MPSA60M940,MPSP60M940,MPSU60M940, MPSD60M940

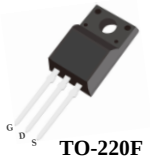
FEATURES

- BV_{DSS}=600V, I_D=4A
- $R_{DS(on)}$:0.94Ω(Max)@V_{GS}=10V
- Very low FOM $R_{DS(on)}$×Q_g
- 100% avalanche tested
- RoHS compliant

APPLICATIONS

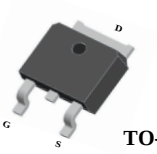
- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

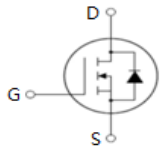
RoHS


TO-220F


TO-220


TO-251


TO-252



Device Marking and Package Information

Ordering code	Package	Marking
MPSA60M940	TO-220F	MP60M940
MPSP60M940	TO-220	MP60M940
MPSU60M940	TO-251	MP60M940
MPSD60M940	TO-252	MP60M940

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter	Symbol	Value		Unit
		TO-220F	TO-220, TO-251,TO-252	
Drain-Source Voltage (V_{GS} = 0V)	V_{DSS}	600		V
Continuous Drain Current	I_D	4		A
Pulsed Drain Current (note1)	I_{DM}	8		A
Gate-Source Voltage	V_{GSS}	±30		V
Single Pulse Avalanche Energy (note2)	E_{AS}	120		mJ
Repetitive Avalanche Current (note1)	I_{AR}	2		A
Repetitive Avalanche Energy (note1)	E_{AR}	0.1		mJ
MOSFET dv/dt ruggedness, V_{DS}=0…400 V	dv/dt	50		V/ns
Reverse diode dv/dt, V_{DS}=0…400 V, I_{SD}≤I_D	dv/dt	50		V/ns
Power Dissipation (T_C = 25ºC)	P_D	23	28	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150		ºC

Thermal Resistance

Parameter	Symbol	Value		Unit
		TO-220F	TO-220, TO-251,TO-252	
Thermal Resistance, Junction-to-Case	R_{thJC}	5.5	4.4	K/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	80	62	

Specifications T_J = 25ºC, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Value**			**Unit**
			Min.	**Typ.**	**Max.**	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	600	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 600V, V_{GS} = 0V, T_J = 25ºC	--	--	1	μA
		V_{DS} = 600V, V_{GS} = 0V, T_J = 150ºC	--	--	100	
Gate-Source Leakage	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 0.25mA	2.5	--	4.5	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D = 2A	--	0.84	0.94	Ω
Gate Resistance	R_G	f = 1.0MHz, open drain	--	14	--	Ω
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 100V, f = 1.0MHz	--	306	--	pF
Output Capacitance	C_{oss}		--	12	--	
Reverse Transfer Capacitance	C_{rss}		--	2	--	
Total Gate Charge	Q_g	V_{DD} = 400V, I_D = 4A, V_{GS} = 10V	--	8.8	--	nC
Gate-Source Charge	Q_{gs}		--	1.5	--	
Gate-Drain Charge	Q_{gd}		--	4.2	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 400V, I_D = 4A, V_{GS} = 10V, R_G = 25Ω	--	36	--	ns
Turn-on Rise Time	t_r		--	27	--	
Turn-off Delay Time	$t_{d(off)}$		--	80	--	
Turn-off Fall Time	t_f		--	25	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	4	A
Pulsed Diode Forward Current	I_{SM}		--	--	8	
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 4A, V_{GS} = 0V	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	V_R = 400V, I_F = 4A, di_F/dt = 100A/μs	--	240	--	ns
Reverse Recovery Charge	Q_{rr}		--	1.1	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	9	--	A

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 2A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics(T_J=25℃)

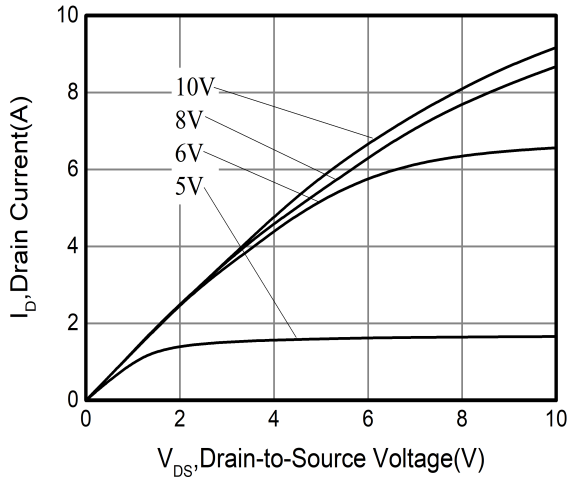


Figure 2. Transfer Characteristics

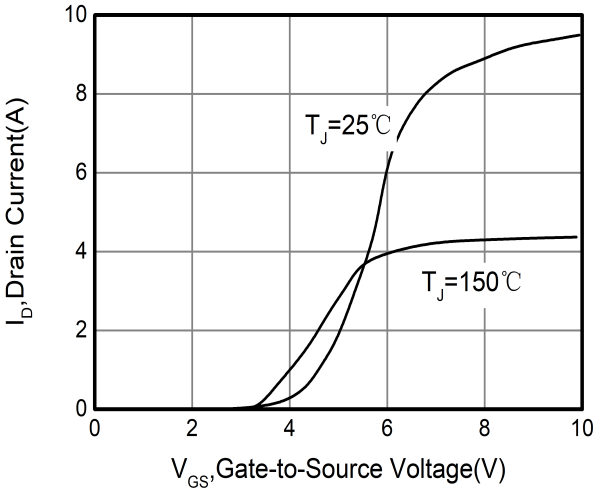


Figure 3. On-Resistance vs Drain Current

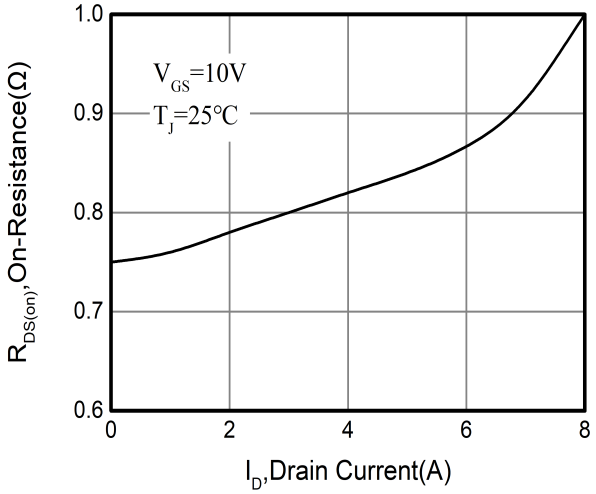


Figure 4. Capacitance

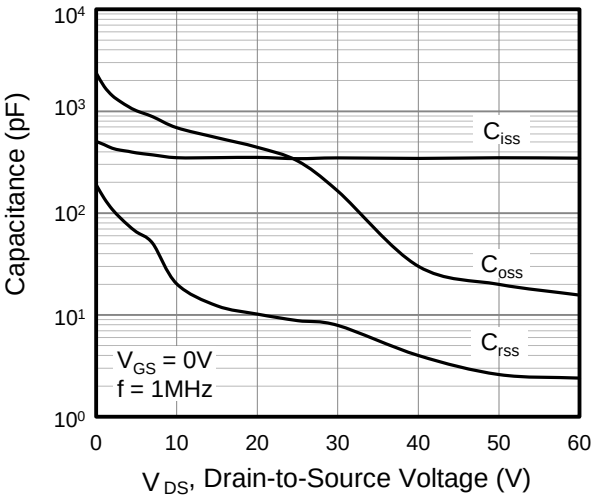


Figure 5. Gate Charge

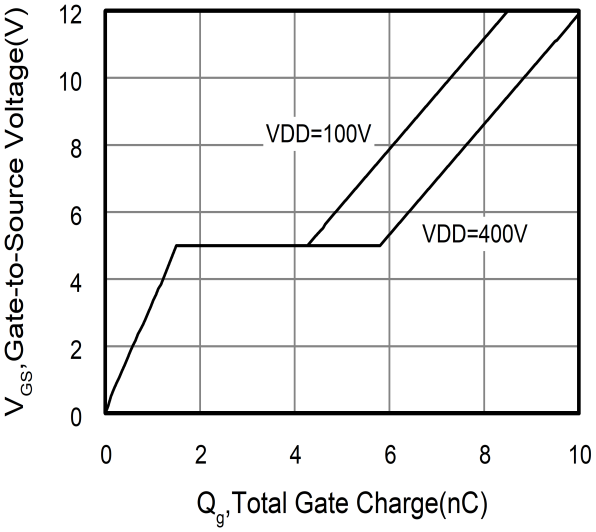
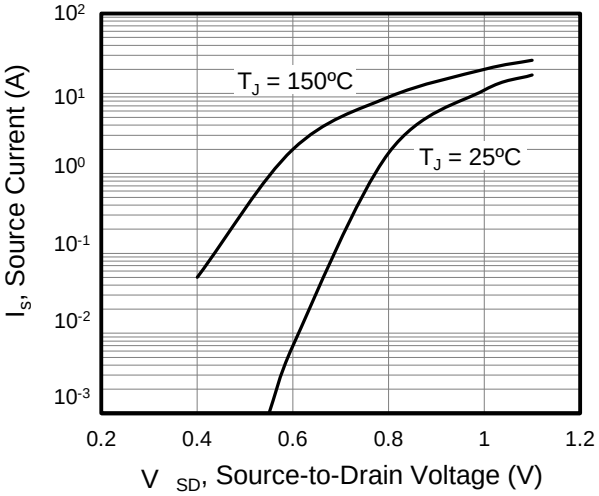


Figure 6. Body Diode Forward Voltage



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. On-Resistance vs. Junction Temperature

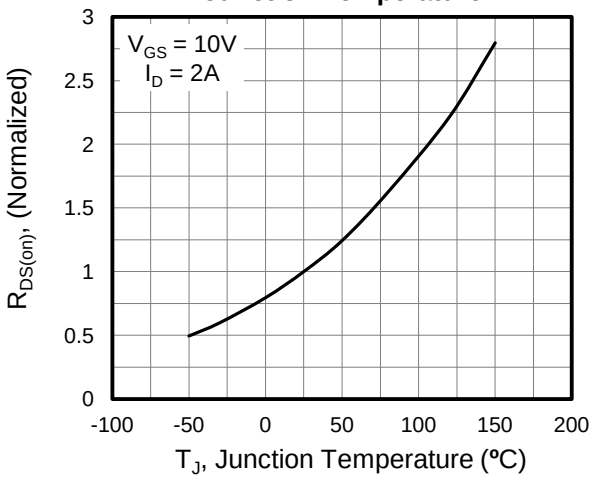


Figure 8. Threshold Voltage vs. Junction Temperature

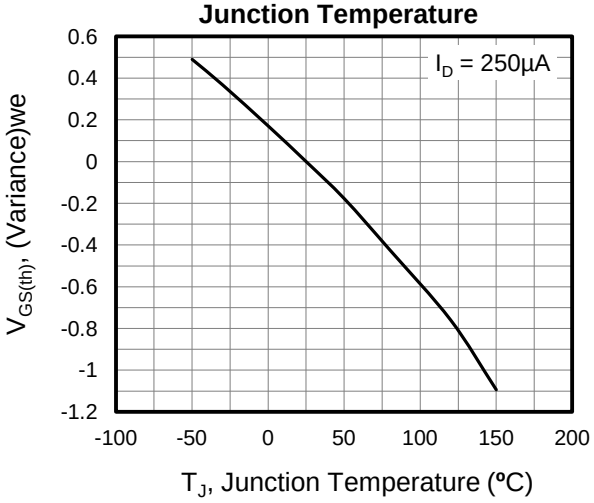


Figure 9. Transient Thermal Impedance TO-251,TO-252 ,TO-220

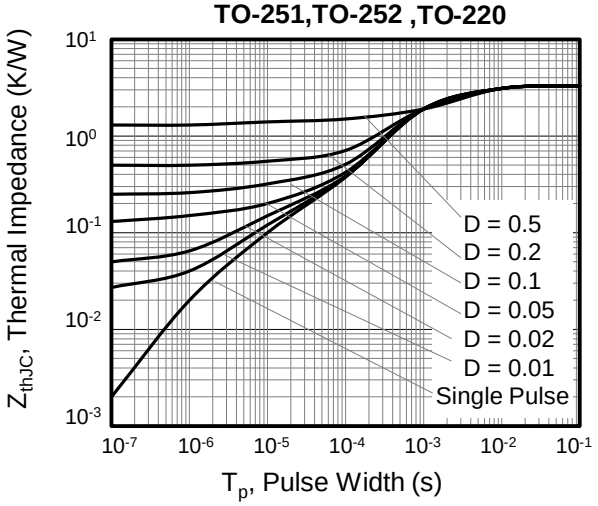


Figure 10. Transient Thermal Impedance TO-220F

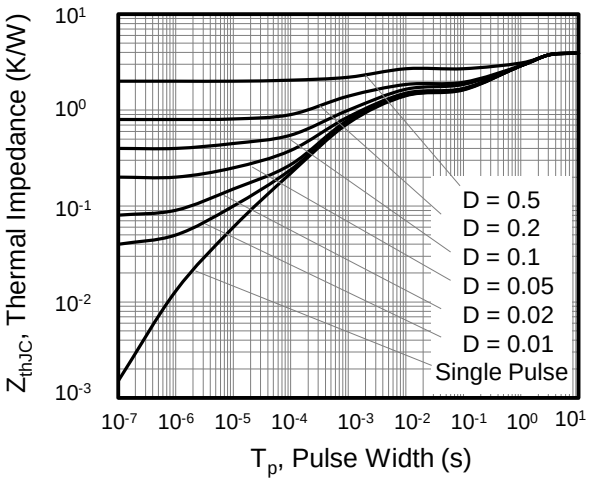


Figure A：Gate Charge Test Circuit and Waveform

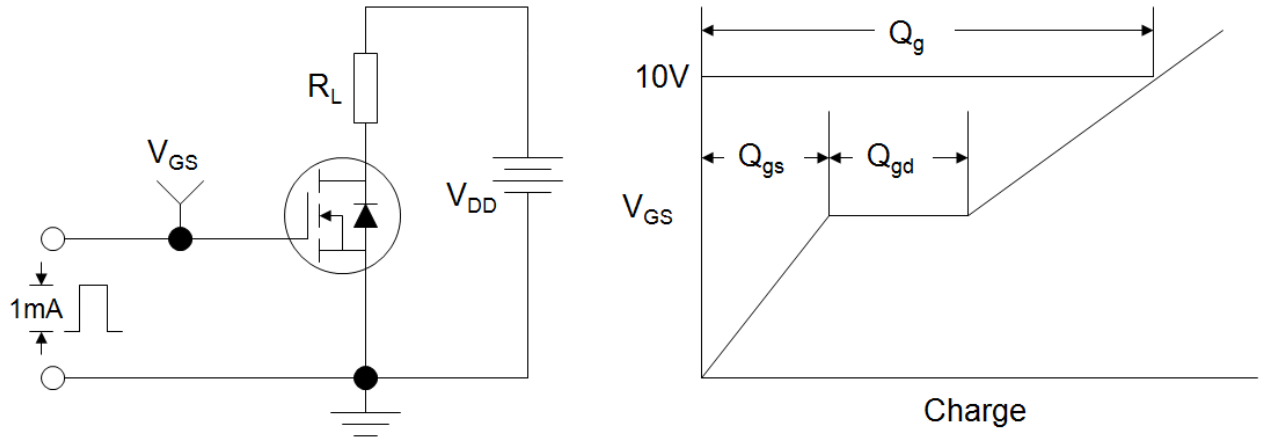


Figure B：Resistive Switching Test Circuit and Waveform

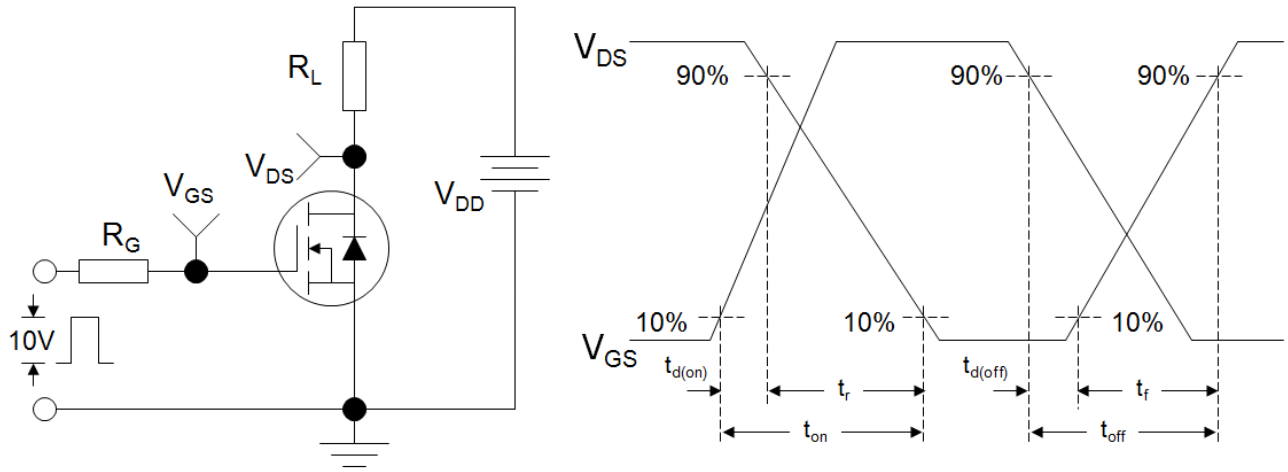
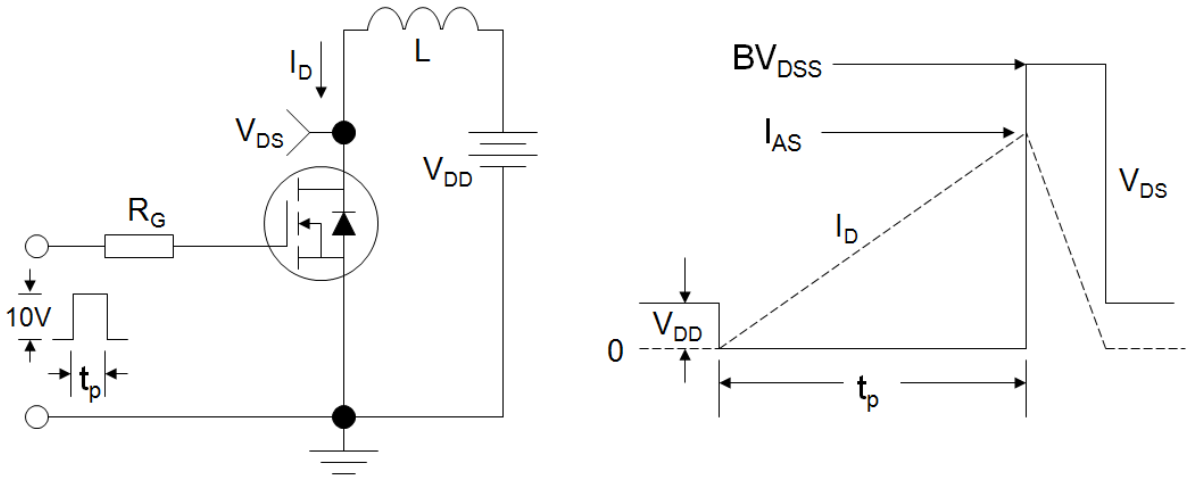
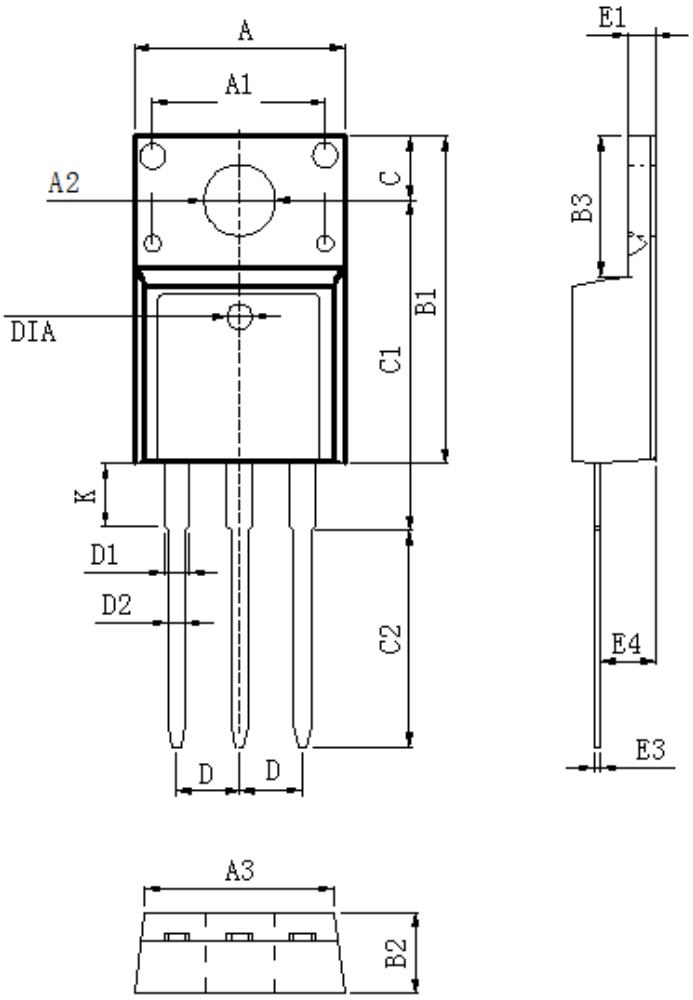


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



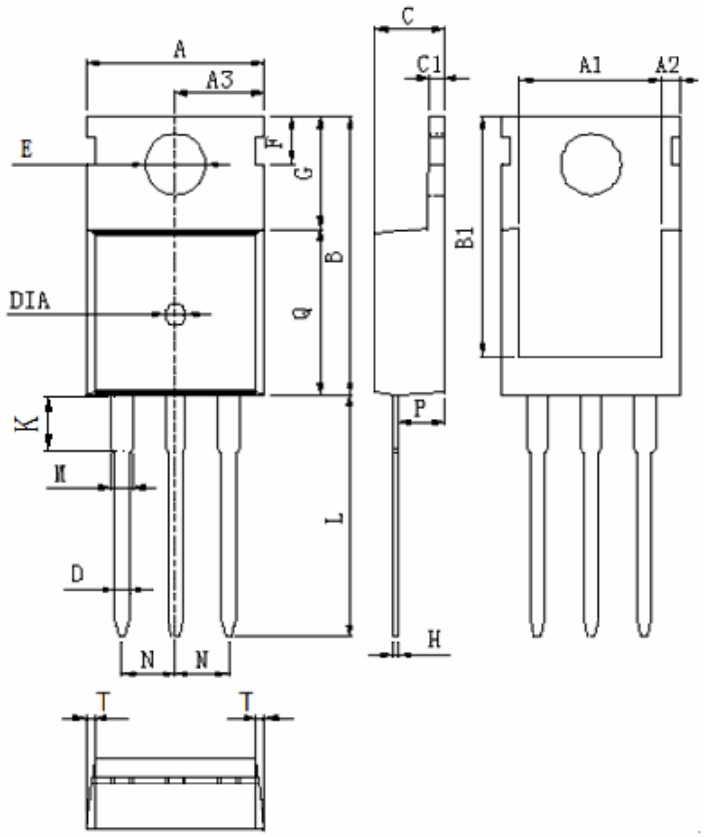
TO-220F



DIM	MILLIMETERS
A	10.16±0.3
A1	7.00±0.1
A2	3.3±0.2
A3	9.5±0.2
B1	15.87±0.3
B2	4.7±0.2
B3	6.68±0.4
C	3.3±0.2
C1	12.57±0.3
C2	10.02±0.5
D	2.54±0.05
D1	1.28±0.2
D2	0.8±0.1
K	3.1±0.3
E1	2.54±0.1
E3	0.5±0.1
E4	2.76±0.2
DIA	⊙1.5(deep 0.2)

Unit :mm

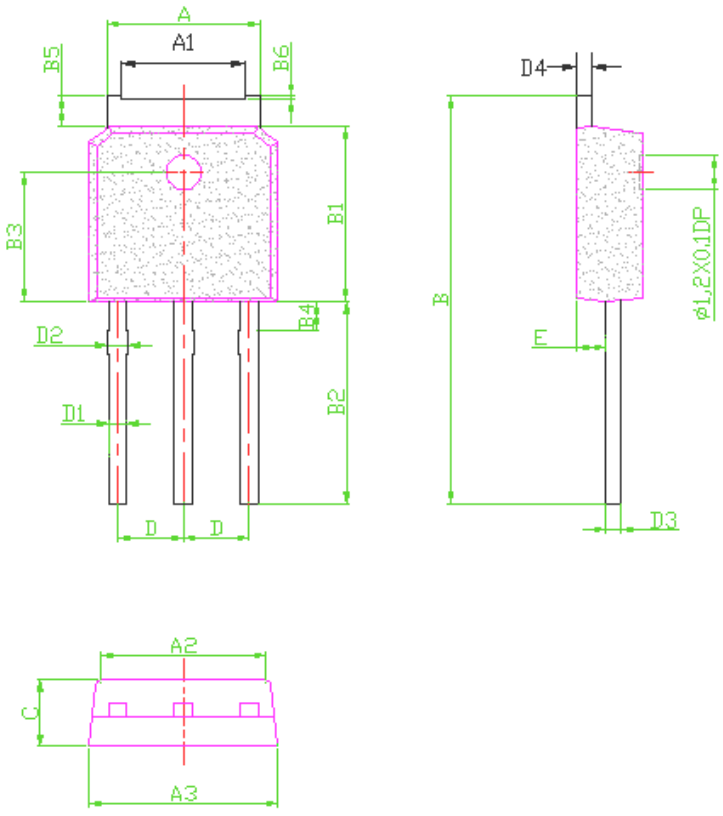
TO-220



DIM	MILLIMETERS
A	10.0±0.3
A1	8.64±0.2
A2	1.15±0.1
A3	5.0±0.2
B	15.8±0.4
B1	13.2±0.3
C	4.56±0.1
C1	1.3±0.2
D	0.8±0.2
E	3.6±0.2
F	2.95±0.3
G	6.5±0.3
H	0.5±0.1
K	3.1±0.2
L	13.2±0.4
M	1.25±0.1
N	2.54±0.1
P	2.4±0.3
Q	9.0±0.3
T	W:0.35
DIA	⊙1.5(deep 0.2)

Unit :mm

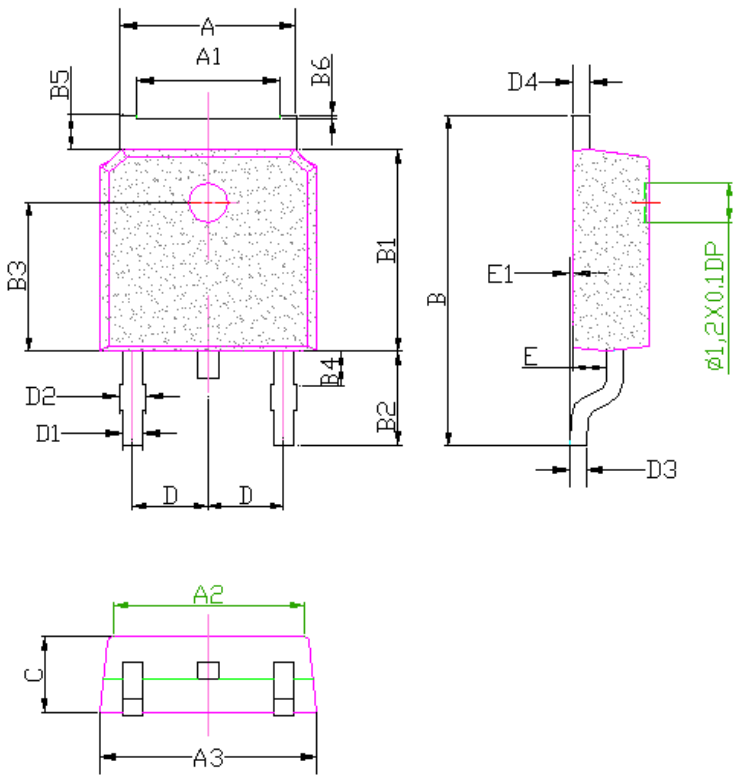
TO-251



DIM	MILLIMETERS
A	5.33±0.2
A1	4.33±0.2
A2	5.80±0.1
A3	6.6±0.2
B	14.15±0.5
B1	6.1±0.3
B2	7.0±0.5
B3	4.5±0.15
B4	1.0±0.1
B5	1.05±0.1
B6	0.1±0.05
C	2.3±0.2
D	2.286±0.05
D1	0.60±0.1
D2	0.72±0.12
D3	0.5±0.08
D4	0.5±0.08
E	1.01±0.2
DIA	⊙1.2(deep 0.1)

Unit :mm

TO-252



DIM	MILLIMETERS
A	5.33±0.2
A1	4.33±0.2
A2	5.80±0.1
A3	6.6±0.2
B	10±0.5
B1	6.1±0.3
B2	2.85±0.5
B3	4.5±0.15
B4	1.0±0.1
B5	1.05±0.1
B6	0.1±0.05
C	2.3±0.15
D	2.286±0.05
D1	0.60±0.1
D2	0.72±0.12
D3	0.5±0.08
D4	0.5±0.08
E	1.01±0.15
E1	0.1±0.05
DIA	⊙1.2(deep 0.1)

Unit :mm