

General Description

The Sanrise SRC65R072B is a high voltage power MOSFET, fabricated using advanced super junction technology. The resulting device has extremely low on resistance, low gate charge and fast switching time, making it especially suitable for applications which require superior power density and outstanding efficiency.

The SRC65R072B break down voltage is 650V and it has a high rugged avalanche characteristics. The SRC65R072B is available in TO-247, TO-263-2, TO-220C and TO-220F packages.

Features

- Ultra Low $R_{DS(ON)} = 72m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 110nC$ typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

- Telecom Power
- EV Charger
- High Power Application

Symbol

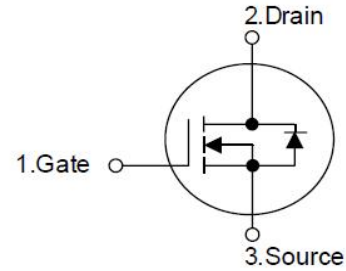


Figure 1 Symbol of SRC65R072B

Package Type

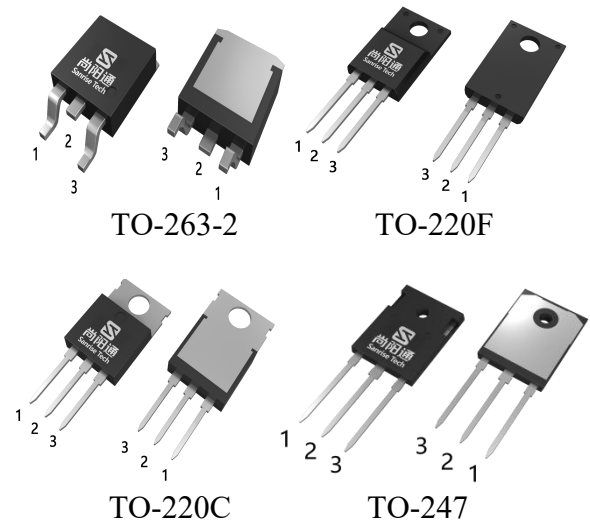


Figure 2 Package Types of SRC65R072B

Ordering Information

Circuit Type		SRC65R072B□□-□		E: Lead Free	
Package				G: Green	
T: TO-247				Blank: Tube	
S2: TO-263-2				TR: Tape & Reel	
TF: TO-220F					
TC: TO-220C					

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-247	SRC65R072BT-E	SRC65R072BT-G	SRC65R072BTE	SRC65R072BTG	Tube
TO-263-2	SRC65R072BS2TR-E	SRC65R072BS2TR-G	SRC65R072BS2E	SRC65R072BS2G	Tape & Reel
TO-220F	SRC65R072BTF-E	SRC65R072BTF-G	SRC65R072BTFE	SRC65R072BTFG	Tube
TO-220C	SRC65R072BTC-E	SRC65R072BTC-G	SRC65R072BTCE	SRC65R072BTCG	Tube

Absolute Maximum Ratings^{Note 1}

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage (static)		V_{GS}	±20	V
Gate-Source Voltage (dynamic), AC(f>1Hz)		V_{GS}	±30	V
Power Dissipation($T_C=25^{\circ}\text{C}$, TO-263-2, TO-220C, TO-247)		P_{tot}	357	W
Power Dissipation($T_C=25^{\circ}\text{C}$, TO-220F)		P_{tot}	35.7	W
Continuous Drain Current	$T_C=25^{\circ}\text{C}$	I_D	48	A
	$T_C=100^{\circ}\text{C}$		30	
	$T_C=125^{\circ}\text{C}$		21.5	
Pulsed Drain Current (Note 2)		I_{DM}	144	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	125	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.6	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	5.0	A
Continuous Diode Forward Current		I_S	48	A
Diode Pulse Current		$I_{S,PULSE}$	144	A
MOSFET dv/dt Ruggedness, $V_{DS} \leq 480\text{V}$		dv/dt	80	V/ns
Reverse Diode dv/dt, $V_{DS} \leq 480\text{V}$, $I_{SD} \leq I_D$		dv/dt	50	V/ns
Operating Junction Temperature		T_J	150	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	-55 to 150	$^{\circ}\text{C}$
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	$^{\circ}\text{C}$

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. $I_{AS}=5\text{A}$, $V_{DD}=60\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-220F	R_{thJC}			3.5	$^{\circ}\text{C}/\text{W}$
	TO-220C				0.35	
	TO-247				0.35	
	TO-263				0.35	
Thermal resistance, Junction-to-Ambient	TO-220F	R_{thJA}			70	$^{\circ}\text{C}/\text{W}$
	TO-220C				58	
	TO-247				58	
	TO-263				58	

Electrical Characteristics

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

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250uA	650			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	uA
Gate-Body Leakage Current	Forward	I _{GSSF}	V _{GS} =20V, V _{DS} =0V			100	nA
	Reverse	I _{GSSR}	V _{GS} =-20V, V _{DS} =0V			-100	
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =1.0mA	3.0	4.0	5.0	V
Static Drain-Source On-Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =24A		57	72	mΩ
Gate Resistance		R _G	f=1MHz, Open Drain		1.0		Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		4.3		nF
Output Capacitance		C _{OSS}			2.0		nF
Reverse Transfer Capacitance		C _{RSS}			50		pF
Effective output capacitance, energy related ^{NOTE5}		C _{O(er)}	V _{GS} =0V, V _{DS} =0...400V		94		pF
Effective output capacitance, time related ^{NOTE6}		C _{O(tr)}			550		
Turn-on Delay Time		t _{d(on)}	V _{DD} =400V, I _D =24A R _G =3.3Ω, V _{GS} =10V		16		ns
Rise Time		t _r			6.0		
Turn-off Delay Time		t _{d(off)}			98		
Fall Time		t _f			4.0		
Gate Charge Characteristics							
Gate to Source Charge		Q _{gs}	V _{DD} =480V, I _D =24A V _{GS} =0 to 10V		28.1		nC
Gate to Drain Charge		Q _{gd}			56.0		
Gate Charge Total		Q _g			110		
Gate Plateau Voltage		V _{plateau}			6.5		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =24A		0.9	1.1	V
Reverse Recovery Time		t _{rr}	V _R =400V, I _F =24A dI _F /dt=100A/us		141		ns
Reverse Recovery Charge		Q _{rr}			0.83		uC
Peak Reverse Recovery Current		I _{rrm}			11.8		A

Note:

5. $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 480V

6. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 480 V

Typical Performance Characteristics

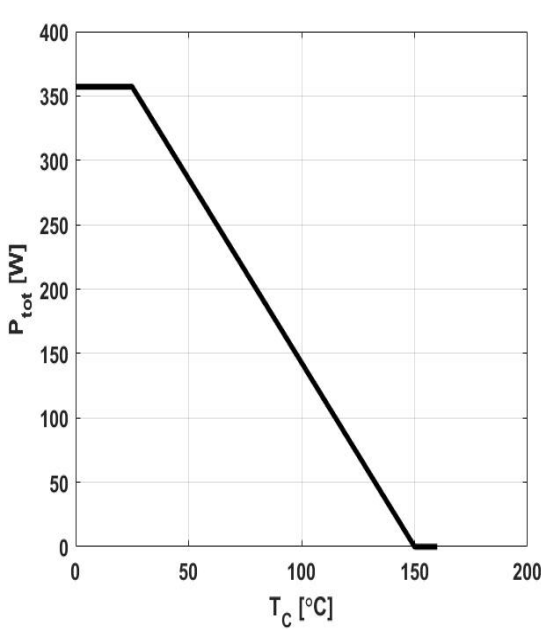
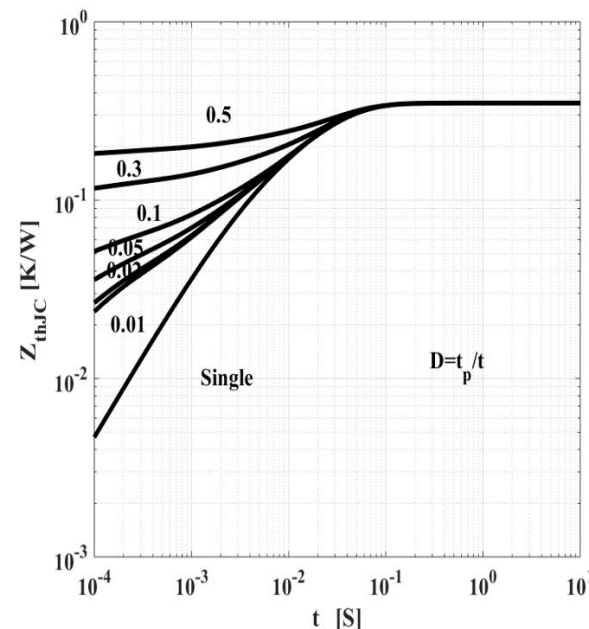
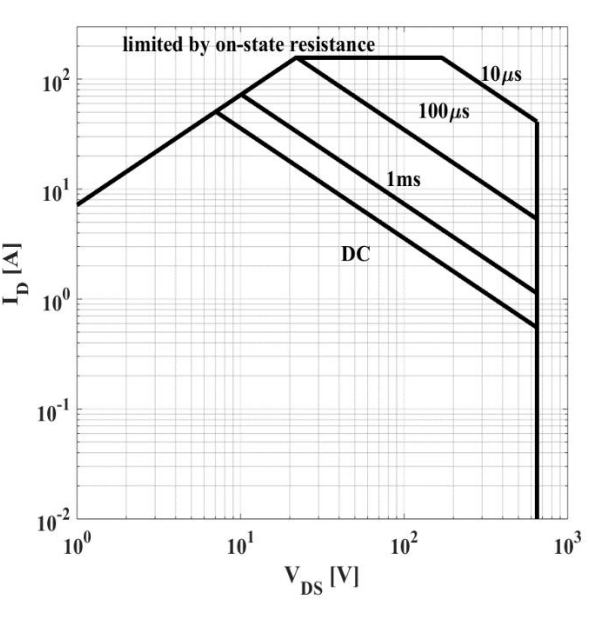
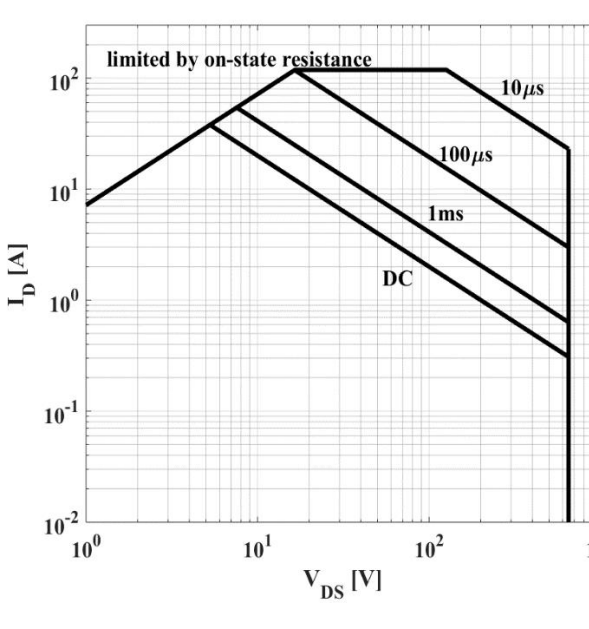
Figure 3: Power Dissipation  $P_{tot} = f(T_c)$; TO-247	Figure 4: Max. Transient Thermal Impedance  $Z_{thJC} = f(t_p)$; parameter: $D = t_p / t_p$; TO-247
Figure 5: Safe Operating Area  $I_D = f(V_{DS})$; $T_c = 25^\circ\text{C}$; $V_{GS} > 7\text{V}$; parameter t_p	Figure 6: Safe Operating Area  $I_D = f(V_{DS})$; $T_c = 80^\circ\text{C}$; $V_{GS} > 7\text{V}$; parameter t_p

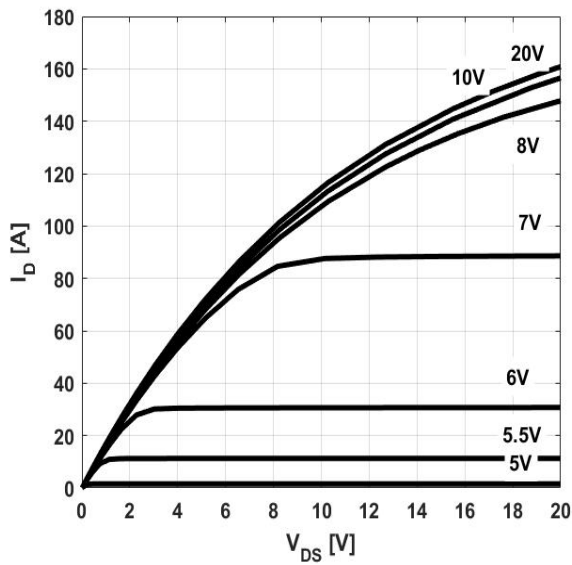
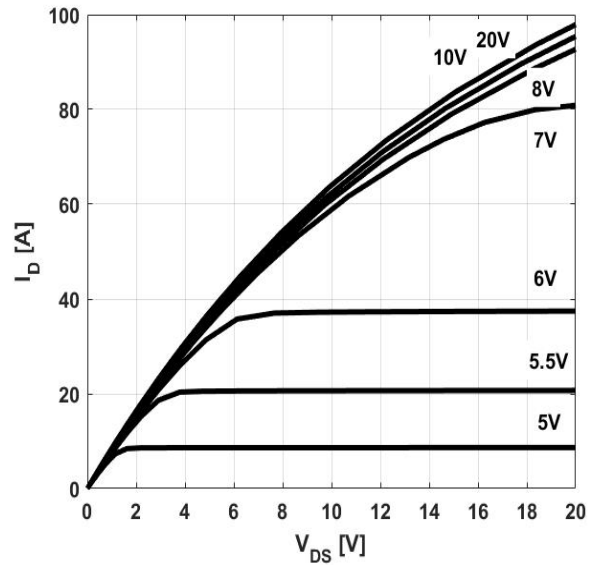
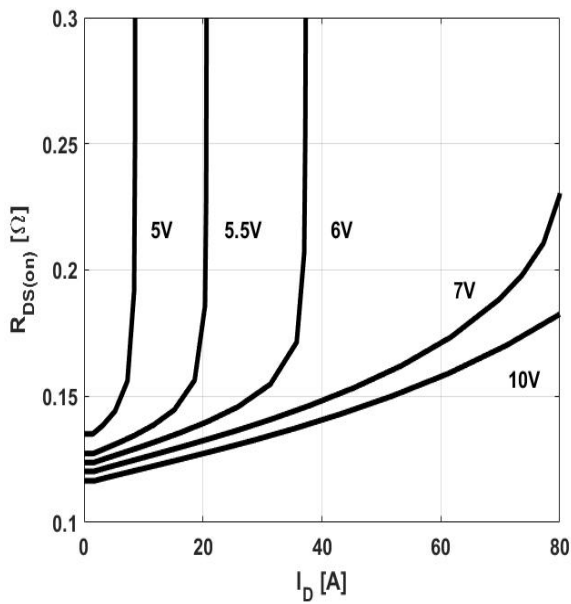
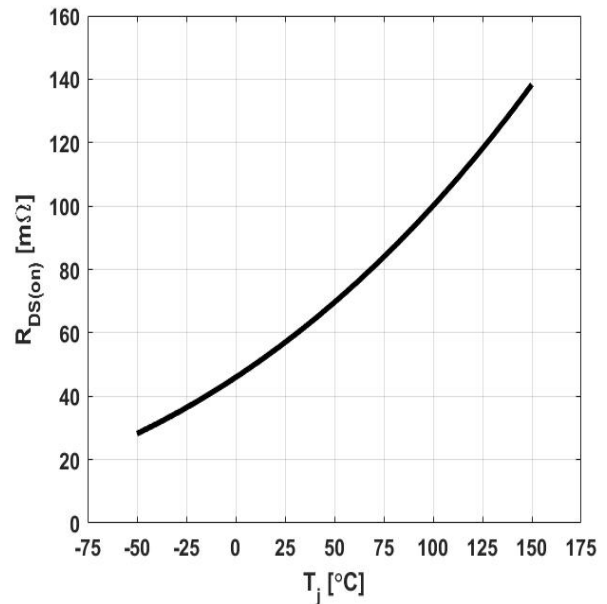
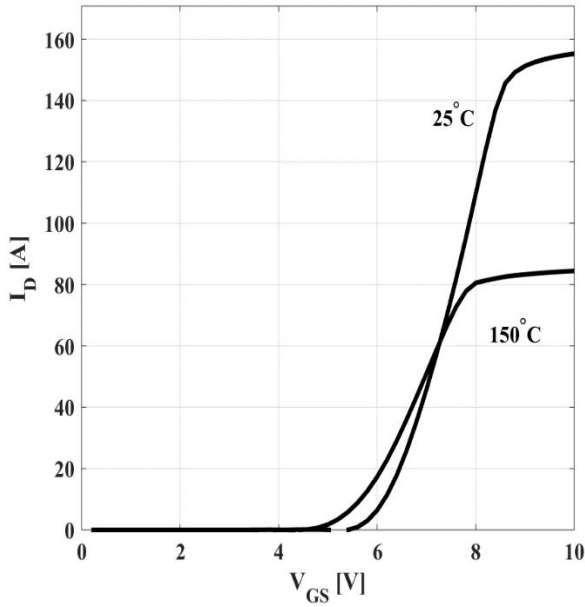
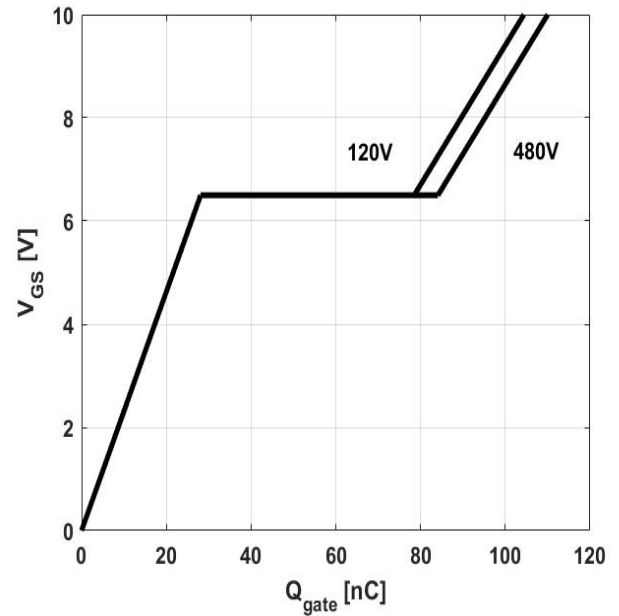
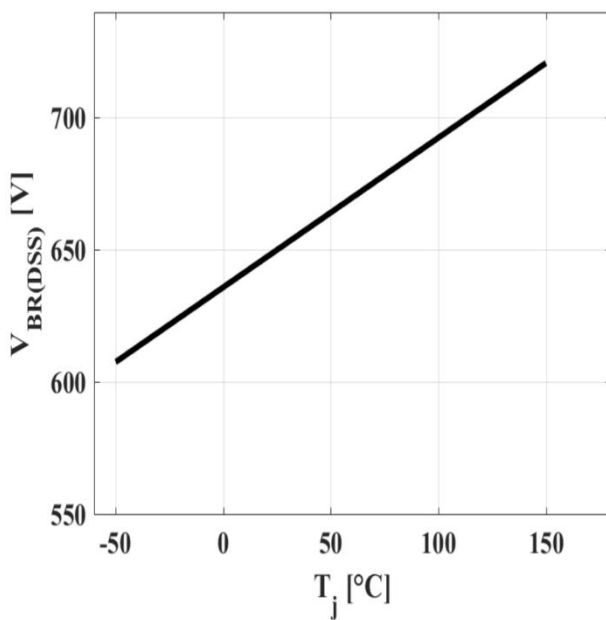
Figure 7: Typ. Output Characteristics

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 8: Typ. Output Characteristics

 $I_D = f(V_{DS}); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 9: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)} = f(I_D); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$
Figure 10: Typ. Drain-Source On-State Resistance

 $R_{DS(ON)} = f(T_j); I_D = 24\text{A}; V_{GS} = 10\text{V}$

Figure 11: Typ. Transfer Characteristics


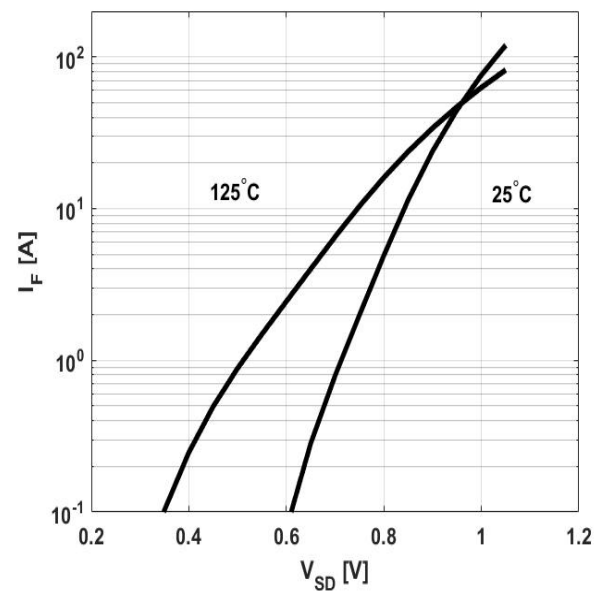
$$I_D = f(V_{GS}); V_{DS} = 20V$$

Figure 12: Typ. Gate Charge


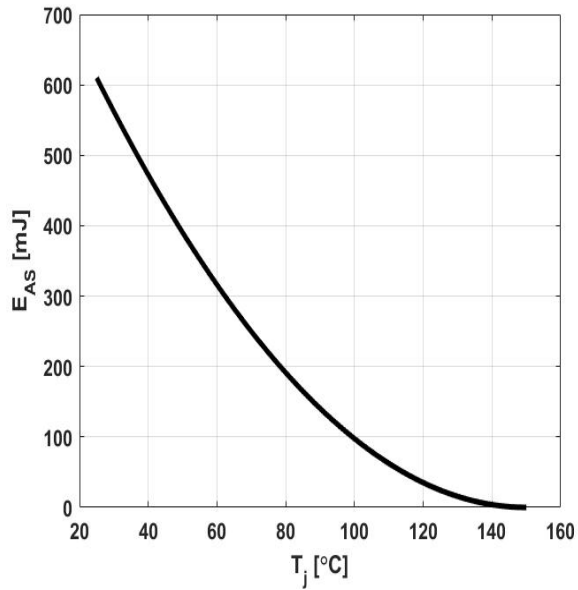
$$V_{GS} = f(Q_{gate}), I_D = 24A \text{ pulsed}$$

Figure 13: Drain-Source Breakdown Voltage


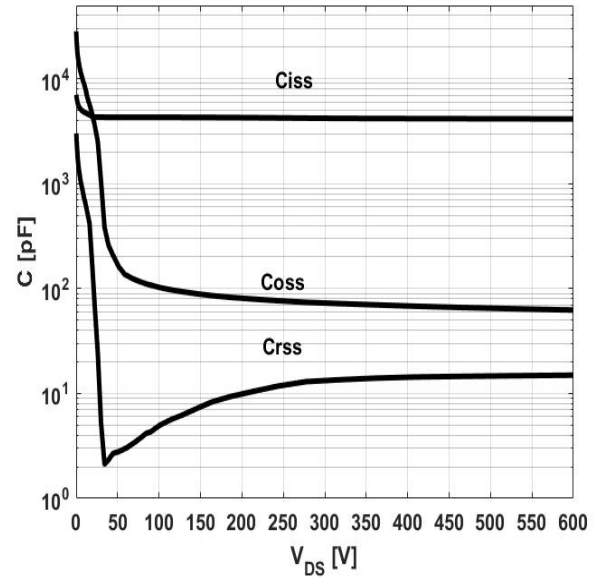
$$V_{BR(DSS)} = f(T_j); I_D = 1mA$$

Figure 14: Forward Characteristics of Reverse Diode


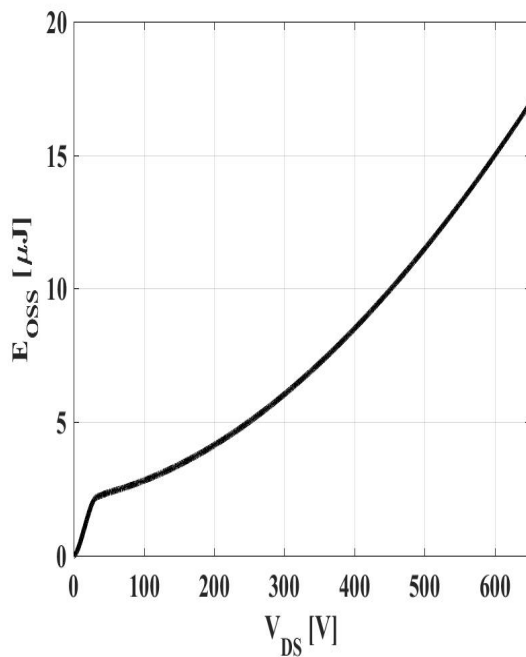
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

Figure 15: Avalanche Energy


$$E_{AS}=f(T_j); I_D=4.8A; V_{DD}=60V$$

Figure 16: Typ. Capacitances


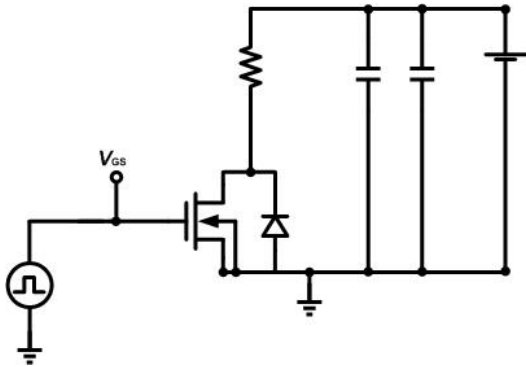
$$C=f(V_{DS}); V_{GS}=0; f=1MHz$$

Figure 17: Coss Stored Energy


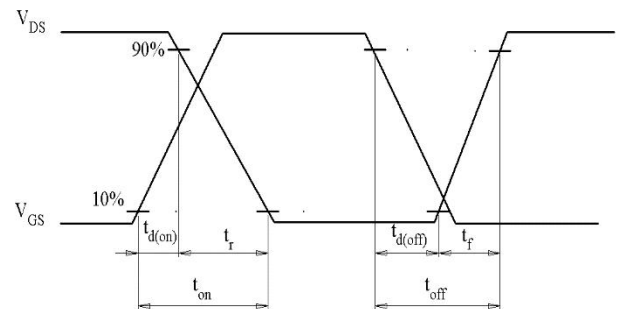
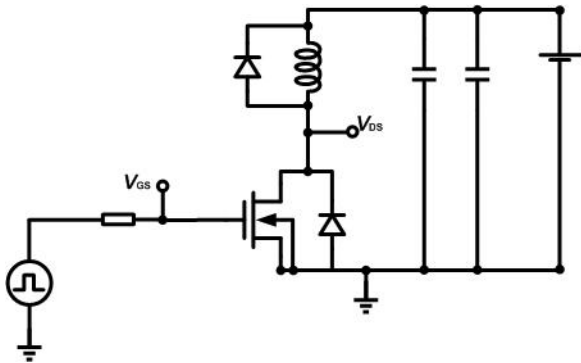
$$E_{OSS}=f(V_{DS})$$

Test Circuits

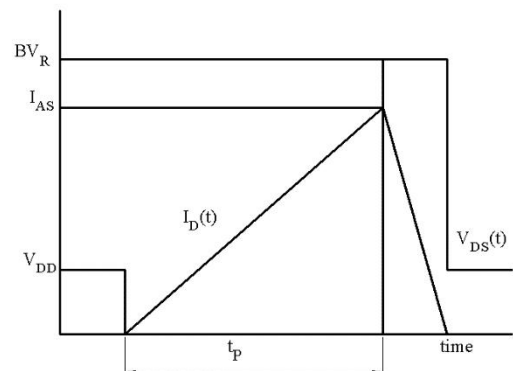
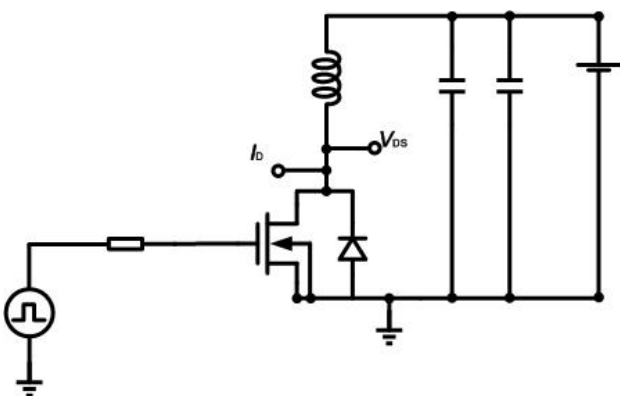
1. Gate Charge Test Circuit & Waveform



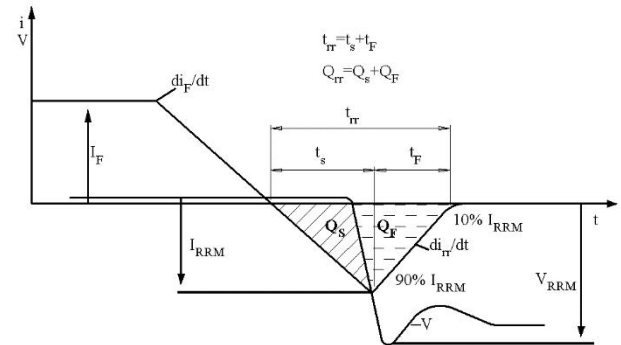
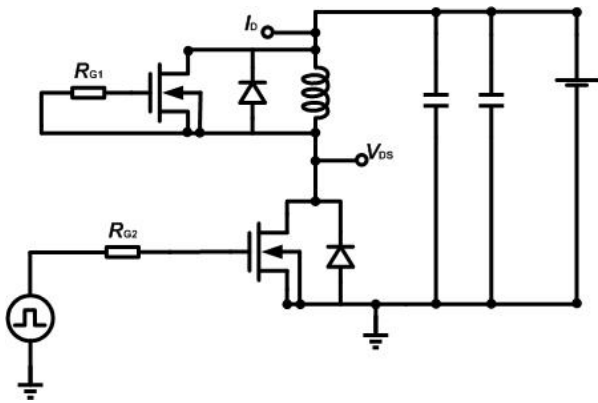
2. Switch Time Test Circuit

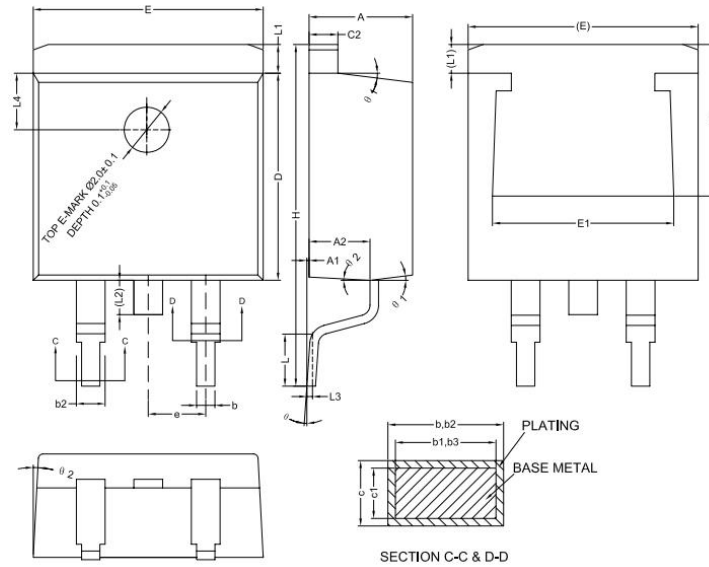


3. Unclaimed Inductive Switching Test Circuit & Waveforms

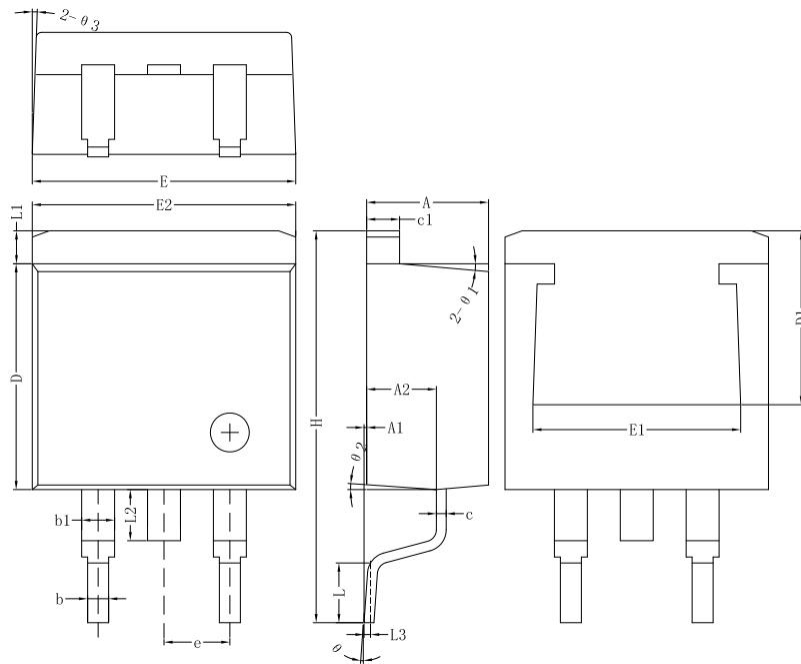


4. Test Circuit and Waveform for Diode Characteristics

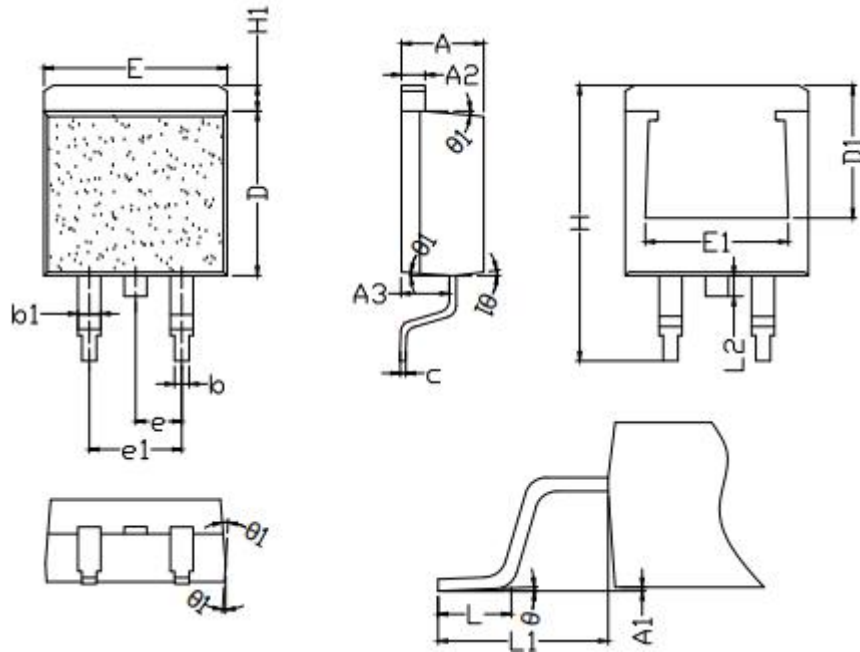


Mechanical Dimensions
TO-263-2 (Package 1)
Unit: mm


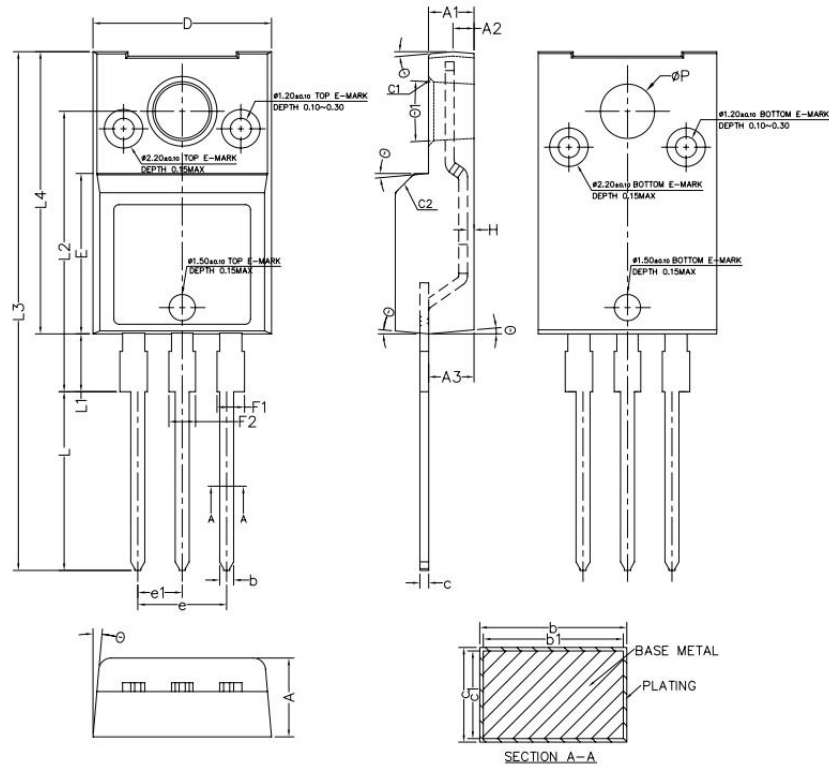
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.40	4.57	4.70
A1	0.00	0.10	0.25
A2	2.59	2.69	2.79
b	0.77	-	0.90
b1	0.76	0.81	0.86
b2	1.23	-	1.36
b3	1.22	1.27	1.32
c	0.34	-	0.47
c1	0.33	0.38	0.43
c2	1.22	-	1.32
D	9.05	9.15	9.25
D1	6.60	-	-
E	10.06	10.16	10.26
E1	7.80	-	8.20
e	2.54(BSC)		
H	14.70	15.10	15.50
L	2.00	2.30	2.60
L1	1.17	1.27	1.40
L2	-	-	1.75
L3	0.25BSC		
L4	2.00REF		
θ	0°	-	8°
θ1	5°	7°	9°
θ2	1°	3°	5°

Mechanical Dimensions
TO-263-2 (Package 2)
Unit: mm


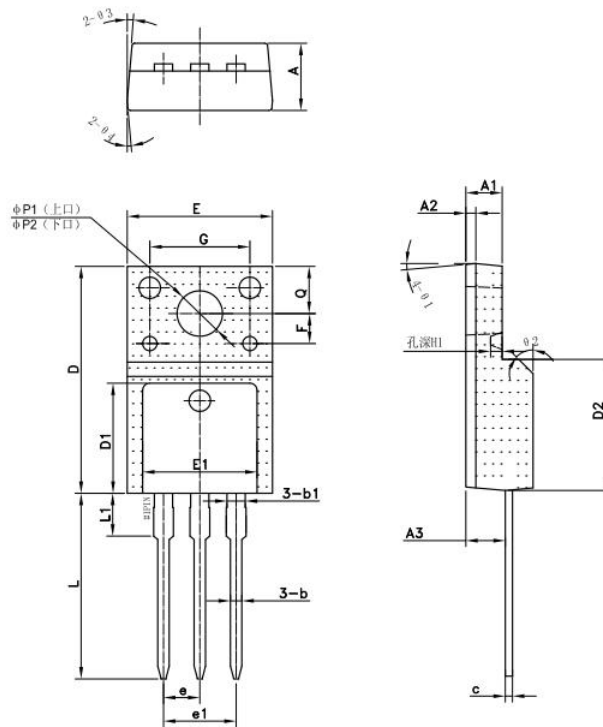
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.55	4.70	4.85
A1	0.00	0.10	0.25
A2	2.59	2.69	2.89
b	0.71	0.81	0.96
b1	-	1.27	-
c	0.36	0.38	0.61
c1	1.17	1.27	1.37
D	8.55	8.70	8.85
D1	-	7.2	-
E	10.01	10.16	10.31
E1	-	7.80	-
E2	9.98	10.08	10.18
e	-	2.54	-
H	14.70	15.10	15.50
L	2.00	2.30	2.70
L1	1.17	1.27	1.40
L2	-	-	2.20
L3	-	0.25BSC	-
θ	0°	-	8°
θ1		5°	
θ2		4°	
θ3		4°	

Mechanical Dimensions
TO-263-2 (Package 3)
Unit: mm


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.42	4.52	4.62
A1	0.00	0.10	0.25
A2	1.24	1.27	1.32
A3	2.50	2.60	2.70
b	0.77	0.81	0.84
b1	1.23	1.28	1.41
c	0.33	0.38	0.43
D	8.80	8.95	9.10
D1	7.2REF		
E	9.92	10.07	10.22
E1	7.85REF		
e	2.50	2.54	2.58
e1	5.08REF		
H	14.80	15.10	15.30
H1	1.12	1.28	1.42
L	2.10	2.23	2.36
L1	4.55	4.75	4.95
L2	1.10	1.30	1.50
θ	0°	2°	5°
θ1	3°	-	5°

Mechanical Dimensions
TO-220F (Package 1)
Unit: mm


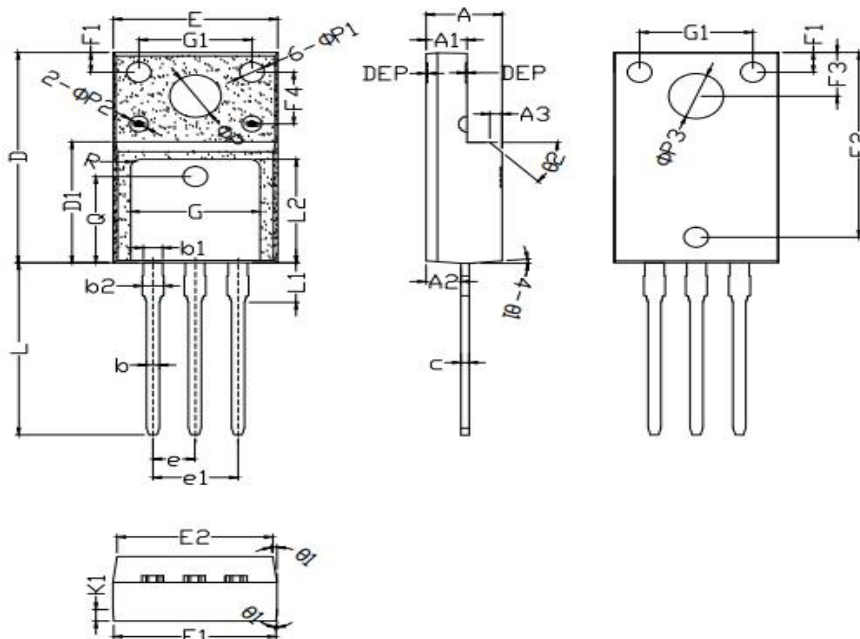
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.40	4.50	4.60
A1	2.50	2.60	2.70
A2	1.10	1.20	1.30
A3	2.49	2.59	2.69
b	0.76	-	0.89
b1	0.75	0.80	0.85
c	0.46	-	0.59
c1	0.45	0.50	0.55
C1	0.20	0.30	0.40
C2	1.00	1.10	1.20
D	10.10	10.20	10.30
E	9.05	9.15	9.25
e	4.98	5.08	5.18
e1	2.44	2.54	2.64
F1	1.22	-	1.60
F2	1.17	-	1.55
H	0.32	0.37	0.42
L	10.00	10.20	10.40
L1	3.15	3.30	3.45
L2	15.85	16.00	16.15
L3	29.30	29.60	29.90
L4	16.00	16.10	16.20
P	3.00	3.10	3.20
θ	3°	5°	7°
θ1	4°	6°	8°

Mechanical Dimensions
TO-220F (Package 2)
Unit: mm


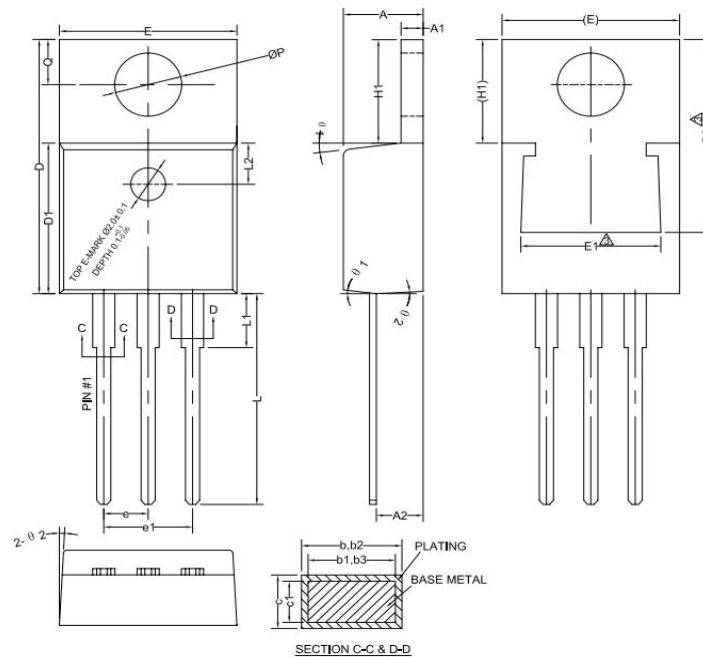
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.50	4.70	4.90
A1	2.34	2.54	2.70
A2	-	0.70	-
A3	2.56	2.76	2.96
b	0.70	0.80	0.95
b1	-	1.28	-
c	0.45	0.50	0.65
D	15.67	15.87	16.07
D1	-	7.70	-
D2	-	9.12	-
E	9.96	10.16	10.36
E1	-	8.00	-
e	2.54		
e1		5.08	
F		2.1	
G		7	
H1	-	0.81	-
L	12.48	12.98	13.20
L1	-	2.93	-
ΦP1 (上口)	2.98	3.18	3.38
ΦP2 (下口)	3.20	3.40	3.60
Q	3.10	3.30	3.50
θ1		5°	
θ2		45°	
θ2		5°	
θ3		5°	

Mechanical Dimensions
TO-220F (Package 3)

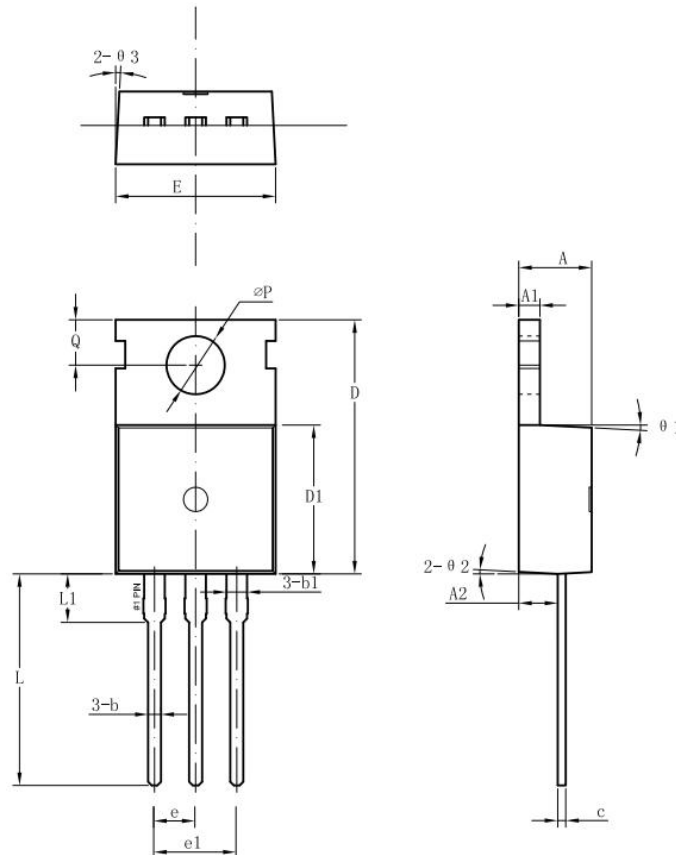
Unit: mm



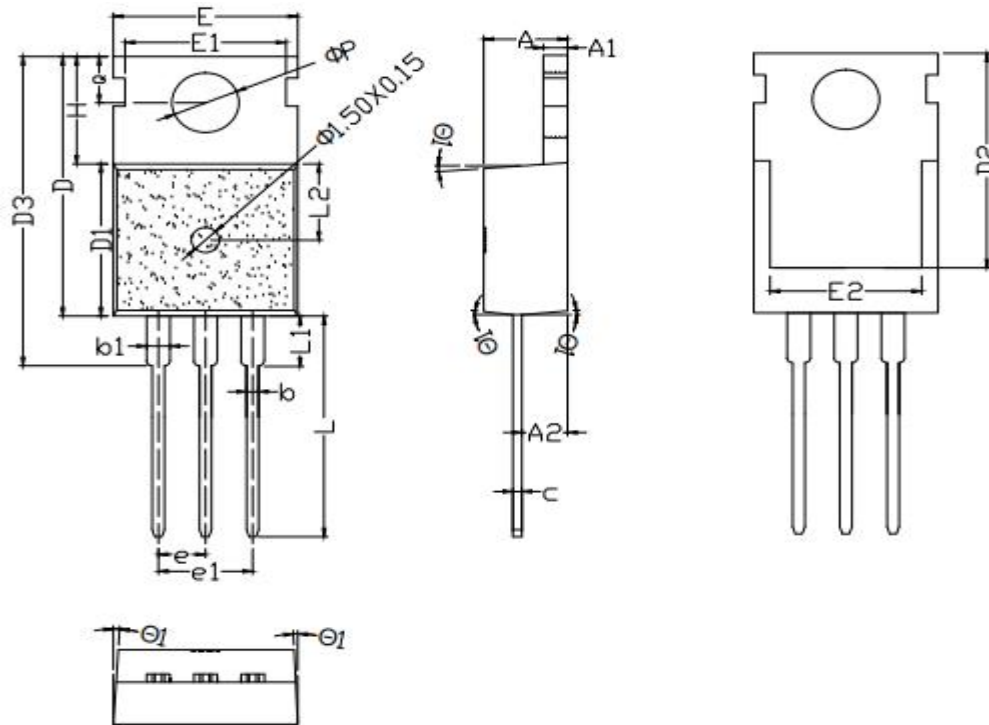
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	2.60	2.80	2.95
A3	1.0REF		
b	0.75	0.80	0.85
b1	1.18	1.20	1.24
b2	1.18	1.24	1.30
c	0.45	0.50	0.55
D	15.67	15.87	16.07
D1	9.04	9.12	9.20
E	10.00	10.16	10.30
E1	9.94	10.06	10.30
E2	9.40	9.50	9.60
e	2.50	2.54	2.58
e1	5.08REF		
L	12.78	12.98	13.18
L1	2.70	2.92	3.20
L2	7.70	7.80	7.90
Q	6.50REF		
ΦP	3.08	3.18	3.28
ΦP1	1.45	1.55	1.65
ΦP2	0.95	1.15	1.35
ΦP3	3.30	3.40	3.50
θ1	3°	5°	7°
θ2	42°	45°	48°
F1	1.40	1.50	1.60
F2	13.80	13.90	14.00
F3	3.20	3.30	3.40
F4	3.70	3.90	4.10
G	7.80	8.00	8.20
G1	6.90	7.00	7.10
K1	0.65	0.70	0.75

Mechanical Dimensions
TO-220C (Package 1)
Unit: mm


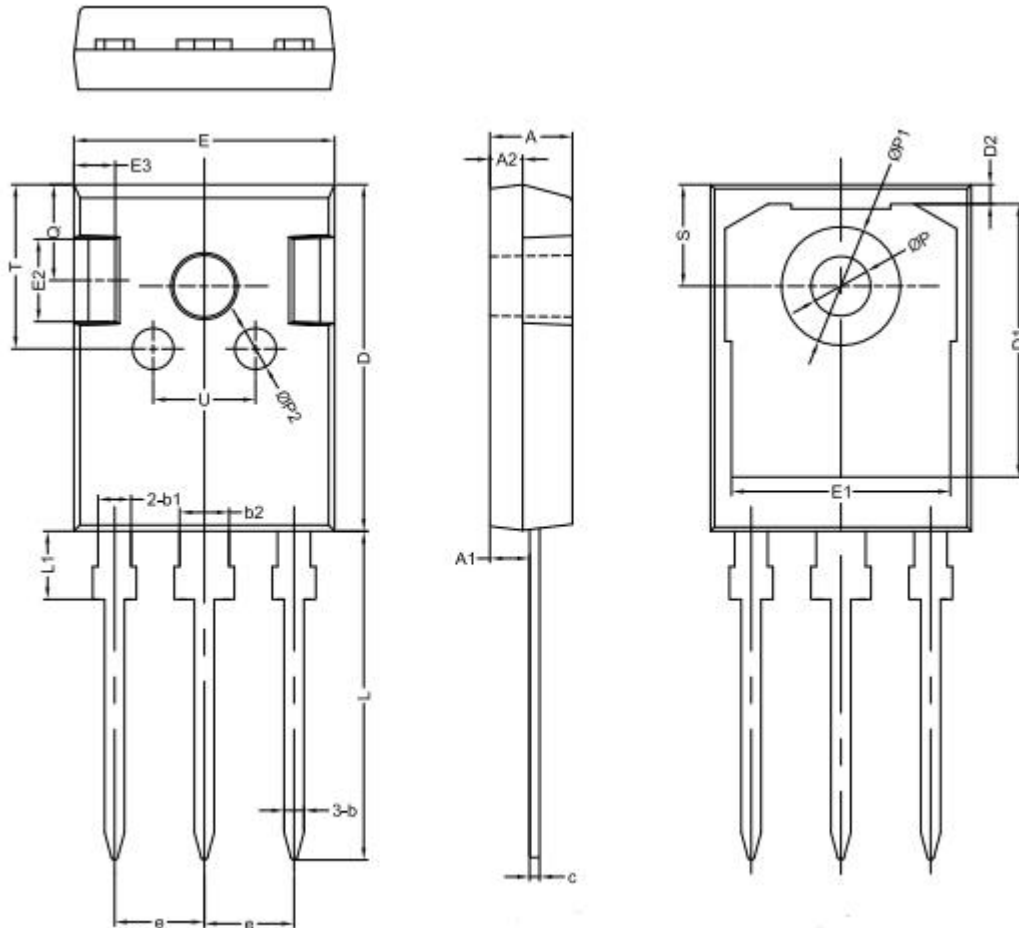
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.40	4.57	4.70
A1	1.22	-	1.32
A2	2.59	2.69	2.79
b	0.77	-	0.90
b1	0.76	0.81	0.86
b2	1.23	-	1.36
b3	1.22	1.27	1.32
c	0.34	-	0.47
c1	0.33	0.38	0.43
D	15.15	15.45	15.75
D1	9.05	9.15	9.25
D2	11.40	-	12.88
E	9.96	10.16	10.36
E1	6.86	-	8.89
e	2.44	2.54	2.64
e1	4.98	5.08	5.18
H1	6.10	6.30	6.50
L	12.70	-	13.12
L1	-	-	3.90
ΦP	3.80	3.84	3.88
Q	2.60	-	2.90
θ1	5°	7°	9°
θ2	1°	2°	5°

Mechanical Dimensions
TO-220C (Package 2)
Unit: mm


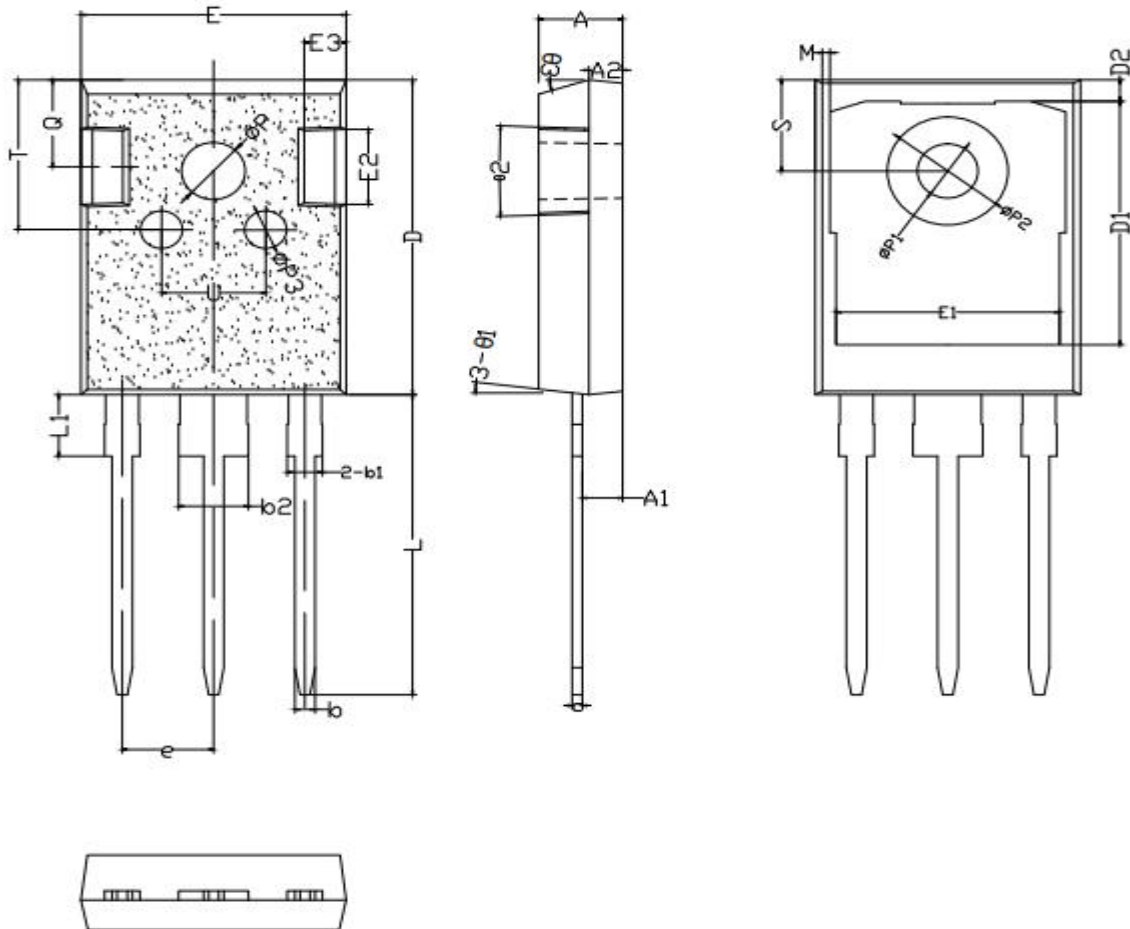
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.50	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b1	-	1.27	-
c	0.40	0.50	0.65
D	15.20	15.70	16.20
D1	9.00	9.20	9.40
E	9.70	10.00	10.20
e		2.54	
e1		5.08	
L	12.60	13.08	13.60
L1	-	3.00	-
ΦP	3.50	3.60	3.80
Q	2.60	2.80	3.00
θ1		3°	
θ2		3°	
θ2		3°	

Mechanical Dimensions
TO-220C (Package 3)
Unit: mm


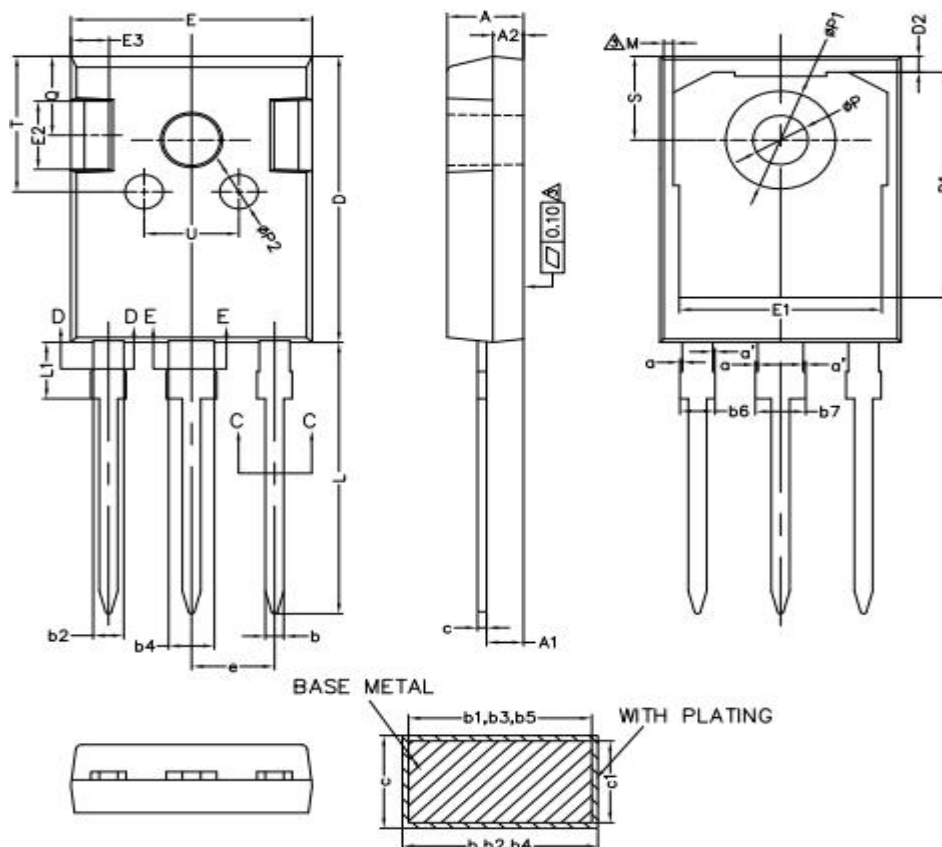
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.40	4.50	4.60
A1	1.25	1.30	1.35
A2	2.30	2.40	2.50
b	0.70	0.80	0.90
b1	1.25	1.33	1.42
c	0.45	0.50	0.55
D	15.50	15.75	16.00
D1	9.10	9.20	9.30
D2	12.90	13.10	13.30
D3	15.45	15.80	16.15
E	9.80	10.02	10.15
e	2.54BSC		
e1	5.08BSC		
L	13.00	13.28	13.45
L1	-	-	3.40
ΦP	3.55	3.65	3.75
Q	2.65	2.75	2.85
θ1	2°	-	7°
E1	8.55	8.70	8.85
E2	7.40	7.60	7.80
H	6.40	6.50	6.60
L2	4.50	4.65	4.80

Mechanical Dimensions
TO-247(Package 1)
Unit: mm


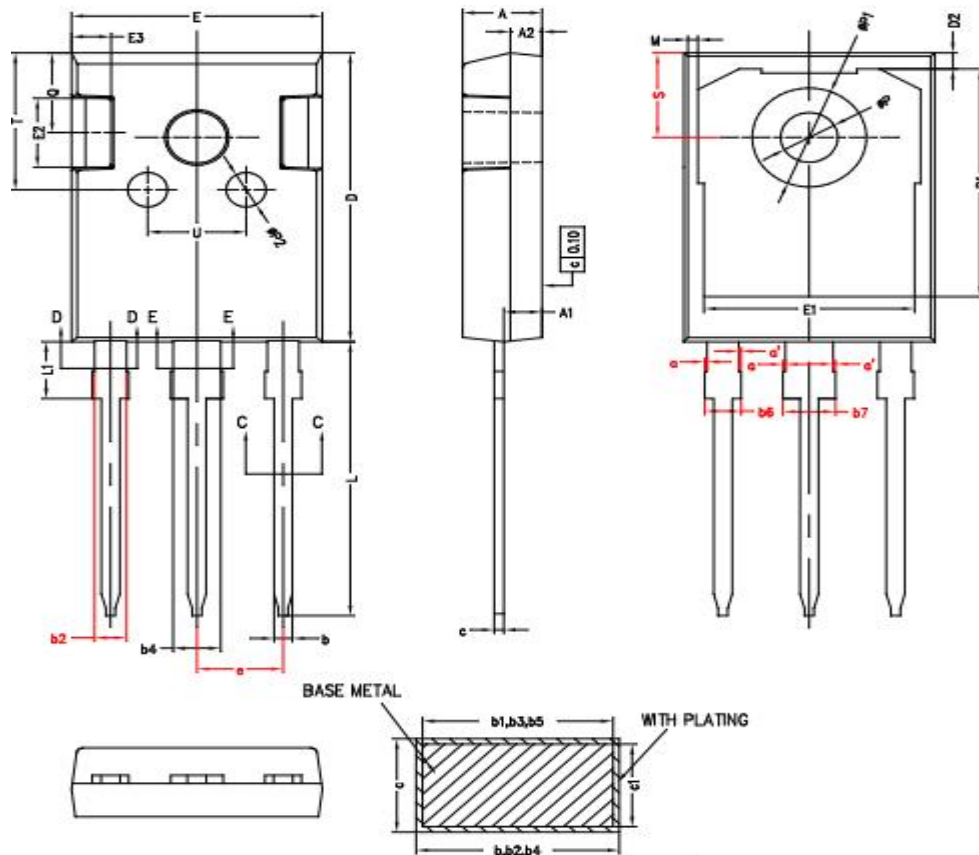
Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E1	-	13.30	-
A1	2.21	2.41	2.61	E2	-	5.00	-
A2	1.90	2.00	2.10	E3	-	2.50	-
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	-	2.00	-	L1	-	4.13	-
b2	-	3.00	-	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	-	7.19	-
D	20.80	21.00	21.20	P2	-	2.50	-
D1	-	16.55	-	Q	-	5.80	-
D2	-	1.20	-	S	6.05	6.15	6.25
E	15.60	15.80	16.0	T	-	10.00	-
U	-	6.20	-				

Mechanical Dimensions
TO-247(Package 2)
Unit: mm


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	E1	13.10	13.25	13.40
A1	2.31	2.41	2.51	E2	4.85	4.95	5.10
A2	1.90	2.00	2.10	E3	2.40	2.50	2.60
b	1.15	1.20	1.25	L	19.80	19.98	20.15
b1	1.95	2.10	2.25	L1	-	-	4.30
b2	2.95	3.10	3.25	ΦP	3.60	3.70	3.80
c	0.55	0.60	0.65	ΦP1	3.40	3.50	3.60
D	20.90	21.00	21.10	ΦP2	6.90	7.10	7.30
D1	16.35	16.55	16.75	Q	5.60	5.80	6.00
D2	1.05	1.20	1.35	S	6.05	6.15	6.25
E	15.70	15.80	15.90	T	9.80	10.00	10.20
U	6.00	6.20	6.40	e	5.40	5.44	5.48
Ø1	5°	7°	9°	ΦP3	2.40	2.50	2.60
Ø2	1°	3°	5°	Ø3	13°	15°	17°

Mechanical Dimensions
TO-247(Package 3)
Unit: mm


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	c1	0.58	0.60	0.62
A1	2.31	2.41	2.51	D	20.90	21.00	21.10
A2	1.90	2.00	2.10	D1	16.25	16.55	16.85
b	1.16	-	1.26	D2	1.05	1.20	1.35
b1	1.15	1.20	1.22	E	15.70	15.80	15.90
b2	1.96	-	2.06	E1	13.10	13.30	13.50
b3	1.95	2.00	2.02	E2	4.90	5.00	5.10
b4	2.96	-	3.06	E3	2.40	2.50	2.60
b5	2.95	3.00	3.02	e	5.34	5.44	5.54
b6	-	-	2.25	L	19.80	19.92	20.10
b7	-	-	3.25	L1	3.95	4.13	4.30
c	0.59	-	0.66	M	0.35	-	0.95
P	3.50	3.60	3.70	P1	7.00	-	7.40
P2	2.40	2.50	2.60	Q	5.60	-	6.00
S	6.05	6.15	6.25	T	9.80	-	10.20
U	6.00	-	6.40	a	0	-	0.15
a'	0	-	0.15				

Mechanical Dimensions
TO-247(Package 4)
Unit: mm


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	E2	4.90	5.00	5.10
A1	2.31	2.41	2.51	E3	2.40	2.50	2.60
A2	1.90	2.00	2.10	e	5.34	5.44	5.54
b	1.12	-	1.22	L	19.80	19.92	20.10
b1	1.11	1.16	1.18	L1	3.95	4.13	4.30
b2	1.96	-	2.06	P	3.50	3.60	3.70
c	0.59	-	0.66	P1	7.00	-	7.40
D	20.90	21.00	21.10	P2	2.40	2.50	2.60
D1	16.25	16.55	16.85	Q	5.60	-	6.00
D2	1.05	1.20	1.35	S	6.05	6.15	6.25
E	15.70	15.80	15.90	T	9.80	-	10.20
E1	13.10	13.30	13.50	U	6.00	-	6.40
b3	1.95	2.00	2.02	b6	-	-	2.25
b4	2.96	-	3.06	b7	-	-	3.25
b5	2.95	3.00	3.02	c1	0.58	0.60	0.62
M	0.35	-	0.95	a	0	-	0.15
a'	0	-	0.15				



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