

40V N-Channel MOSFET

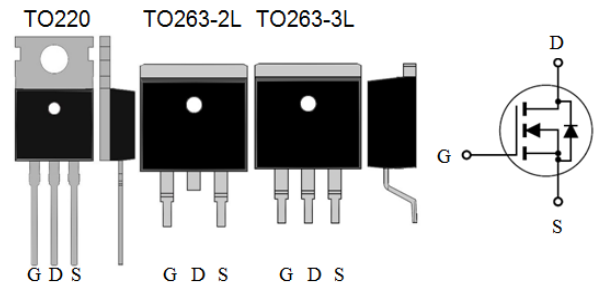
Applications:

- Power Supply
- DC-DC Converters
- DC-AC Inverters

V_{DS}	$R_{DS(ON)}(MAX)$	I_D
40V	4m Ω	170A

Features:

- Lead Free
- Low $R_{DS(ON)}$ to Minimize Conductive Loss
- Low Gate Charge for Fast Switching Application
- Optimized $V_{(BR)DSS}$ Ruggedness



Pin Definition and Inner Circuit

Ordering Information

Park Number	Package	Brand
MXP4004BT	TO220	MXP
MXP4004BF	TO263-2L	
MXP4004BE	TO263-3L	

Absolute Maximum Ratings

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

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage	40	V
I_D	Continuous Drain Current	Silicon Limited	170
		Package Limited	80
I_{DM}	Pulsed Drain Current @ $V_{GS}=10\text{V}$	679	
P_D	Power Dissipation	231	W
V_{GS}	Gate-to-Source Voltage	+/-20	V
T_J and T_{stg}	Operating Junction and Storage Temperature Range	-55 to 175	$^\circ\text{C}$

Avalanche Characteristics

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

Symbol	Parameter	Value	Unit
$E_{AS}^{\text{①}}$	Single Pulse Avalanche Energy ($V_{DS}=20\text{V}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$, $L=1\text{mH}$)	200	mJ
I_{AS}	Single Pulse Avalanche Current	Figure 9	A

Thermal Resistance

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.65	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	$^\circ\text{C}/\text{W}$

① : Guarantee number.

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

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	40	-	-	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	-	-	1	uA	$V_{DS}=32V, V_{GS}=0V$
		-	-	100		$V_{DS}=32V, V_{GS}=0V, T_J=125^{\circ}\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	-	-	100	nA	$V_{GS}=+20V$
	Gate-to-Source Reverse Leakage	-	-	100		$V_{GS}=-20V$

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	-	2.3	4.0	m Ω	$V_{GS}=10V, I_D=80A$
$V_{GS(th)}$	Gate Threshold Voltage	2	-	4	V	$V_{GS}=V_{DS}, I_D=250\mu A$

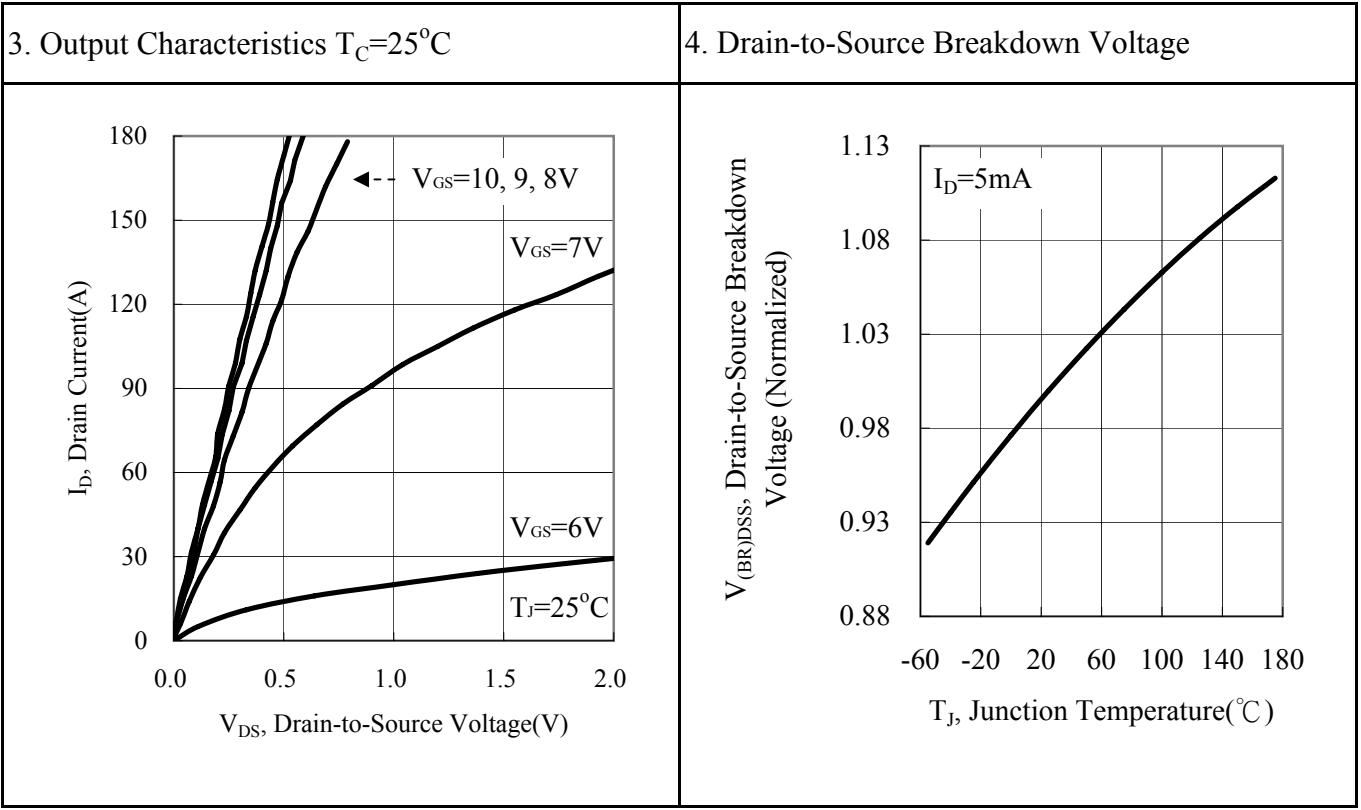
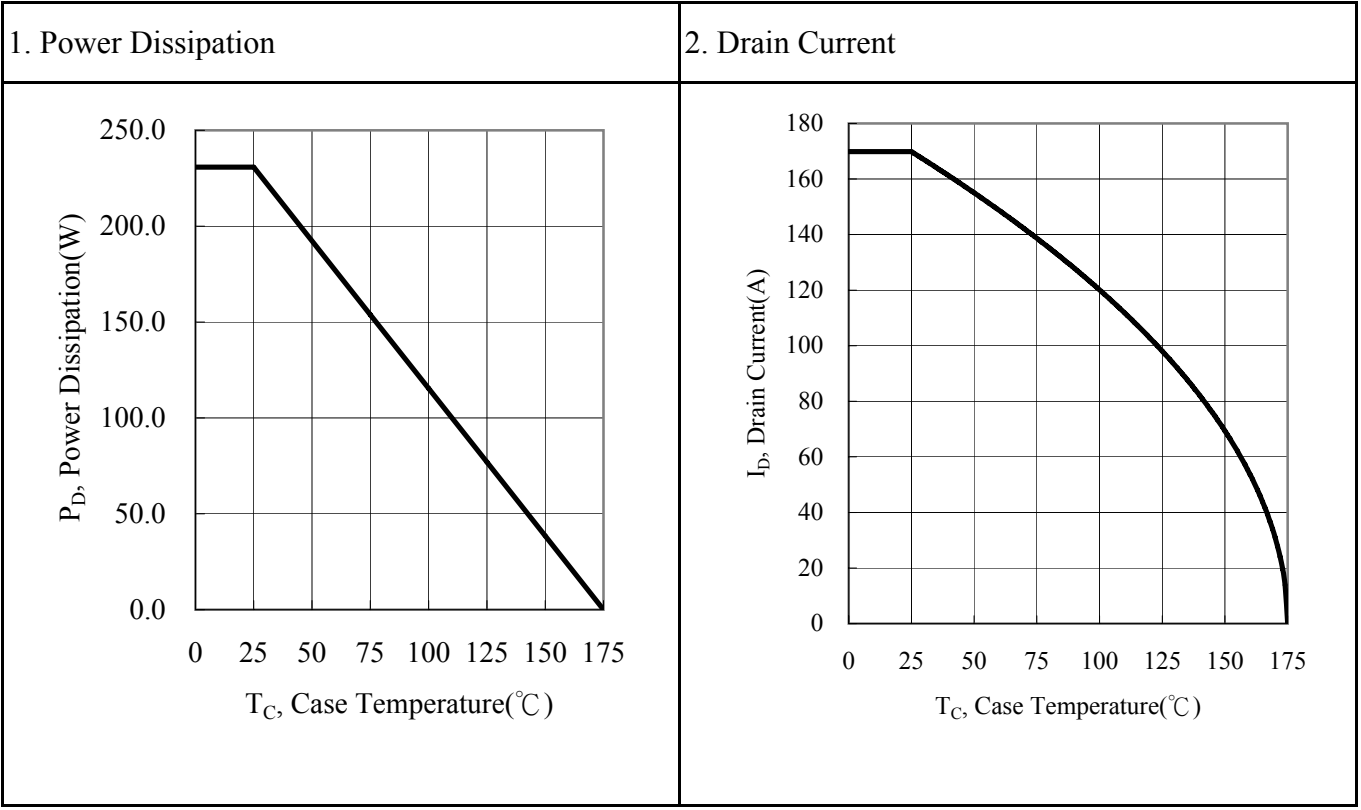
Dynamic Characteristics
 $T_J=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
C_{iss}	Input Capacitance	-	5016	-	pF	$V_{GS}=0V, V_{DS}=20V,$ $f=1.0\text{MHz}$
C_{oss}	Output Capacitance	-	787	-		
C_{rss}	Reverse Transfer Capacitance	-	292	-		
Q_g	Total Gate Charge	-	74	-	nC	$V_{DD}=20V, I_D=80A, V_{GS}=10V$
Q_{gs}	Gate-to-Source Charge	-	23	-		
Q_{gd}	Gate-to-Drain ("Miller") Charge	-	26	-		
$T_d(on)$	Turn-on Delay Time	-	18.7	-	ns	$V_{DD}=20V, I_D=40A,$ $V_{GS}=10V, R_G=10\Omega, R_L=0.5\Omega$
T_r	Rise Time	-	67.1	-		
$T_d(off)$	Turn-off Delay Time	-	48.8	-		
T_f	Fall Time	-	31	-		

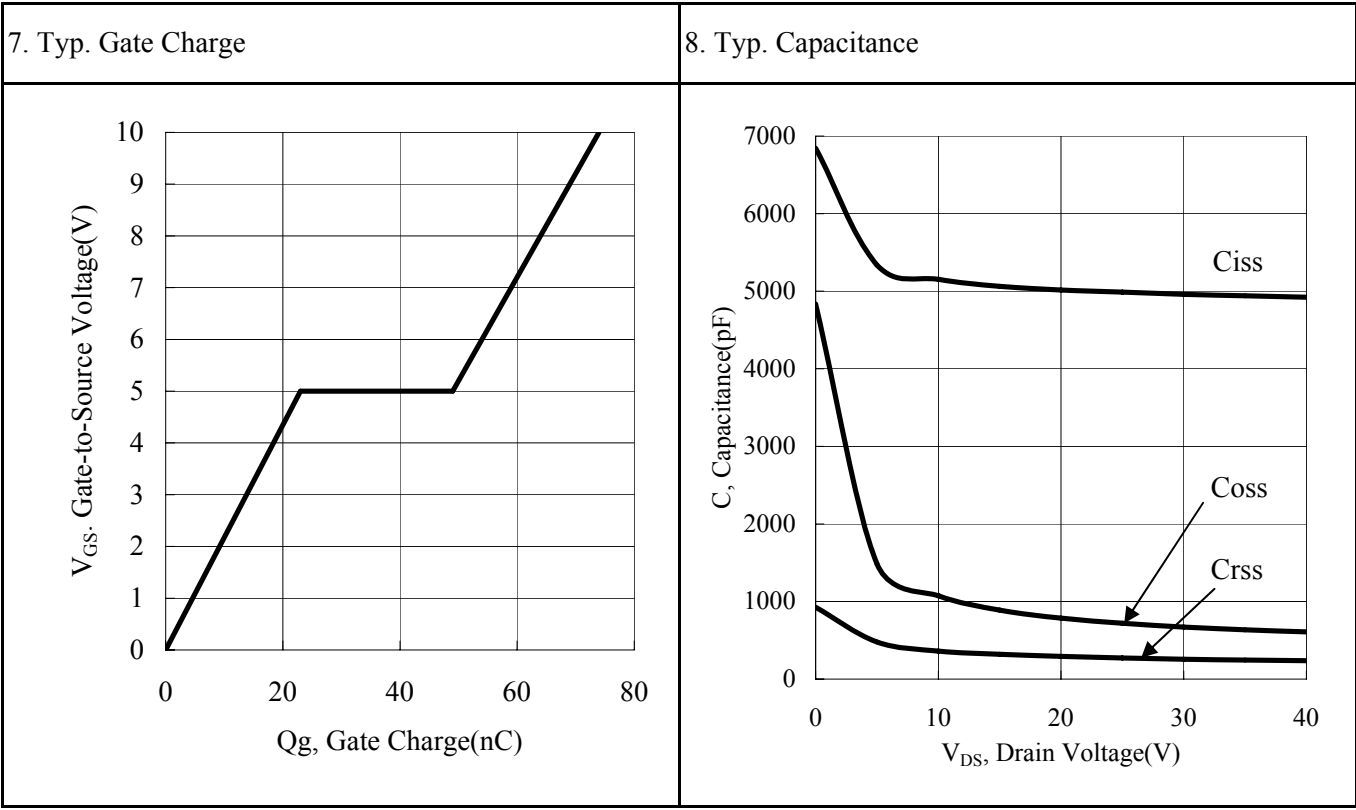
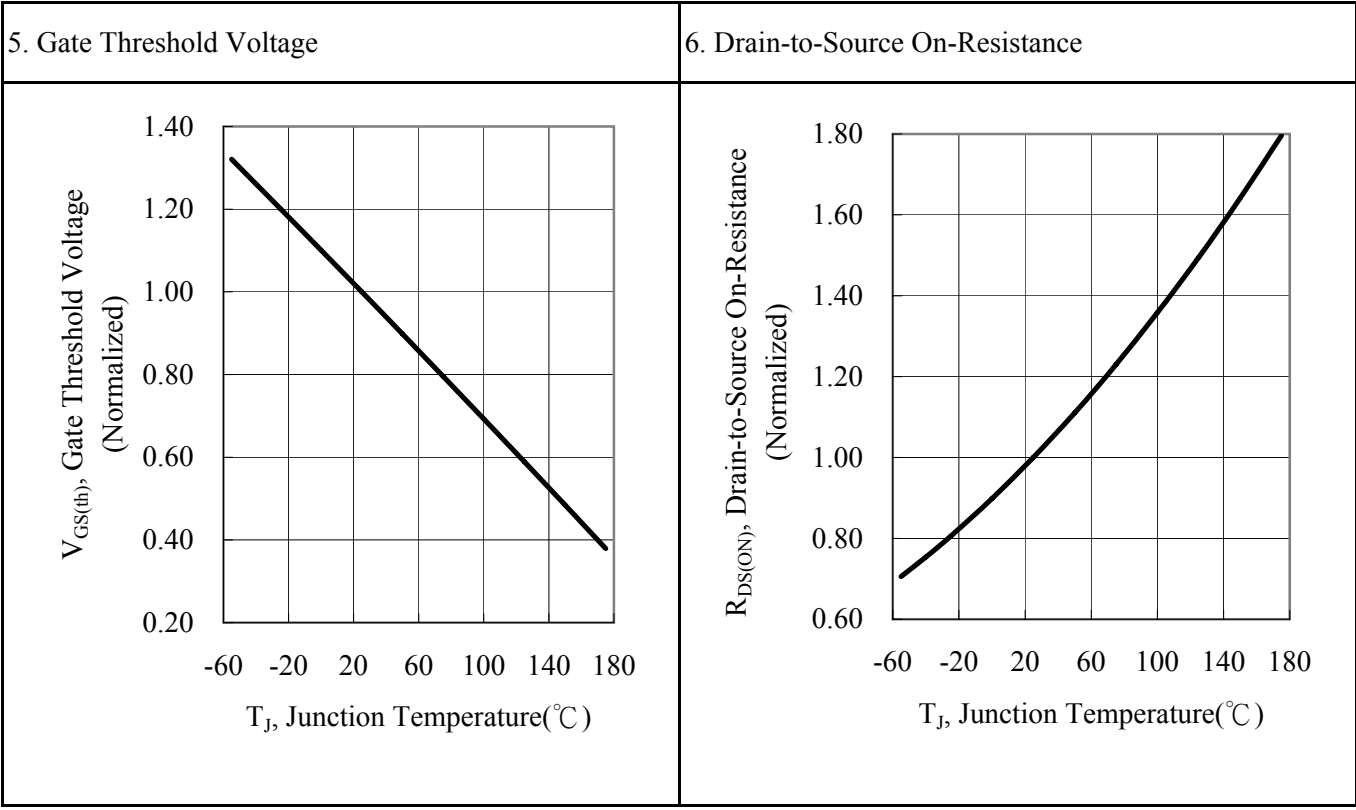
Source-Drain Diode Characteristics
 $T_J=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	-	-	1.2	V	$I_S=80A, V_{GS}=0V$
T_{rr}	Reverse Recovery Time	-	51.6	-	ns	$I_S=80A, di/dt=100A/\mu s$
Q_{rr}	Reverse Recovery Charge	-	35.1	-	nC	

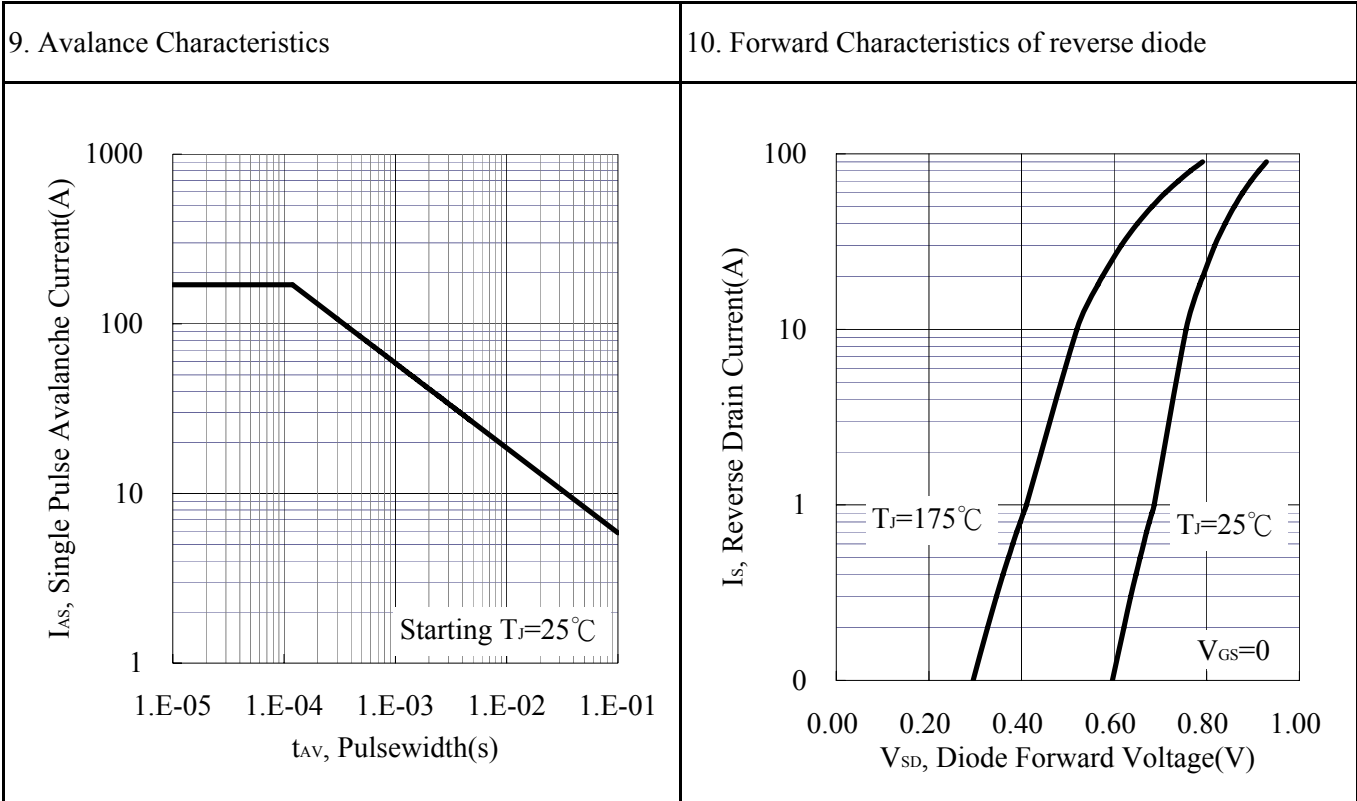
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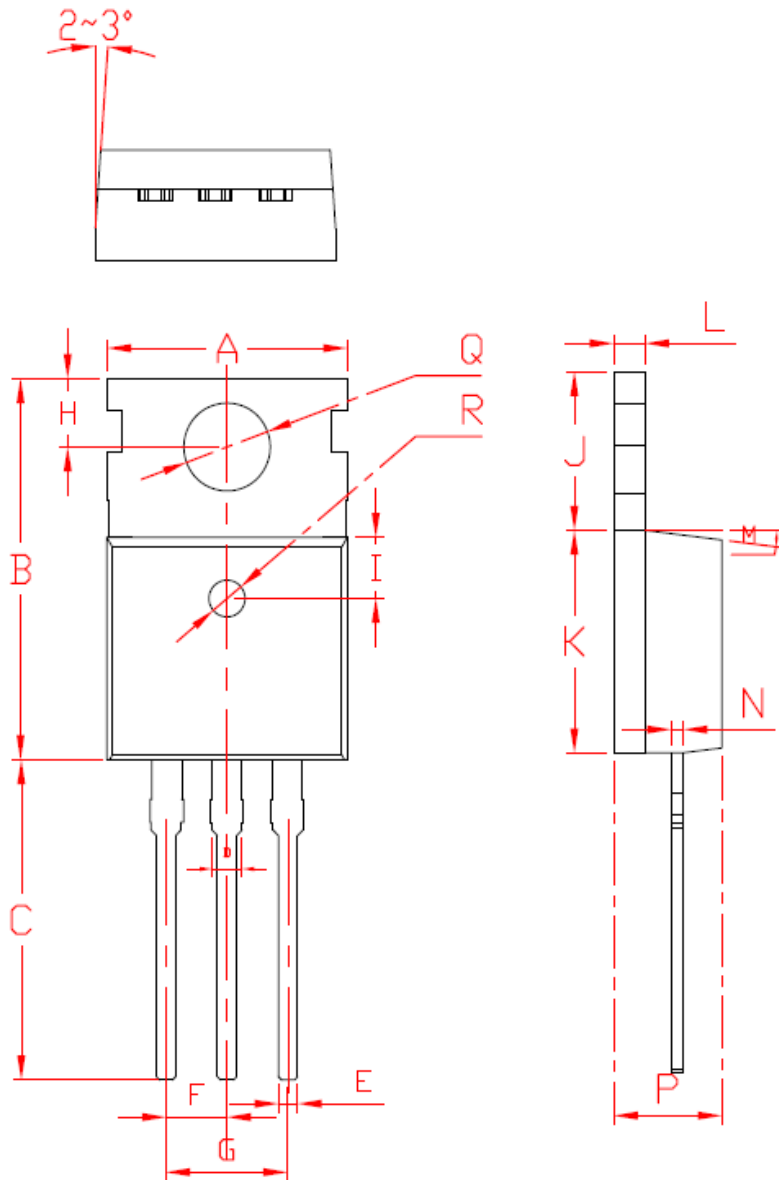


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TO220

1. Outline Dimension

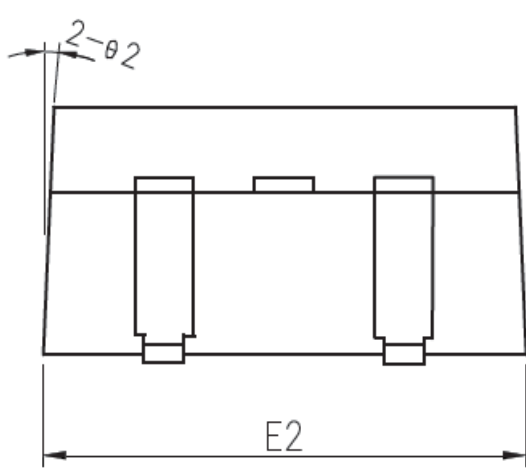
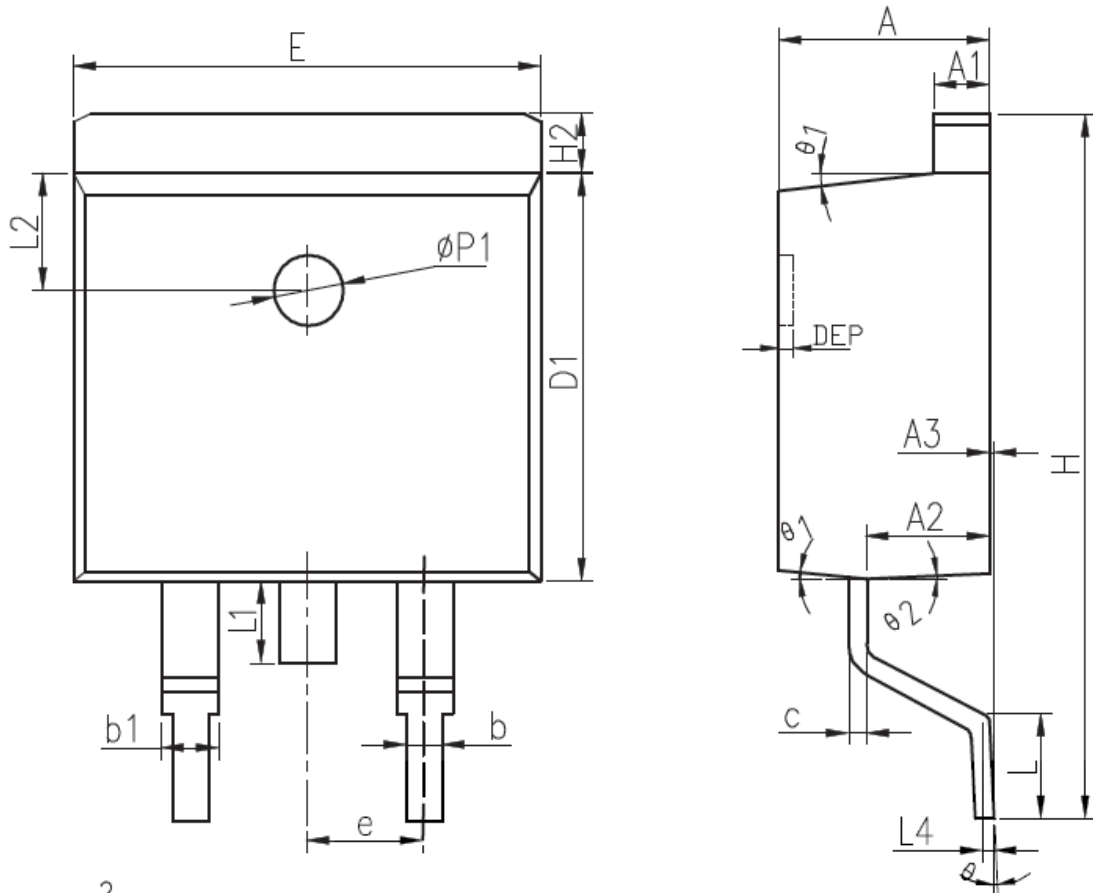


Symbol	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Min	9.8	15.4	12.75					2.73		6.4	9	1.29		0.48	2.35	4.4	3.5	1.4
Non	10	15.6	13.1	1.31	0.8	2.54	5.08	2.8	2.5	6.5	9.1	1.3	1.27	0.5	2.4	4.5	3.6	1.5
Max	10.2	15.8	13.17					2.87		6.6	9.2	1.32		0.56	2.5	4.7	3.63	1.6

UNIT : mm

TO263-2L

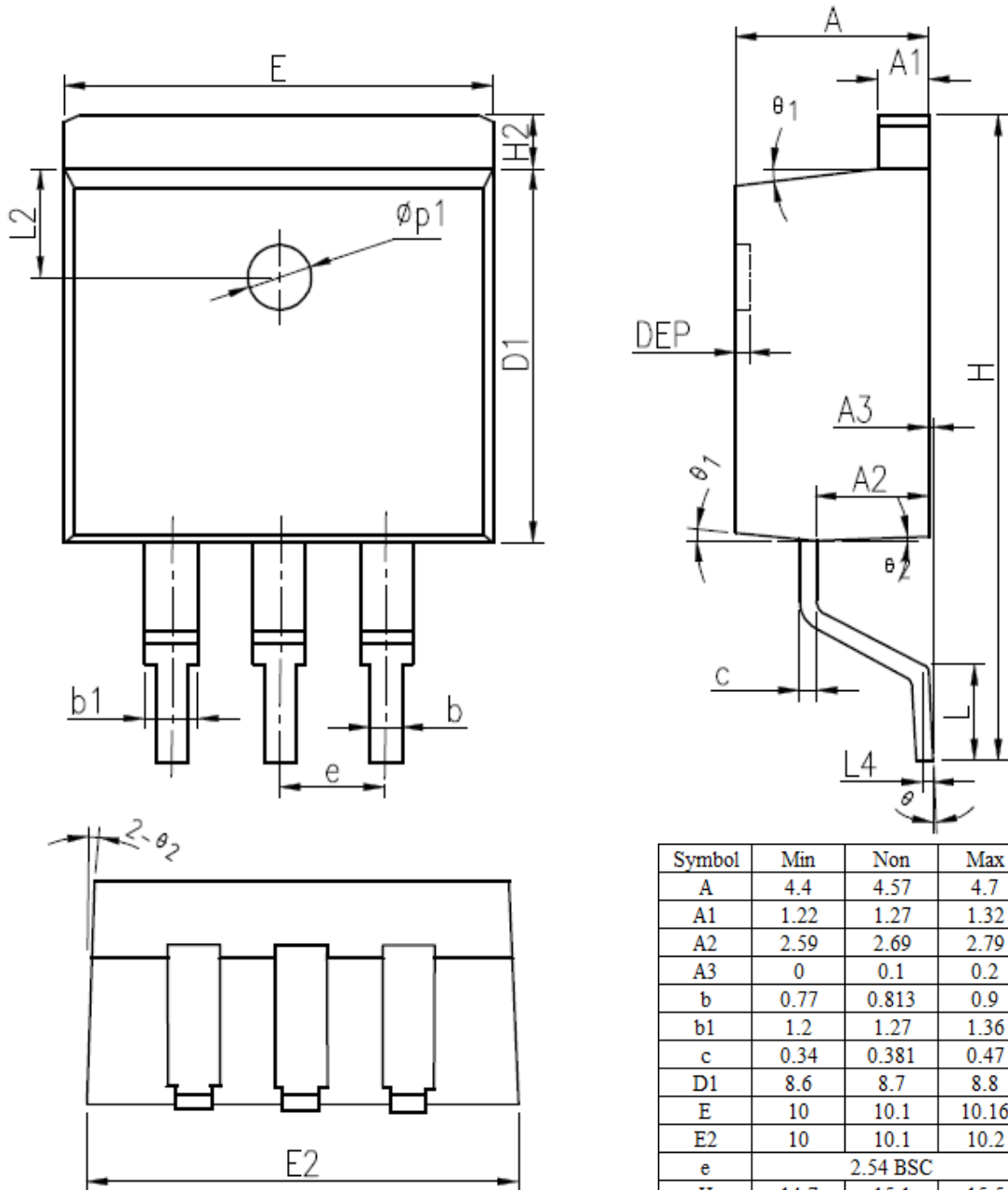
1. Outline Dimension



SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.22	1.27	1.32	0.048	0.050	0.052
A2	2.59	2.69	2.79	0.102	0.106	0.110
A3	0.00	0.10	0.20	0.000	0.004	0.008
b	0.77	0.813	0.90	0.030	0.032	0.035
b1	1.20	1.270	1.36	0.047	0.050	0.054
c	0.34	0.381	0.47	0.013	0.015	0.019
D1	8.60	8.70	8.80	0.339	0.343	0.346
E	10.00	10.16	10.26	0.394	0.400	0.404
E2	10.00	10.10	10.20	0.394	0.398	0.402
e	2.54 BSC			0.100 BSC		
H	14.70	15.10	15.50	0.579	0.594	0.610
H2	1.17	1.27	1.40	0.046	0.050	0.055
L	2.00	2.30	2.60	0.079	0.091	0.102
L1	1.45	1.55	1.70	0.057	0.061	0.067
L2	2.50 REF			0.098 REF		
L4	0.25 BSC			0.010 BSC		
theta	0°	5°	8°	0°	5°	8°
theta1	5°	7°	9°	5°	7°	9°
theta2	1°	3°	5°	1°	3°	5°
phi P1	1.40	1.50	1.60	0.055	0.059	0.063
DEP	0.05	0.10	0.20	0.002	0.004	0.008

TO263-3L

1. Outline Dimension



Symbol	Min	Non	Max
A	4.4	4.57	4.7
A1	1.22	1.27	1.32
A2	2.59	2.69	2.79
A3	0	0.1	0.2
b	0.77	0.813	0.9
b1	1.2	1.27	1.36
c	0.34	0.381	0.47
D1	8.6	8.7	8.8
E	10	10.1	10.16
E2	10	10.1	10.2
e	2.54 BSC		
H	14.7	15.1	15.5
H2	1.17	1.27	1.4
L	2	2.3	2.6
L2	2.5 REF		
L4	0.25 BSC		
θ	0	5	8
θ_1	5	7	9
θ_2	1	3	5
$\Phi P1$	1.4	1.5	1.6
DEP	0.05	0.1	0.2

UNIT : mm

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