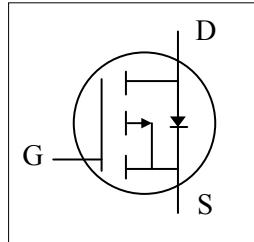




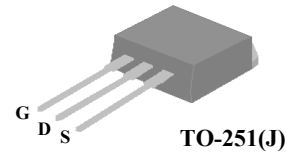
- ▼ Lower Gate Charge
- ▼ Simple Drive Requirement
- ▼ Fast Switching Characteristic
- ▼ RoHS Compliant & Halogen-Free



$BV_{DSS}$	-40V
$R_{DS(ON)}$	40m $\Omega$
$I_D$	-19.6A

### Description

AP4P040 series are from Advanced Power innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.



The straight lead version TO-251 package is widely preferred for all commercial-industrial through hole applications.

### Absolute Maximum Ratings@ $T_j=25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-40	V
$V_{GS}$	Gate-Source Voltage	+20	V
$I_D@T_C=25^\circ\text{C}$	Drain Current, $V_{GS}$ @ 10V	-19.6	A
$I_D@T_C=100^\circ\text{C}$	Drain Current, $V_{GS}$ @ 10V	-12.4	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	-80	A
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation	25	W
$P_D@T_A=25^\circ\text{C}$	Total Power Dissipation <sup>4</sup>	1.13	W
$E_{AS}$	Single Pulse Avalanche Energy <sup>3</sup>	16.2	mJ
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

### Thermal Data

Symbol	Parameter	Value	Units
$R_{thj-c}$	Maximum Thermal Resistance Junction-case	5	$^\circ\text{C}/\text{W}$
$R_{thj-a}$	Maximum Thermal Resistance, Junction-ambient	110	$^\circ\text{C}/\text{W}$



# AP4P040J

## Electrical Characteristics@T<sub>j</sub>=25°C(unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-40	-	-	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-10A	-	-	40	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-6A	-	-	60	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA	-1	-	-3	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-10A	-	17	-	S
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-32V, V <sub>GS</sub> =0V	-	-	-1	uA
I <sub>GSS</sub>	Gate-Source Leakage	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V	-	-	±0.1	uA
Q <sub>g</sub>	Total Gate Charge	I <sub>D</sub> =-6A	-	12	19.2	nC
Q <sub>gs</sub>	Gate-Source Charge	V <sub>DS</sub> =-32V	-	4.5	-	nC
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge	V <sub>GS</sub> =-4.5V	-	4.5	-	nC
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DS</sub> =-20V	-	10	-	ns
t <sub>r</sub>	Rise Time	I <sub>D</sub> =-10A	-	26	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time	R <sub>G</sub> =3.3Ω	-	37	-	ns
t <sub>f</sub>	Fall Time	V <sub>GS</sub> =-10V	-	38	-	ns
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V	-	1340	2144	pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =-20V	-	120	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	f=1.0MHz	-	80	-	pF
R <sub>g</sub>	Gate Resistance	f=1.0MHz	-	8.5	17	Ω

## Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V <sub>SD</sub>	Forward On Voltage <sup>2</sup>	I <sub>S</sub> =-10A, V <sub>GS</sub> =0V	-	-	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =-10A, V <sub>GS</sub> =0V,	-	12	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=-100A/μs	-	6	-	nC

### Notes:

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Starting T<sub>j</sub>=25°C , V<sub>DD</sub>=-30V , L=0.1mH , R<sub>G</sub>=25Ω , V<sub>GS</sub>=-10V
- 4.Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT, AUTOMOTIVE OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

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APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.

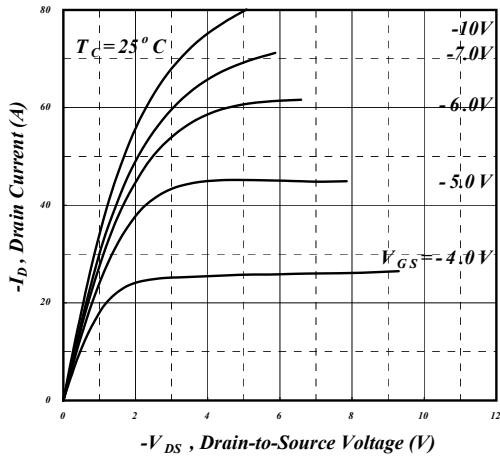


Fig 1. Typical Output Characteristics

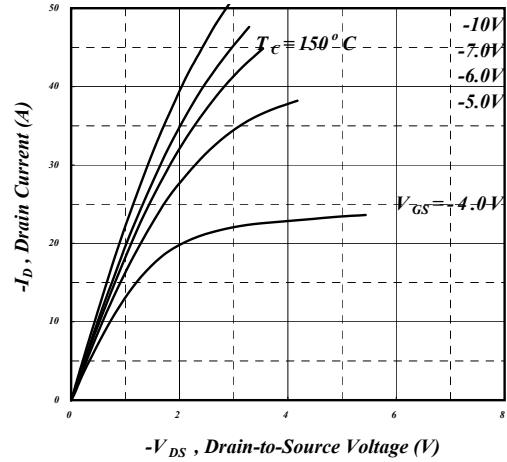


Fig 2. Typical Output Characteristics

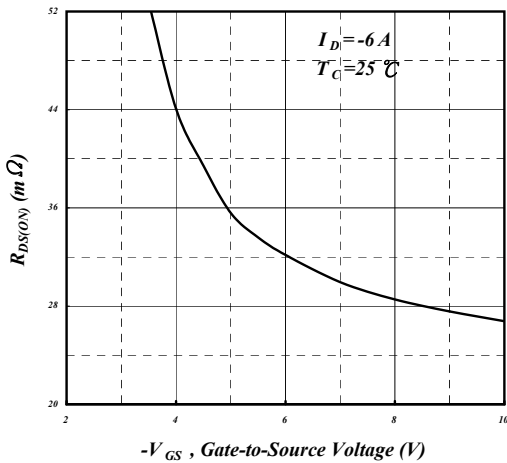


Fig 3. On-Resistance v.s. Gate Voltage

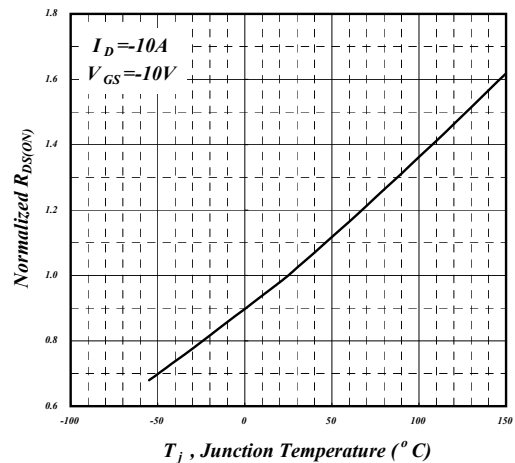


Fig 4. Normalized On-Resistance v.s. Junction Temperature

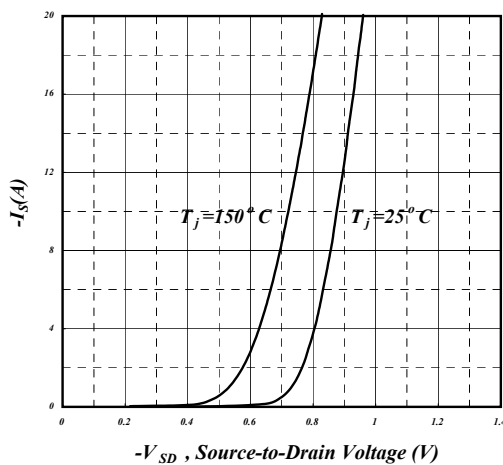


Fig 5. Forward Characteristic of Reverse Diode

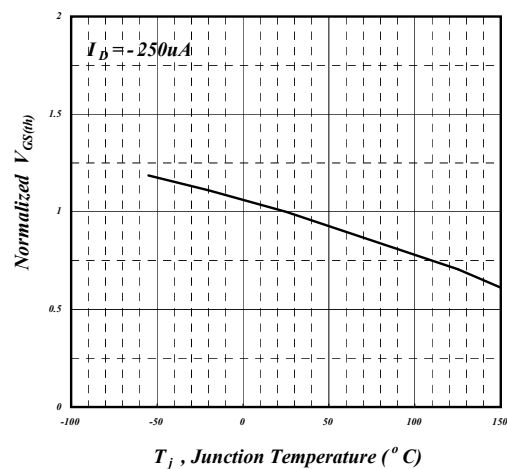


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

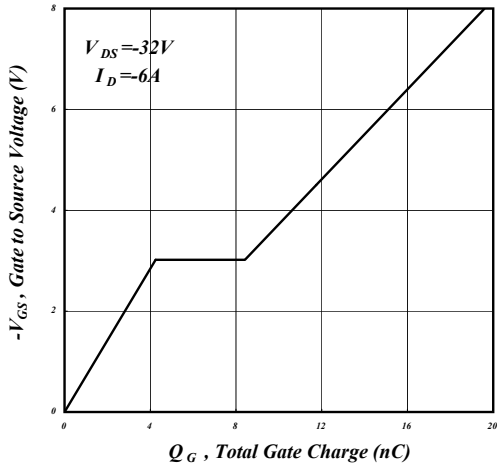


Fig 7. Gate Charge Characteristics

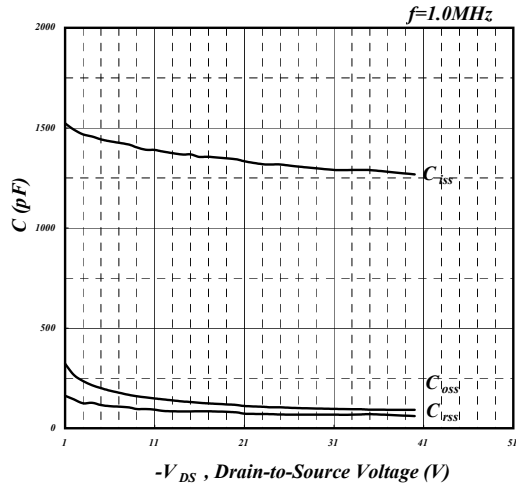


Fig 8. Typical Capacitance Characteristics

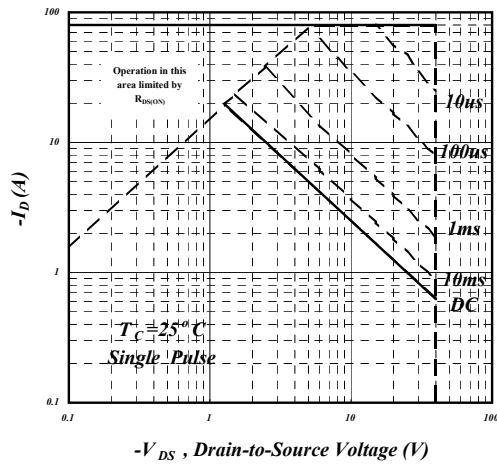


Fig 9. Maximum Safe Operating Area

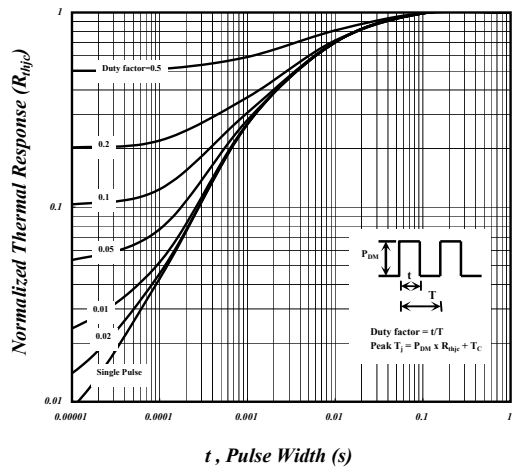


Fig 10. Effective Transient Thermal Impedance

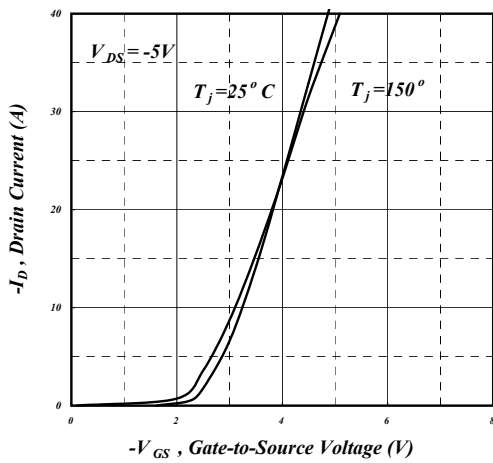


Fig 11. Transfer Characteristics

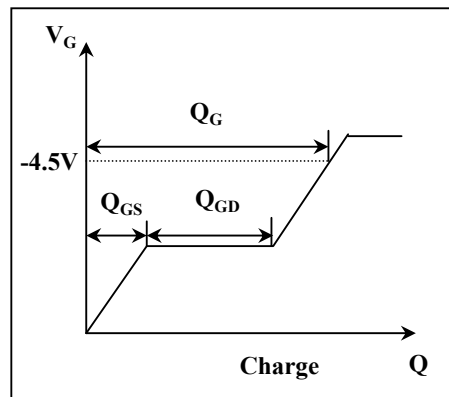


Fig 12. Gate Charge Waveform

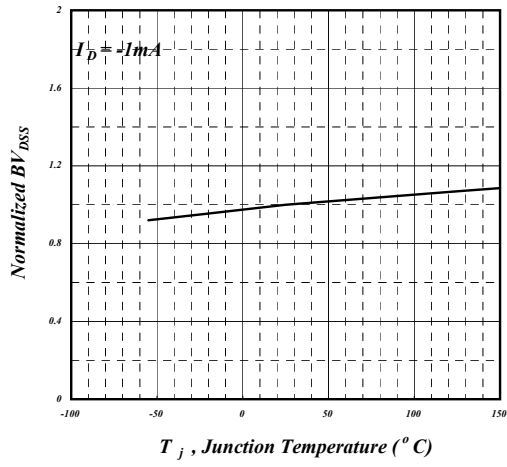


Fig 13. Normalized  $BV_{DSS}$  v.s. Junction Temperature

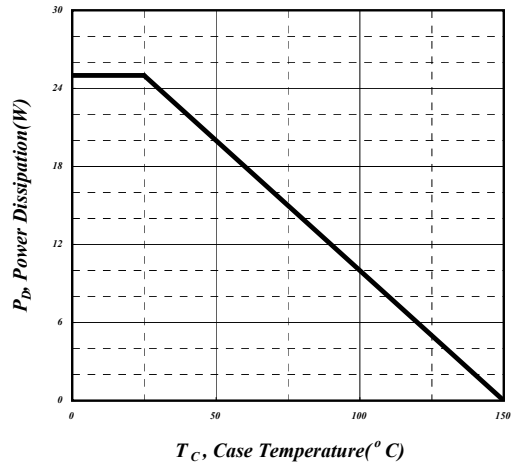


Fig 14. Total Power Dissipation

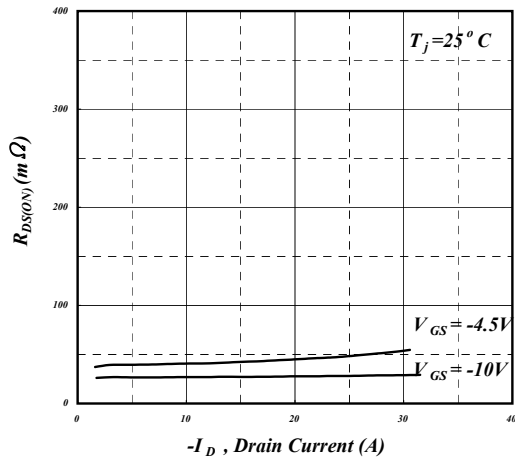


Fig 15. Typ. Drain-Source on State Resistance

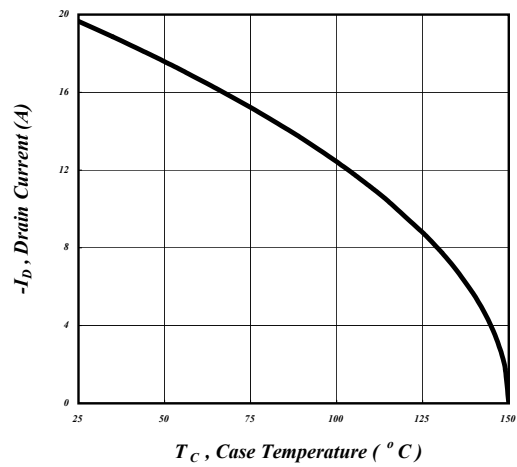


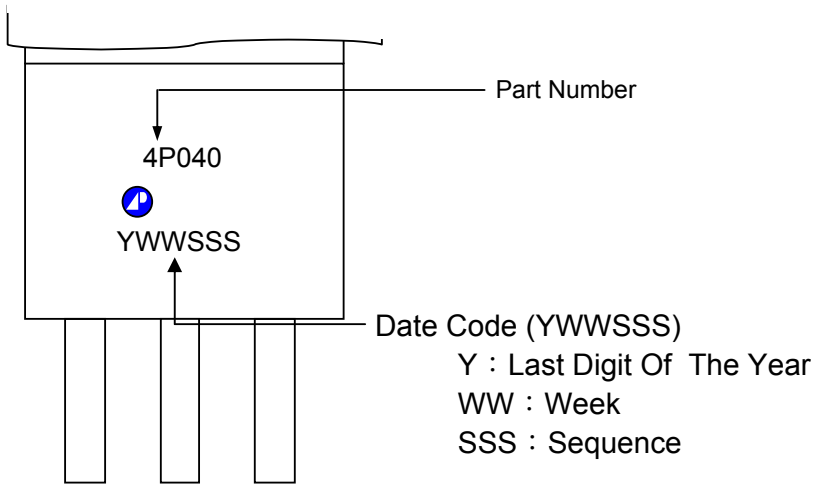
Fig 16. Drain Current v.s. Case Temperature



**AP4P040J**

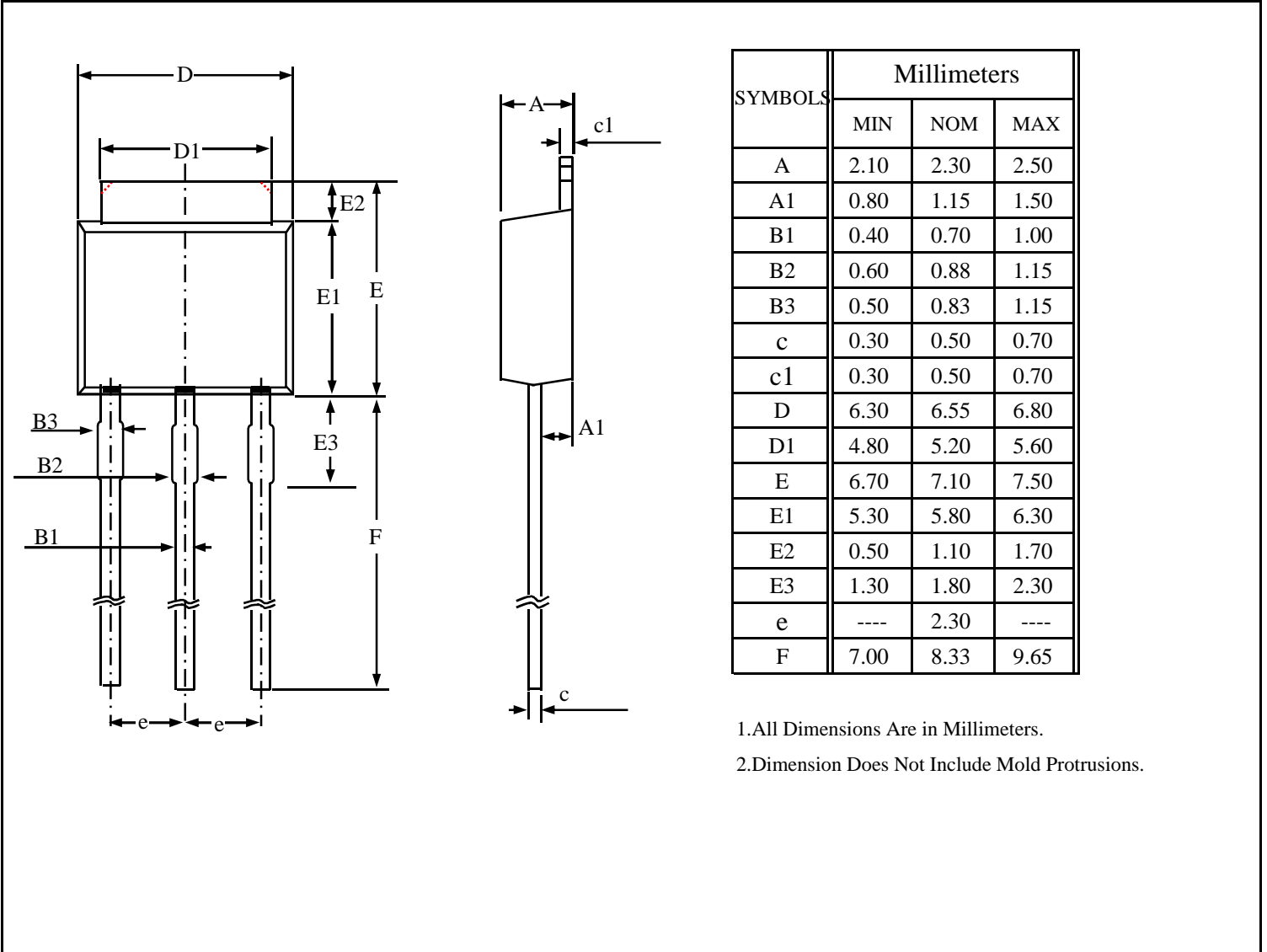
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**MARKING INFORMATION**





## Package Outline : TO-251



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	2.10	2.30	2.50
A1	0.80	1.15	1.50
B1	0.40	0.70	1.00
B2	0.60	0.88	1.15
B3	0.50	0.83	1.15
c	0.30	0.50	0.70
c1	0.30	0.50	0.70
D	6.30	6.55	6.80
D1	4.80	5.20	5.60
E	6.70	7.10	7.50
E1	5.30	5.80	6.30
E2	0.50	1.10	1.70
E3	1.30	1.80	2.30
e	----	2.30	----
F	7.00	8.33	9.65

1.All Dimensions Are in Millimeters.

2.Dimension Does Not Include Mold Protrusions.



**TO-251 FOOTPRINT :**

