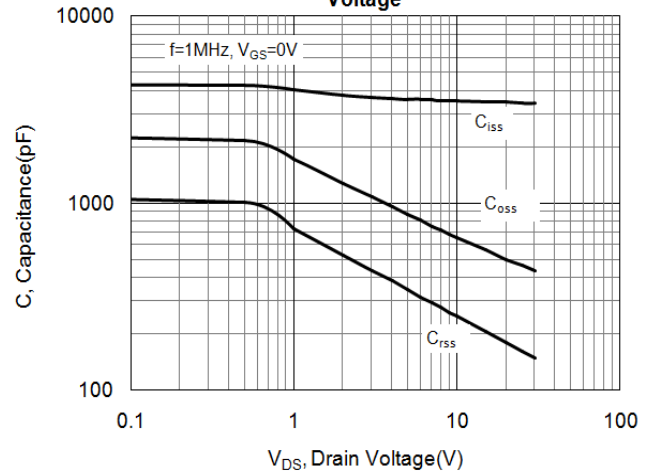
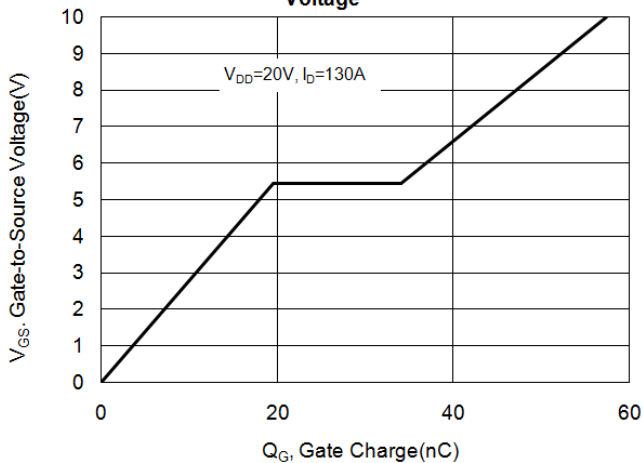
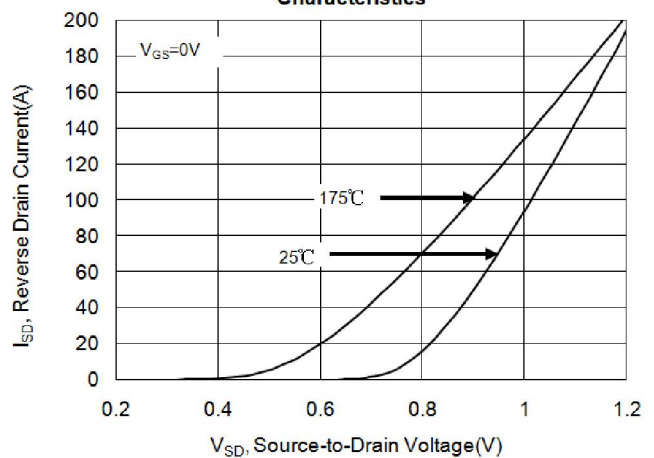
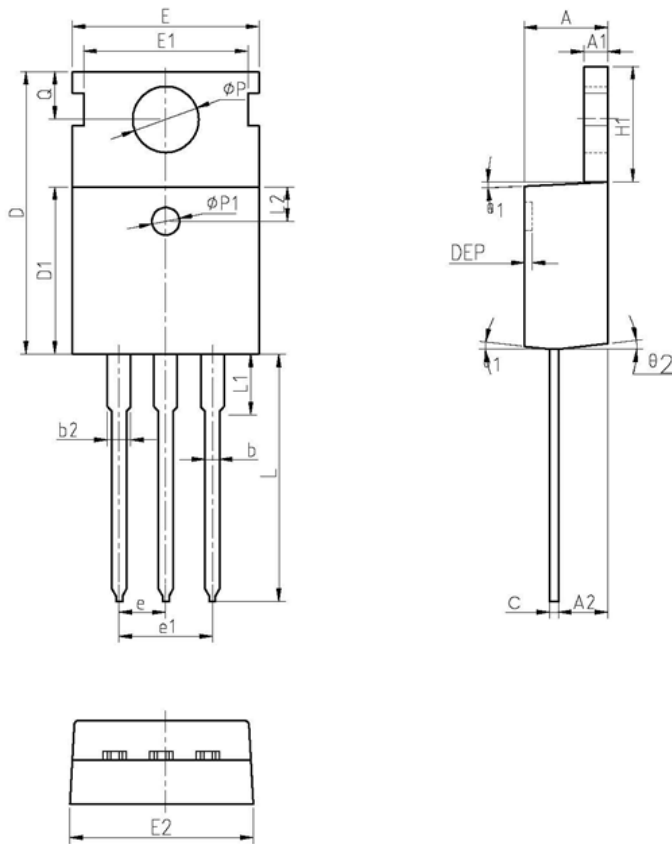


Figure 11. Typical Breakdown Voltage vs. Junction Temperature

Figure 12. Typical Threshold Voltage vs. Junction Temperature

Figure 13. Maximum Forward Safe Operation Area

Figure 14. Typical Capacitance vs. Drain-to-Source Voltage

Figure 15. Typical Gate Charge vs. Gate-to-Source Voltage

Figure 16. Typical Body Diode Transfer Characteristics


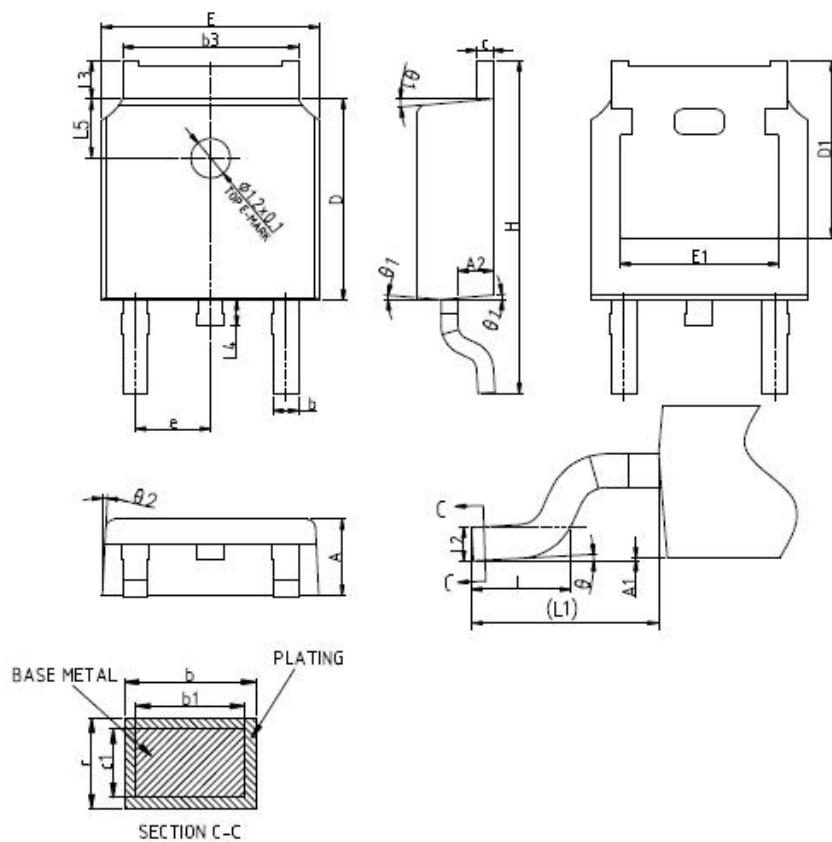
Package Dimensions

TO-220-3L



COMMON DIMENSIONS

SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.27	1.30	1.33	0.050	0.051	0.052
A2	2.35	2.40	2.50	0.093	0.094	0.098
b	0.77	0.80	0.90	0.030	0.031	0.035
b2	1.17	1.27	1.36	0.046	0.050	0.054
c	0.48	0.50	0.56	0.019	0.020	0.022
D	15.40	15.60	15.80	0.606	0.614	0.622
D1	9.00	9.10	9.20	0.354	0.358	0.362
DEP	0.05	0.10	0.20	0.002	0.004	0.008
E	9.80	10.00	10.20	0.386	0.394	0.402
E1	—	8.70	—	—	0.343	—
E2	9.80	10.00	10.20	0.386	0.394	0.402
e	2.54		BSC	0.100		BSC
e1	5.08		BSC	0.200		BSC
H1	6.40	6.50	6.60	0.252	0.256	0.260
L	12.75	13.50	13.65	0.502	0.531	0.537
L1	—	3.10	3.30	—	0.122	0.130
L2	2.50		REF	0.098		REF
φP	3.50	3.60	3.63	0.138	0.142	0.143
φP1	3.50	3.60	3.63	0.138	0.142	0.143
Q	2.73	2.80	2.87	0.107	0.110	0.113
θ1	5°	7°	9°	5°	7°	9°
θ2	1°	3°	5°	1°	3°	5°
θ3	1°	3°	5°	1°	3°	5°

TO-252

COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.97	1.07	1.17
b	0.72	0.78	0.85
b1	0.71	0.76	0.81
b3	5.23	5.33	5.46
c	0.47	0.53	0.58
c1	0.46	0.51	0.56
D	6.00	6.10	6.20
D1	5.30REF		
E	6.50	6.60	6.70
E1	4.70	4.83	4.92
e	2.28BSC		
H	9.90	10.10	10.30
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.51BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	1.70	1.80	1.90
⌀	0"	-	8"
①	5"	7"	9"
②	5"	7"	9"

NOTES

1. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-252 AA.
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

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