

General Description

The Sanrise SRC60R140B 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 SRC60R140B break down voltage is 600V and it has a high rugged avalanche characteristics. The SRC60R140B is available in TO-220F, TO-220C, TO-263-2 and TO-247 packages.

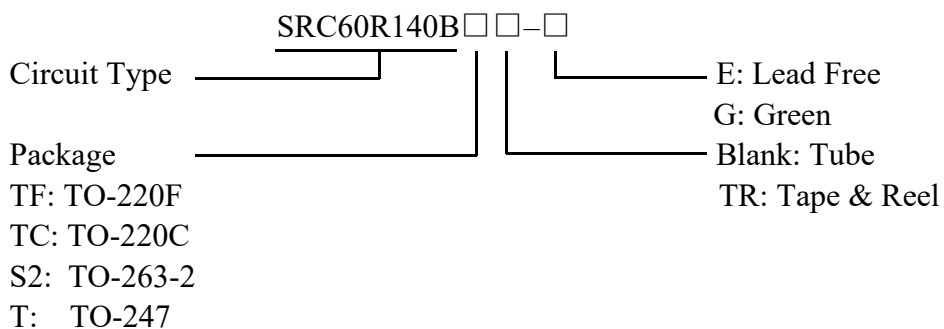
Features

- Ultra Low $R_{DS(ON)} = 140m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 40.4nC$ typ.
- Intrinsic Fast-Recovery Body Diode
- Fast switching capability
- Robust design with better EAS performance
- Non-automotive Qualified

Application

- AC/DC Power Supply
- PC Power
- Sever / Telecom
- Solar Inverter

Ordering Information



Symbol

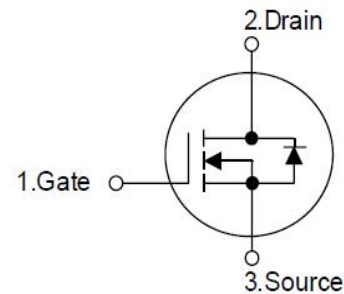


Figure 1 Symbol of SRC60R140B

Package Type

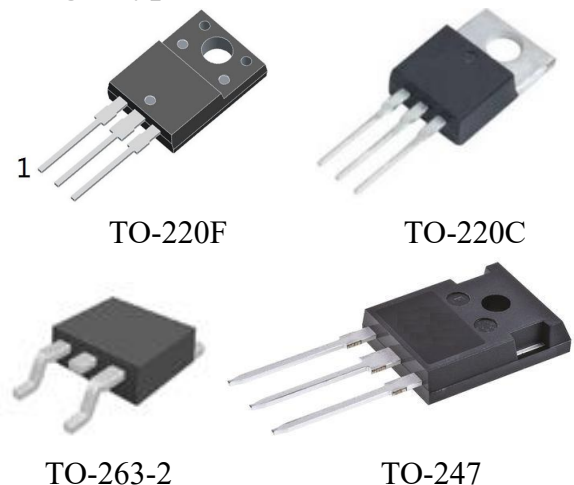


Figure 2 Package Types of SRC60R140B

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-220F	SRC60R140BTF-E	SRC60R140BTF-G	SRC60R140BTFE	SRC60R140BTFG	Tube
TO-220C	SRC60R140BTC-E	SRC60R140BTC-G	SRC60R140BTCE	SRC60R140BTCG	Tube
TO-263-2	SRC60R140BS2TR-E	SRC60R140BS2TR-G	SRC60R140BS2E	SRC60R140BS2G	Tape & Reel
TO-247	SRC60R140BT-E	SRC60R140BT-G	SRC60R140BTE	SRC60R140BTG	Tube

Absolute Maximum Ratings^{Note 1}

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage(static)		V_{GSS}	±30	V
Gate-Source Voltage(dynamic),AC($f>1\text{Hz}$)		V_{GSS}	±30	
Continuous Drain Current	$T_C=25^\circ\text{C}$	I_D	25.0	A
	$T_C=100^\circ\text{C}$		15.8	
	$T_C=125^\circ\text{C}$		11.2	
Power Dissipation (TO-220C,TO-247,TO-263-2)		P_{tot}	178.6	W
Power Dissipation (TO-220F)		P_{tot}	34.7	W
Pulsed Drain Current (Note 2)		I_{DM}	76	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	510	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.7	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	3.6	A
Continuous Diode Forward Current		I_S	25.0	A
Diode Pulse Current		$I_{S,PULSE}$	76	A
MOSFET dv/dt Ruggedness, $V_{DS}\leq 480\text{V}$		dv/dt	50	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	°C
Storage Temperature		T_{STG}	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	°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. $I_{AS} = 3.6\text{A}$, $V_{DD} = 60\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-220F	R_{thJC}			3.6	°C /W
	TO-247				0.7	
	TO-220C				0.7	
	TO-263-2				0.7	
Thermal resistance, Junction-to-Ambient	TO-220F	R_{thJA}			80	°C /W
	TO-247				62	
	TO-220C				62	
	TO-263-2				62	

Electrical Characteristics

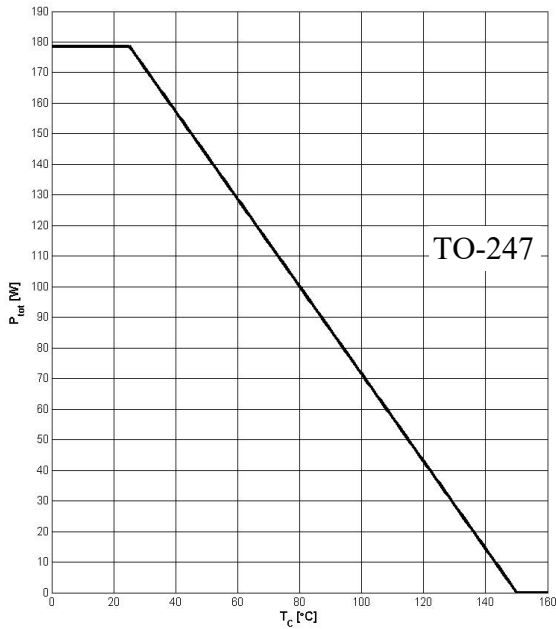
$T_J = 25\text{ }^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			10	μA
Gate-Body Leakage Current	Forward	$I_{GSSF}, V_{GS}=30V, V_{DS}=0V$			100	nA
	Reverse	$I_{GSSR}, V_{GS}=-30V, V_{DS}=0V$			-1.0	μA
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.3	3.3	4.3	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=13.0A$		126	140	mΩ
Gate Resistance	R_G	$f=1MHz, \text{Open Drain}$		1.7		Ω
Dynamic Characteristics						
Input Capacitance	C_{ISS}	$V_{DS}=50V, V_{GS}=0V, f=1MHz$		1650		pF
Output Capacitance	C_{OSS}			129.6		
Reverse Transfer Capacitance	C_{RSS}			10.1		
Effective output capacitance, energy related ^{NOTE5}	$C_{O(er)}$	$V_{GS}=0V, V_{DS}=0\dots 480V$		76.8		pF
Effective output capacitance, time related ^{NOTE6}	$C_{O(tr)}$			281		
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=400V, I_D=13.0A, R_G=3.4\Omega, V_{GS}=10V$		11		ns
Rise Time	t_r			10		
Turn-off Delay Time	$t_{d(off)}$			76		
Fall Time	t_f			8		
Gate Charge Characteristics						
Gate to Source Charge	Q_{gs}	$V_{DD}=480V, I_D=13.0A, V_{GS}=0 \text{ to } 10V$		10.8		nC
Gate to Drain Charge	Q_{gd}			13.9		
Gate Charge Total	Q_g			40.4		
Gate Plateau Voltage	$V_{plateau}$			5.4		V
Reverse Diode Characteristics						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{SD}=13.0A$		0.90	1.1	V
Reverse Recovery Time	t_{rr}	$V_R=400V, I_F=13.0A, dI_F/dt=100.0A/\mu s$		124		ns
Reverse Recovery Charge	Q_{rr}			0.59		μC
Peak Reverse Recovery Current	I_{rrm}			9.5		A

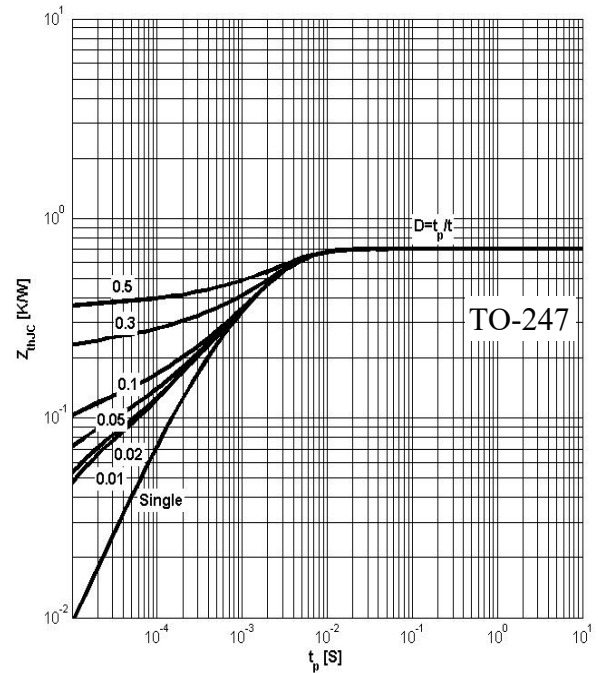
Note:

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

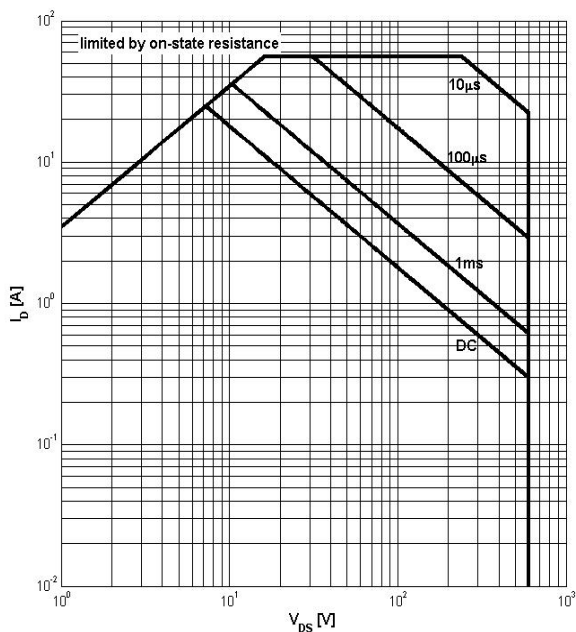
6. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 480V

Typical Performance Characteristics
Figure 3: Power Dissipation


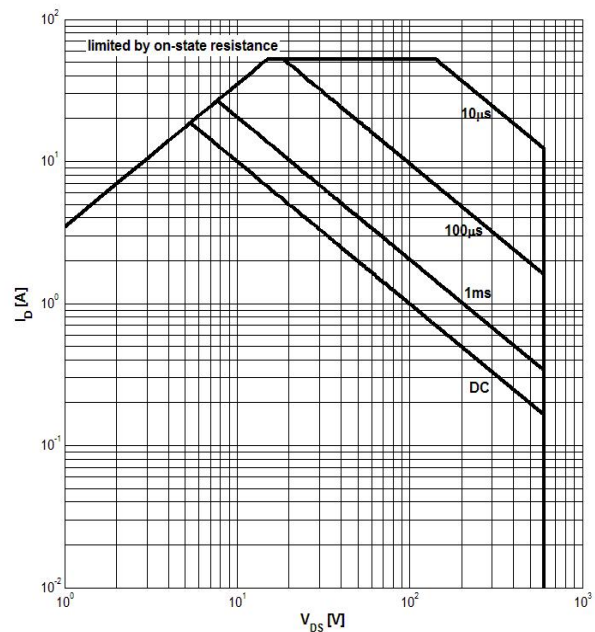
$$P_{tot} = f(T_c)$$

Figure 4: Max. Transient Thermal Impedance


$$Z_{th(jc)} = f(t_p); \text{ parameter: } D = t_p/T$$

Figure 5: Safe Operating Area


$$I_D = f(V_{DS}); T_c = 25^\circ\text{C}; V_{GS} > 7\text{V}; \text{ parameter } t_p$$

Figure 6: Safe Operating Area


$$I_D = f(V_{DS}); T_c = 80^\circ\text{C}; V_{GS} > 7\text{V}; \text{ parameter } t_p$$

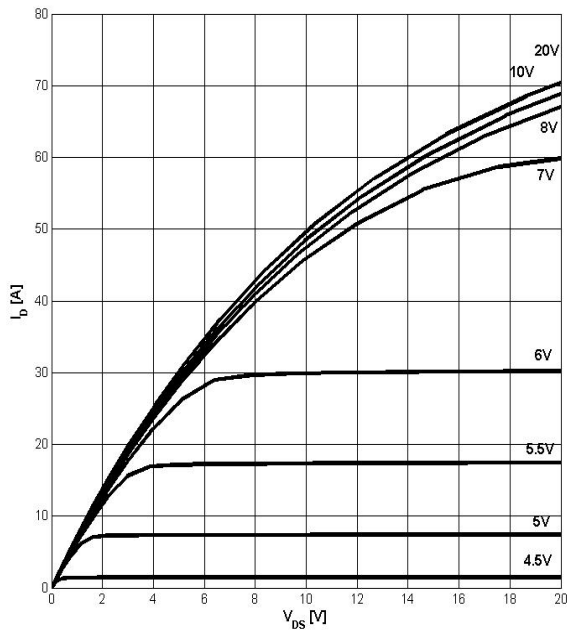
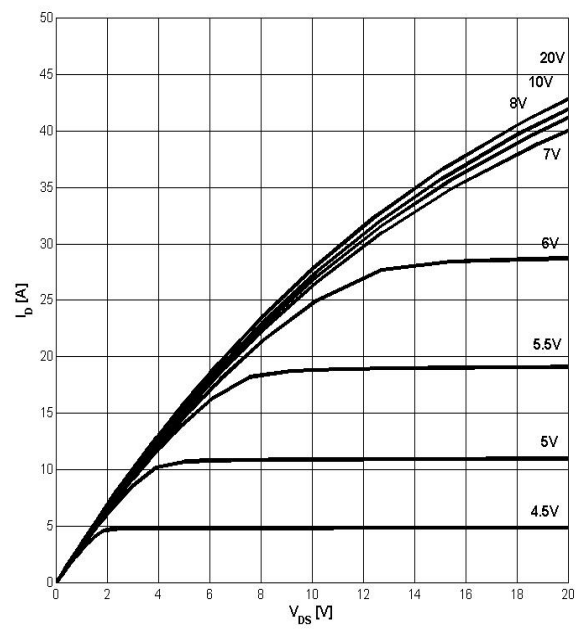
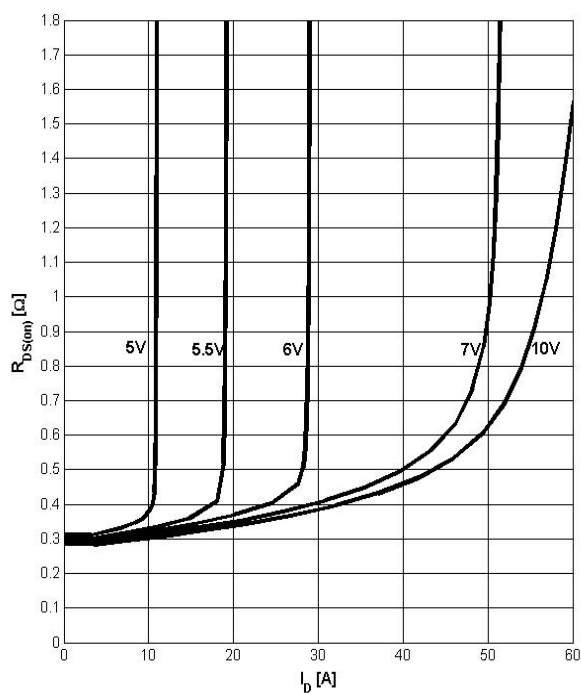
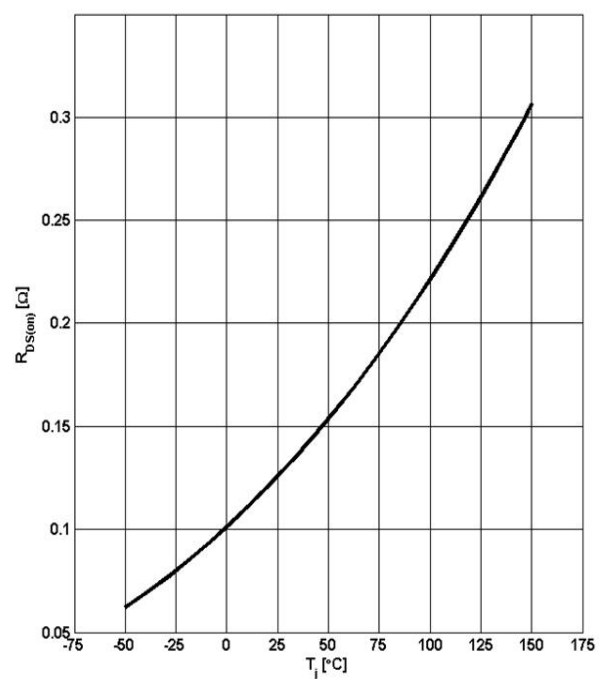
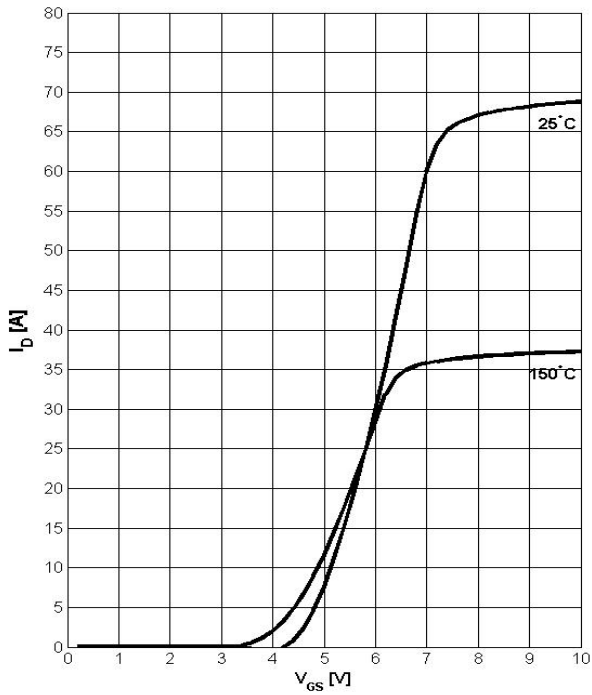
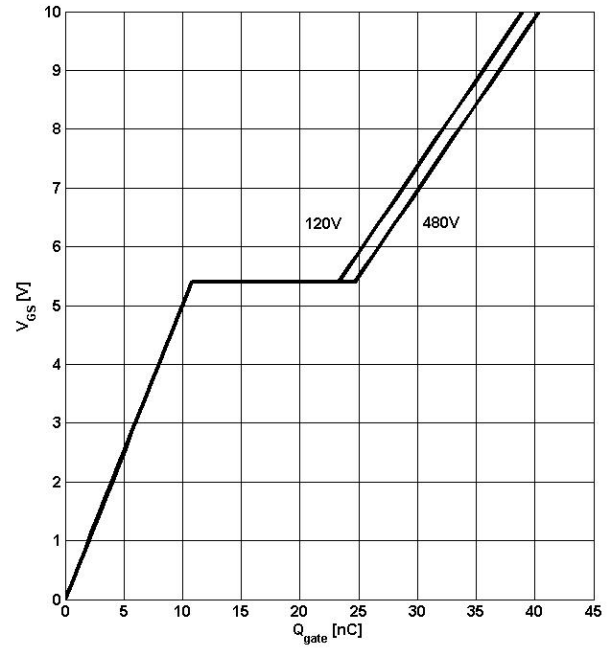
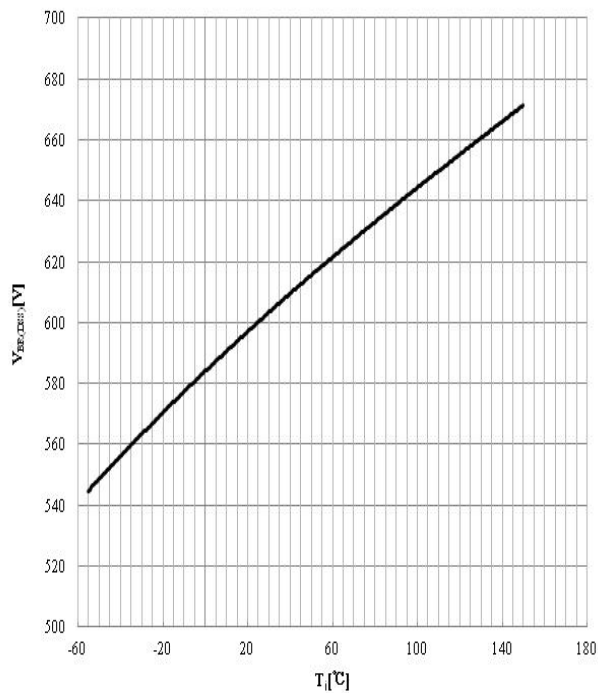
Figure 7: Typ. Output Characteristics

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$
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

 $R_{DS(on)} = f(T_j); I_D = 13\text{A}; V_{GS} = 10\text{V}$

Figure 11: Typ. Transfer Characteristics


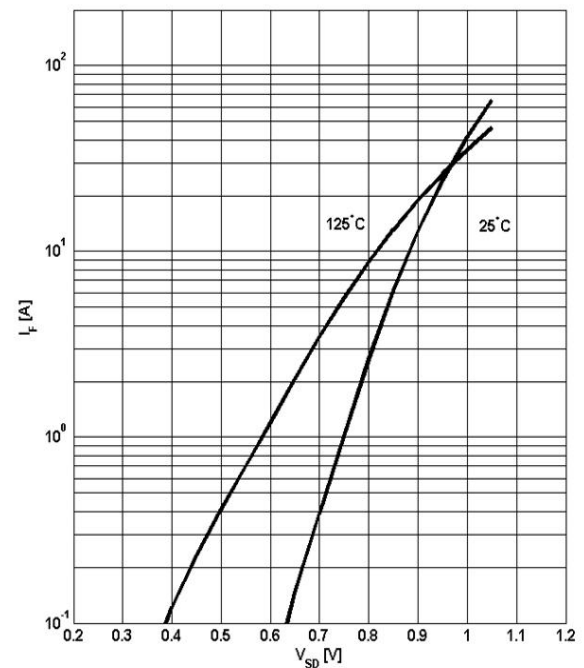
$$I_D = f(V_{GS}); V_{DS} = 20V$$

Figure 12: Typ. Gate Charge


$$V_{GS} = f(Q_{gate}), I_D = 13A \text{ pulsed}$$

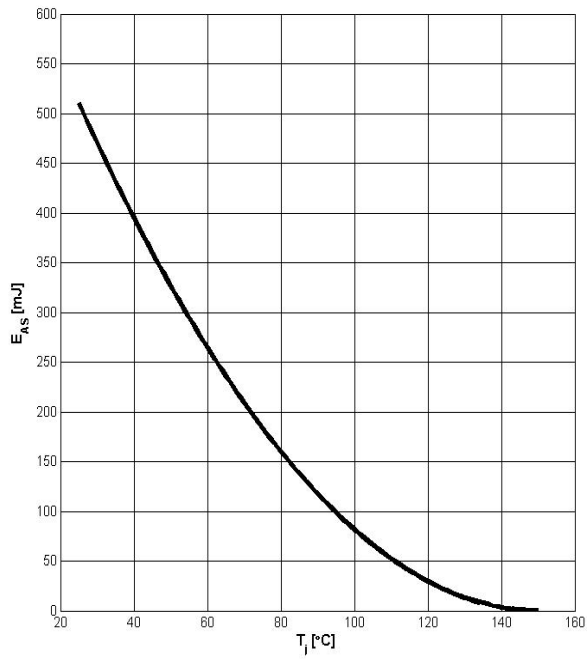
Figure 13: Drain-Source Breakdown Voltage


$$V_{BR(DSS)} = f(T_j); I_D = 10mA$$

Figure 14: Forward Characteristics of Reverse Diode


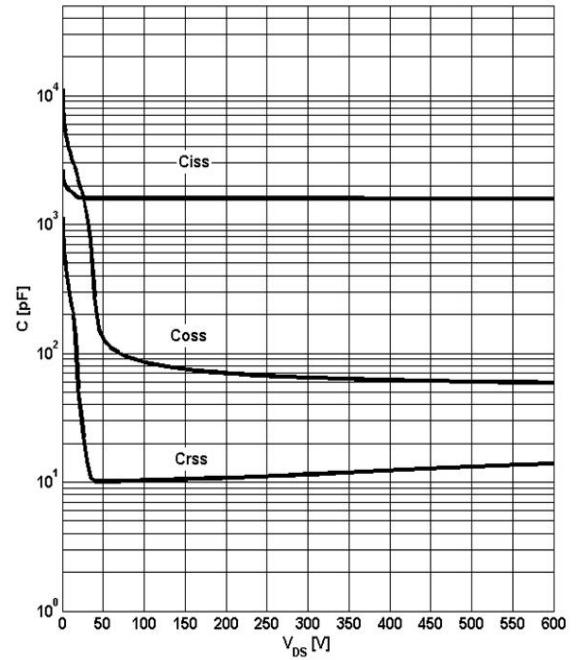
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

Figure 15: Avalanche Energy



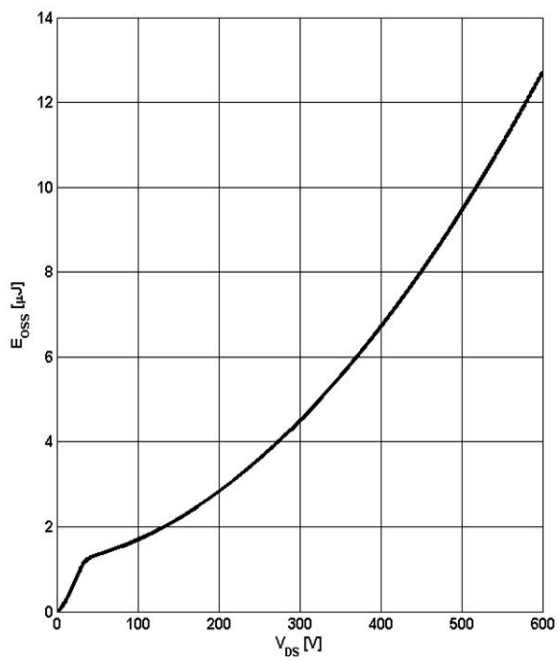
$E_{AS}=f(T_j); I_D=3.6A; V_{DD}=60V$

Figure 16: Typ. Capacitances

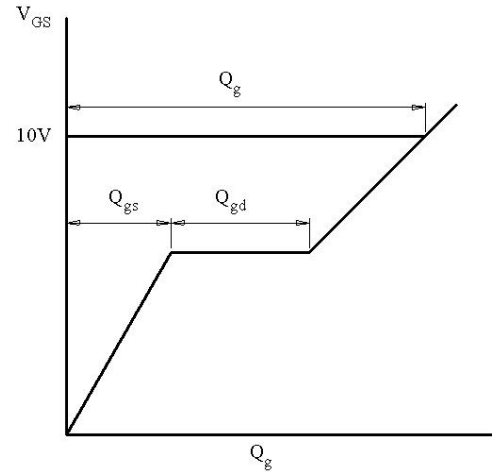
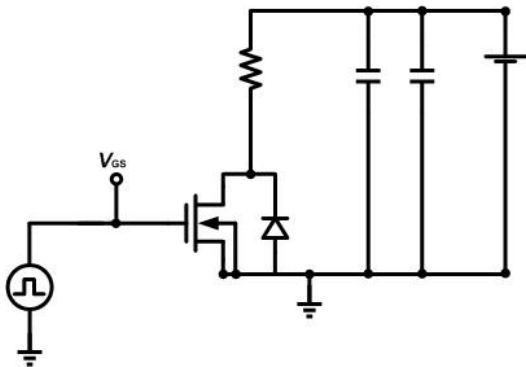
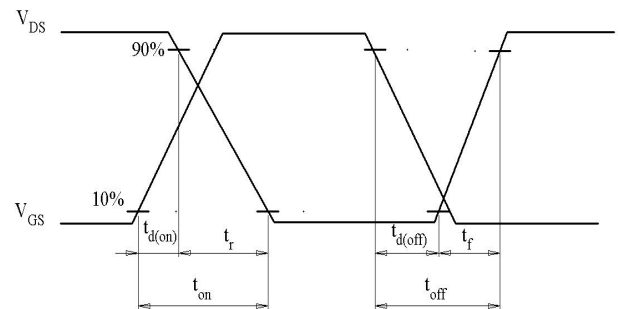
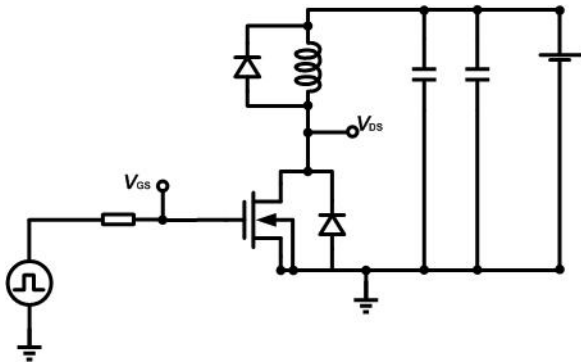
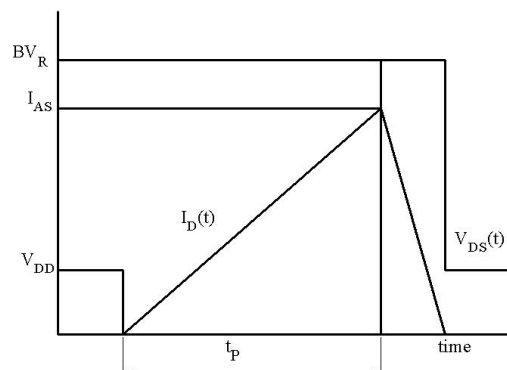
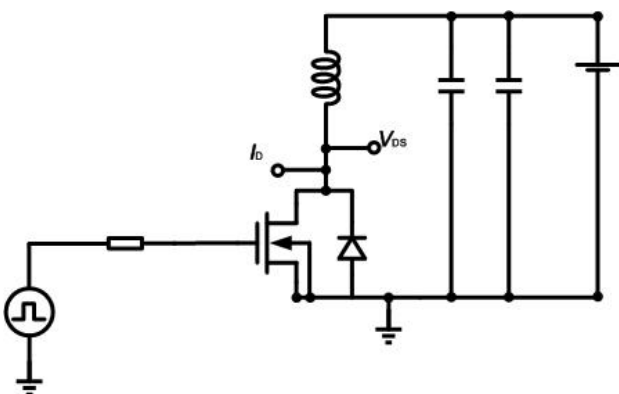


$C=f(V_{DS}); V_{GS}=0; f=1MHz$

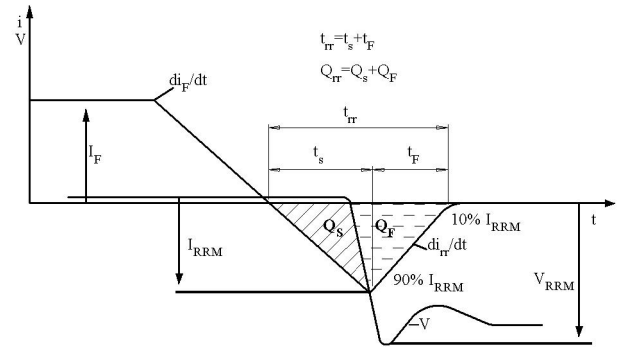
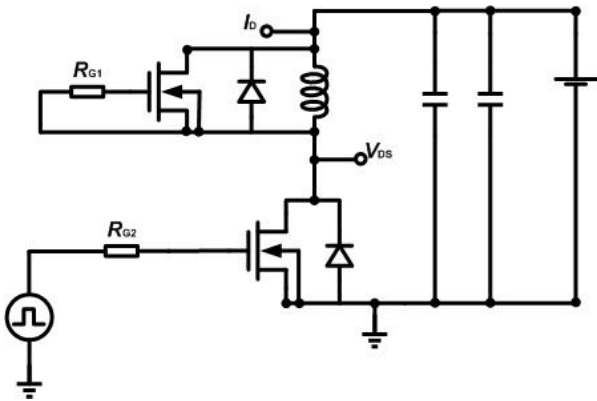
Figure 17: Coss Stored Energy

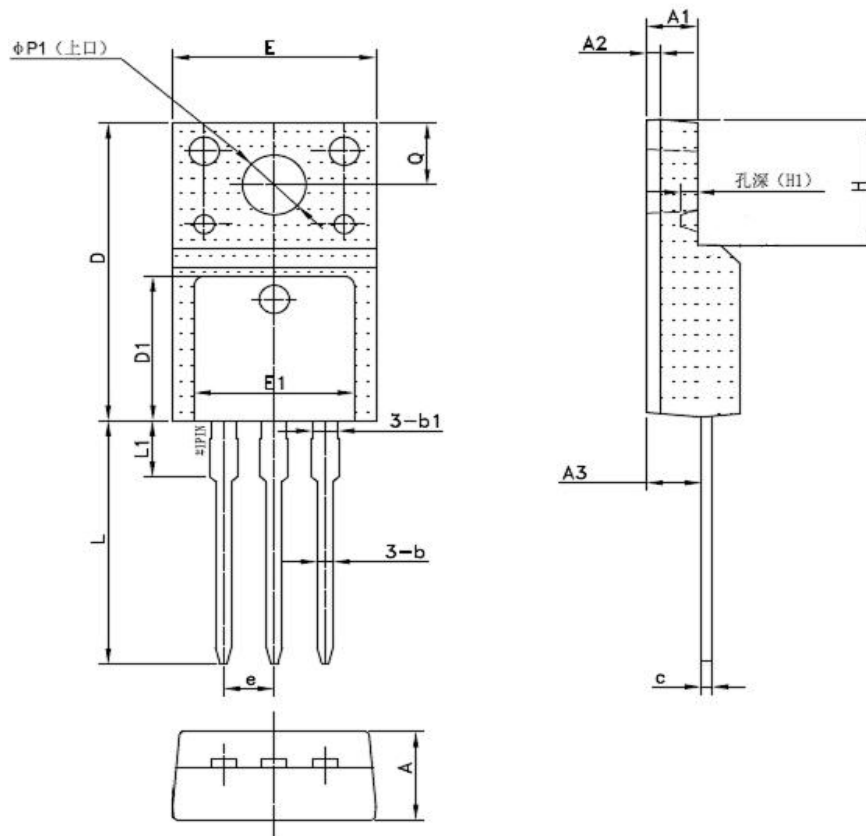


$E_{OSS}=f(V_{DS})$

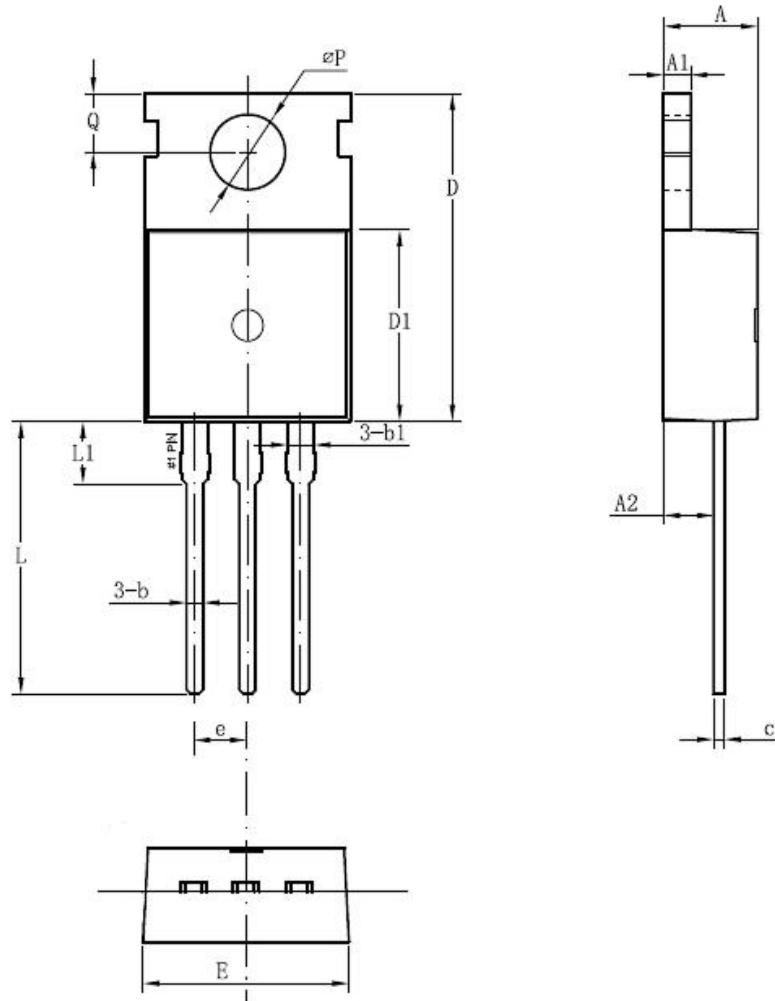
Test Circuits
1. Gate Charge Test Circuit & Waveform

2. Switch Time Test Circuit

3. Unclaimed Inductive Switching Test Circuit & Waveforms


4. Test Circuit and Waveform for Diode Characteristics

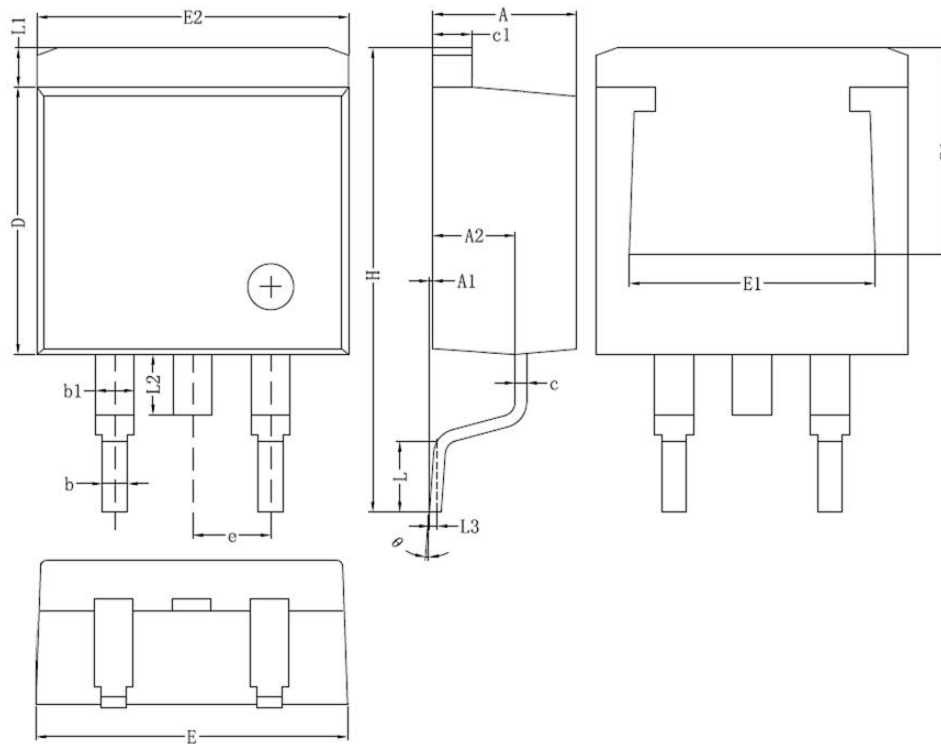


Mechanical Dimensions
TO-220F
Unit: mm


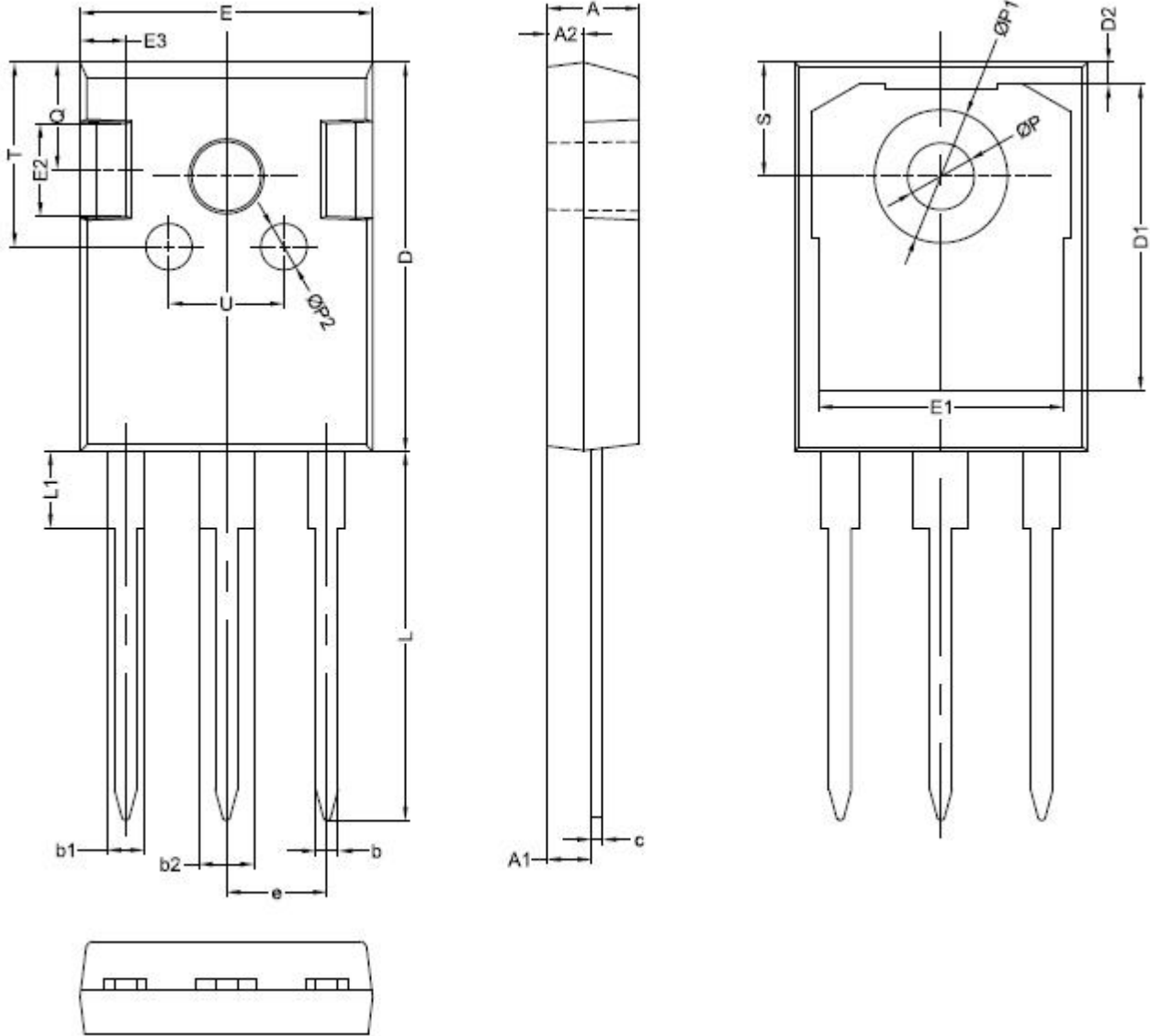
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.70	4.90
A1	2.34	2.54	2.90
A2	-	0.70	-
A3	2.56	2.76	2.96
b	0.55	-	0.95
b1	-	1.28	-
c	0.42	0.50	0.70
D	14.70	-	16.07
D1	-	7.70	-
E	9.96	10.16	10.36
E1	-	8.00	-
e	2.54(BSC)		
H	-	6.70	-
(H1)	-	(0.81)	-
L	12.48	12.98	13.50
L1	-	2.93	-
φP1	-	3.18	-
Q	2.90	3.30	3.50

Mechanical Dimensions (Continued)
TO-220C
Unit: mm


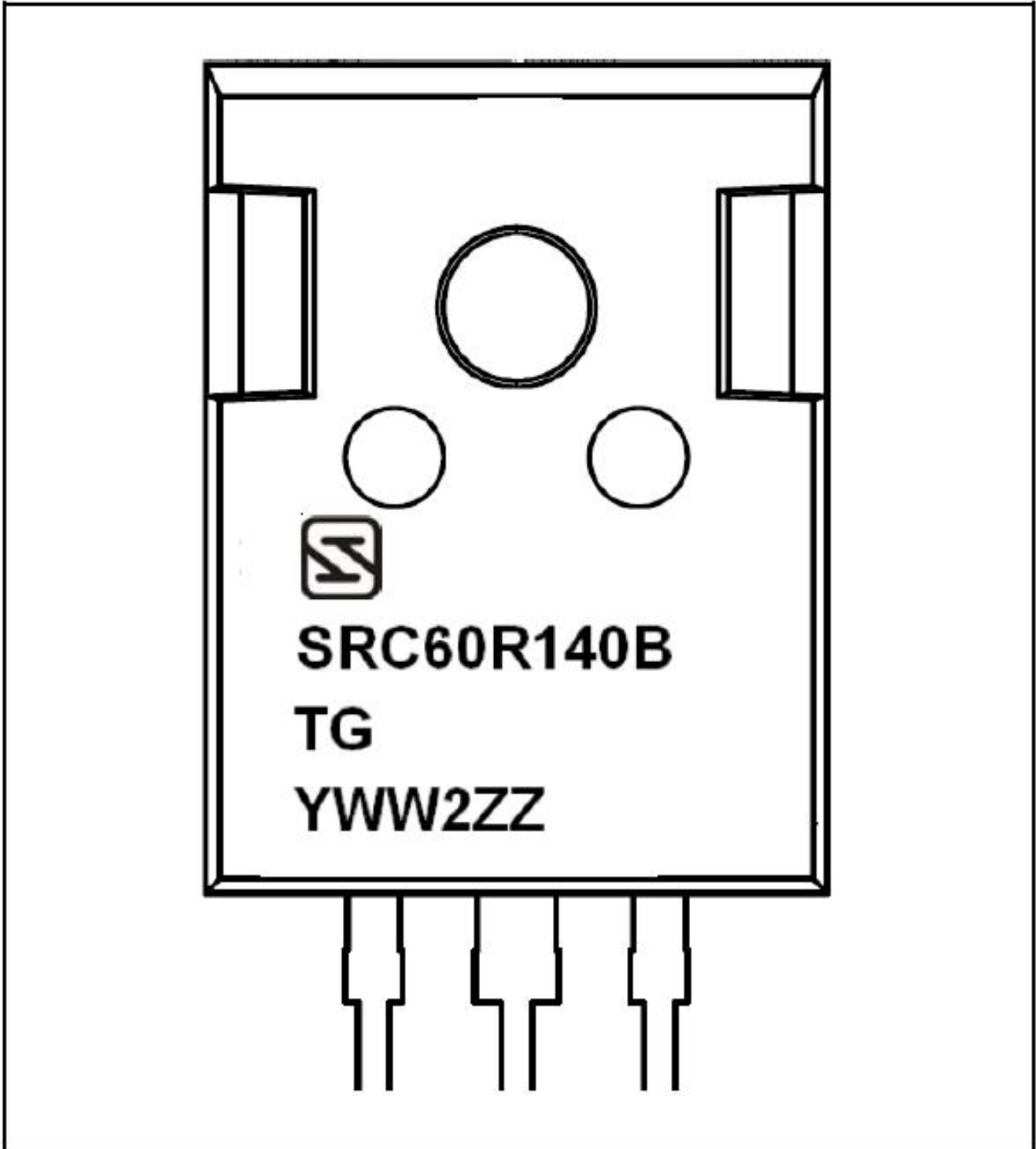
Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.50	4.70
A1	1.20	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b1	-	1.27	-
c	0.40	0.50	0.65
D	15.20	15.70	16.20
D1	9.00	9.20	9.40
E	9.70	10.00	10.20
e	2.54(BSC)		
L	12.60	13.08	13.60
L1	-	3.00	-
ΦP	3.50	3.60	3.80
Q	2.60	2.80	3.00



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


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.30	4.60	4.85
A1	0.00	0.10	0.25
A2	2.59	2.69	2.89
b	0.70	0.81	0.96
b1	-	1.27	-
c	0.36	0.40	0.61
c1	1.15	1.27	1.40
D	8.55	-	9.40
D1	6.40	-	-
E	9.80	10.10	10.31
E1	7.60	-	-
E2	9.80	10.00	10.20
e	2.54(BSC)		
H	14.70	15.20	16.00
L	2.00	2.30	2.84
L1	1.00	1.27	1.40
L2	-	-	2.20
L3	-	0.25	-
θ	0°	-	8°

Mechanical Dimensions (Continued)
TO-247
Unit: mm


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E2	4.50	5.00	5.50
A1	2.21	2.41	2.61	E3	2.00	2.50	3.00
A2	1.90	2.00	2.10	e	4.94	5.44	5.94
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	1.70	2.00	2.30	L1	3.63	4.13	4.63
b2	2.70	3.00	3.30	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	6.69	7.19	7.69
D	20.80	21.00	21.20	P2	2.00	2.50	3.00
D1	15.55	16.55	17.05	Q	5.30	5.80	6.30
D2	0.70	1.20	1.70	S	6.05	6.15	6.25
E	15.60	15.80	16.00	T	9.5	10.00	10.5
E1	12.30	13.30	13.80	U	5.701	6.20	6.70



 SRC60R140B TG YWW2ZZ		SanRise Logo	Arial/Arial Narrow Type Font
	SRC60R140BTG	Marking ID	
	YWW	Year and work week of mold operation	
	2	Assembly site code	
	ZZ	批号末两位	
Comments: Laser Mark			



Shenzhen Sanrise Technology Co., LTD
<http://www.sanrise-tech.com>

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