

General Description

The Sanrise SRC60R017FB 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 SRC60R017FB break down voltage is 600V and it has a high rugged avalanche characteristics. The SRC60R017FB is available in TO-247 package.

Features

- Ultra Low $R_{DS(ON)} = 17m\Omega @ V_{GS} = 10V$.
- $V_{ds@T_{jmax}} = 650v$.
- Ultra Low Gate Charge, $Q_g = 290nC$ typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified
- Ultra-fast body diode

Application

- Server / Telecom Power
- EV Charger

Symbol

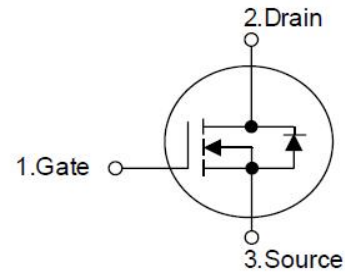


Figure 1 Symbol of SRC60R017FB

Package Type

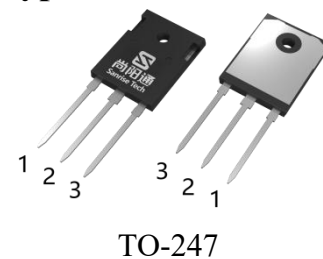
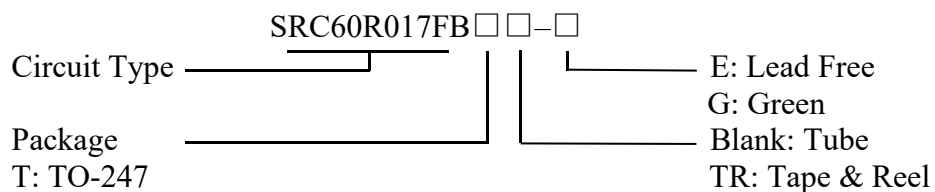


Figure 2 Package Type of SRC60R017FB

Ordering Information



Package	Part Number	Marking ID	Packing Type
TO-247	SRC60R017FBT-G	SRC60R017FBTG	Tube

Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage (static)		V_{GSS}	±20	V
Gate-Source Voltage (dynamic), AC $f > 1\text{Hz}$		V_{GSS}	±30	V
Power Dissipation ($T_c=25^\circ\text{C}, \text{TO-247}$)		P_{tot}	657	W
Continuous Drain Current	$T_c=25^\circ\text{C}$	I_D	120	A
	$T_c=100^\circ\text{C}$		76	
	$T_c=125^\circ\text{C}$		54	
Pulsed Drain Current (Note 2)		I_{DM}	360	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	600	mJ
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	4380	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.6	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	5.5	A
Continuous Diode Forward Current		I_S	120	A
Diode Pulse Current		$I_{S,PULSE}$	360	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:

- 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.
- Repetitive Rating: Pulse width limited by maximum junction temperature
- $I_{AS} = 5.5\text{A}$, $V_{DD} = 60\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$. Finish goods test condition.
- $I_{AS} = 14.8\text{A}$, $V_{DD} = 60\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$. Typical Eas.

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-247	R_{thJC}			0.19	$^\circ\text{C}/\text{W}$
Thermal resistance, Junction-to-Ambient	TO-247	R_{thJA}			62	$^\circ\text{C}/\text{W}$

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}	$V_{GS}=0V, I_D=250\mu A$	600			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			10	μA
Gate-Body Leakage Current	Forward	$I_{GSSF}, V_{GS}=30V, V_{DS}=0V$			200	nA
	Reverse	$I_{GSSR}, V_{GS}=-30V, V_{DS}=0V$			-200	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=2.9mA$	3.0	4.0	5.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=40A$		15.1	17	mΩ
Gate Resistance	R_G	f=1MHz, Open Drain		1.3		Ω
Dynamic Characteristics						
Input Capacitance	C_{ISS}	$V_{DS}=400V,$		13.7		nF
Output Capacitance	C_{OSS}	$V_{GS}=0V, f=100KHz$		222		pF
Effective output capacitance, energy related ^{NOTE5}	$C_{O(er)}$	$V_{GS}=0V,$ $V_{DS}=0\dots 480V$		291		pF
Effective output capacitance, time related ^{NOTE6}	$C_{O(tr)}$			237 9		
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=400V, I_D=60A$ $R_G=2\Omega, V_{GS}=12V$		73.2		ns
Rise Time	t_r			21.6		
Turn-off Delay Time	$t_{d(off)}$			184		
Fall Time	t_f			12.4		
Gate Charge Characteristics						
Gate to Source Charge	Q_{gs}	$V_{DD}=400V, I_D=60A$ $V_{GS}=0 \text{ to } 10V$		85		nC
Gate to Drain Charge	Q_{gd}			90		
Gate Charge Total	Q_g			290		
Gate Plateau Voltage	$V_{plateau}$			6.5		V
Reverse Diode Characteristics						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{SD}=40A$		0.85	1.1	V
Reverse Recovery Time	t_{rr}	$V_R=400V, I_F=50A$ $dI_F/dt=100A/\mu s$		195		ns
Reverse Recovery Charge	Q_{rr}			1.8		μC
Peak Reverse Recovery Current	I_{rrm}			15		A

Note:

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

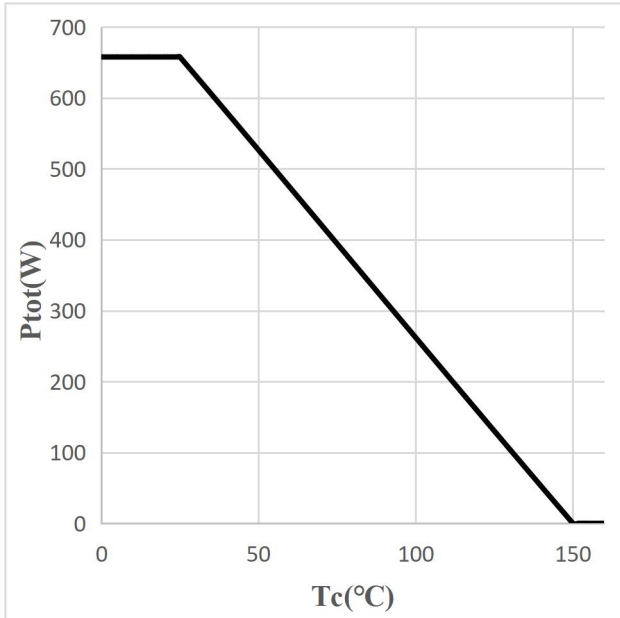
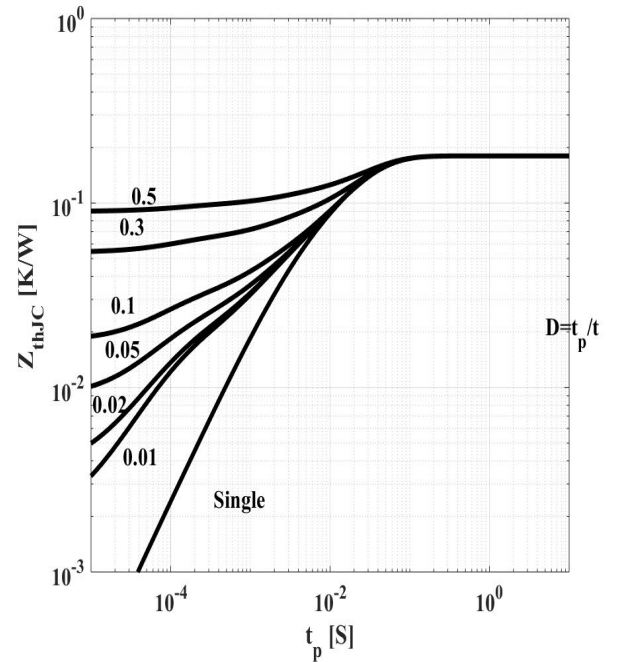
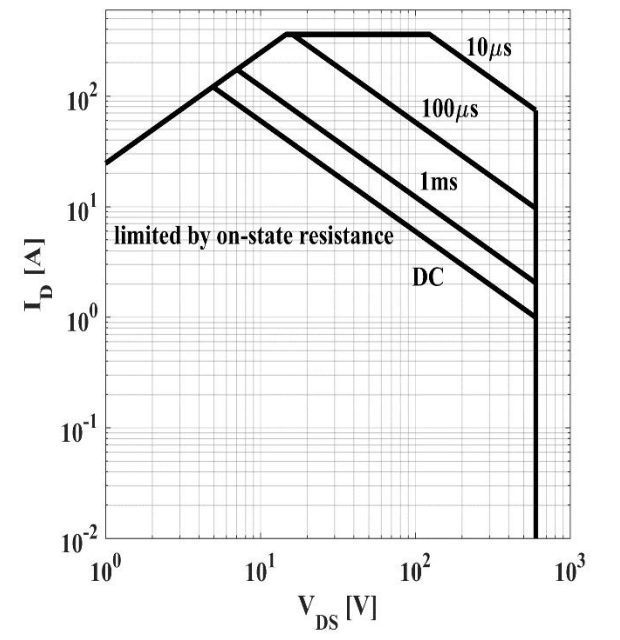
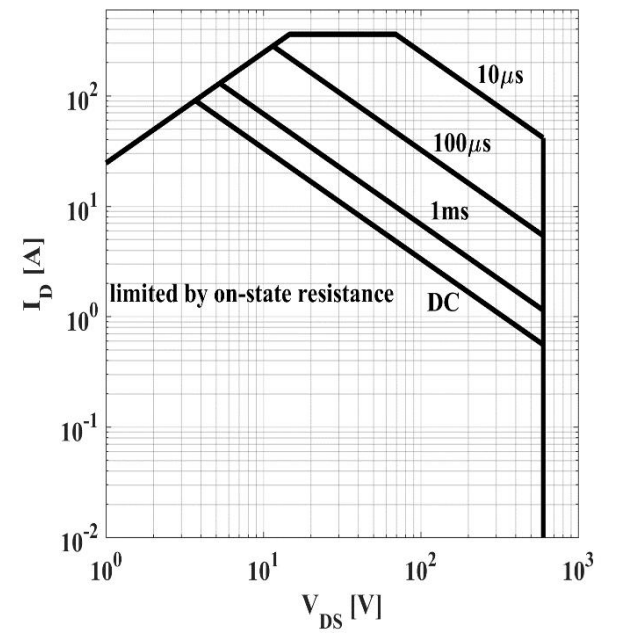
<p>Figure 3: Power Dissipation</p>  <p>$P_{tot} = f(T_c)$</p>	<p>Figure 4: Max. Transient Thermal Impedance</p>  <p>$Z_{thJC} = f(t_p)$; parameter: $D = t_p/T$</p>
<p>Figure 5: Safe Operating Area</p>  <p>$I_D = f(V_{DS})$; $T_c = 25^\circ\text{C}$; $V_{GS} > 7\text{V}$; parameter t_p</p>	<p>Figure 6: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

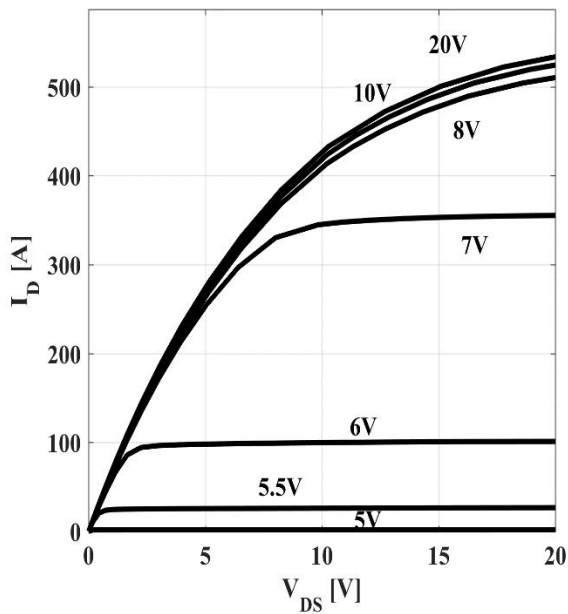
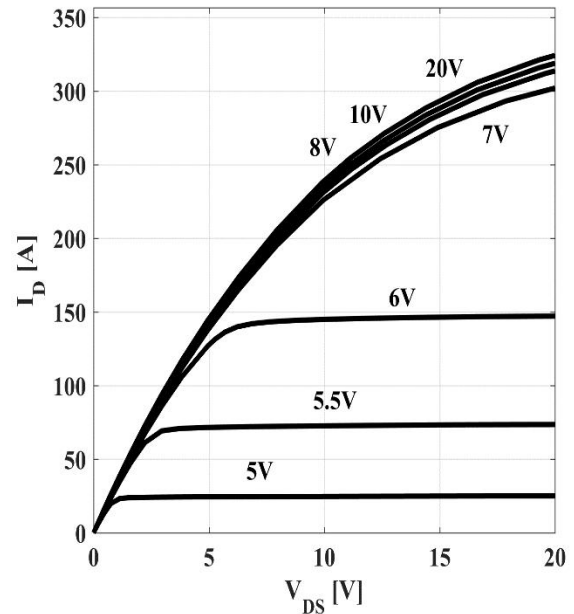
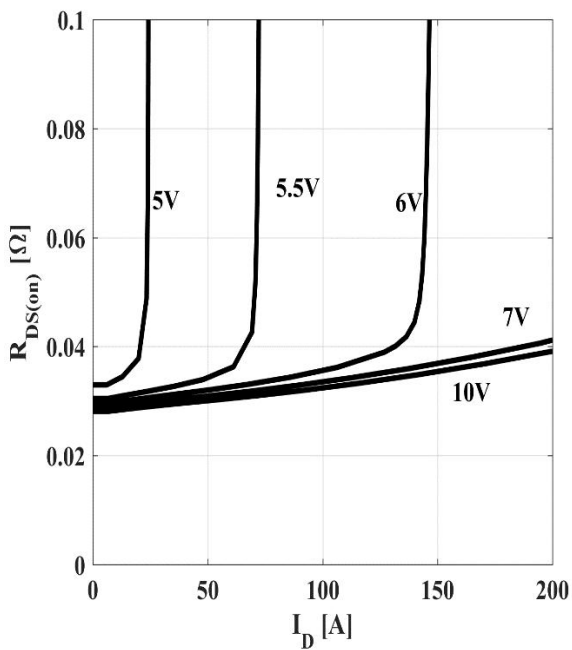
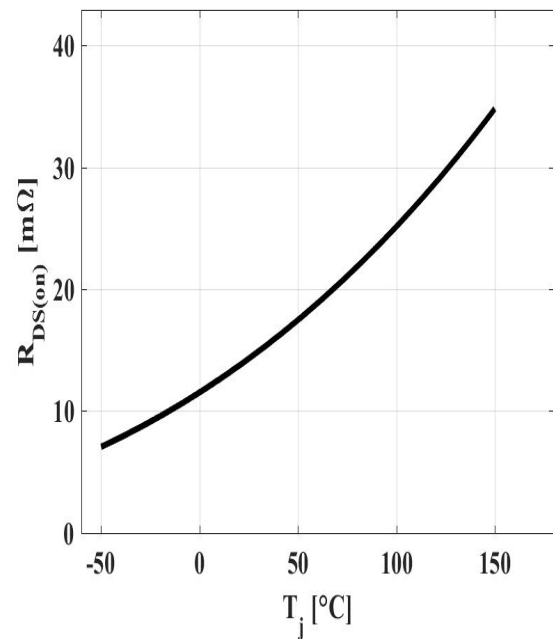
Figure 7: Typ. Output Characteristics

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

 $R_{DS(ON)} = f(T_j); I_D = 40\text{A}; V_{GS} = 10\text{V}$

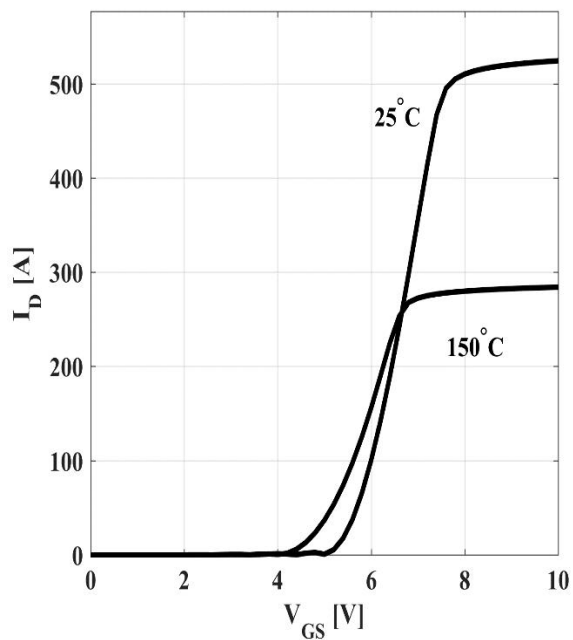
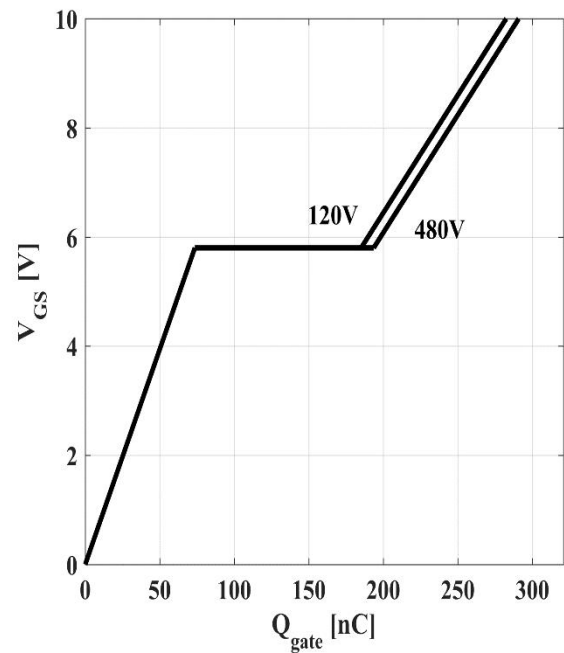
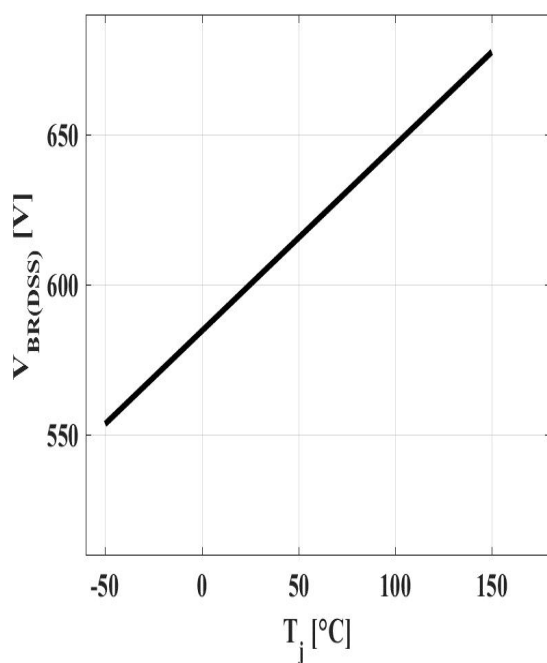
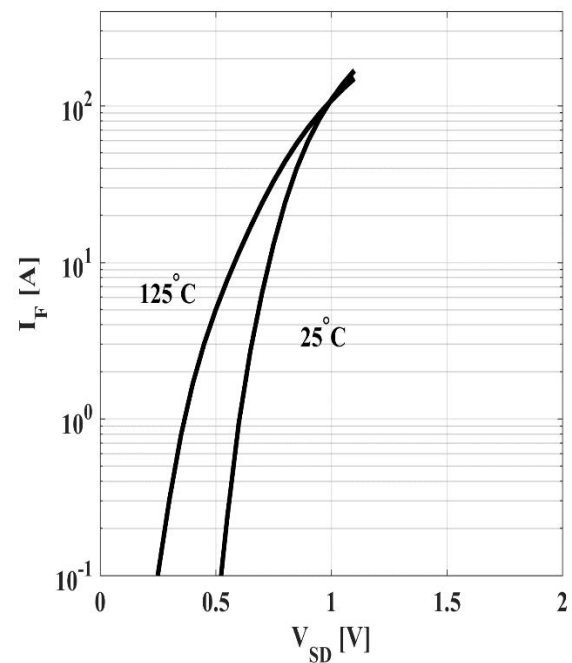
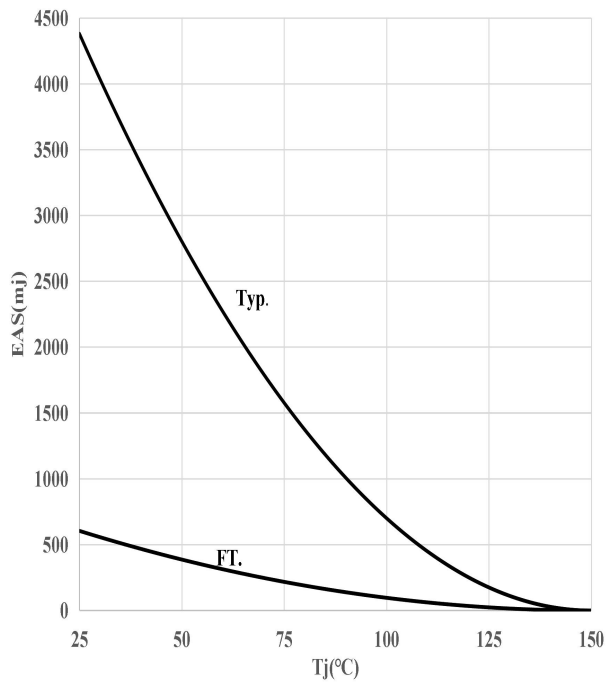
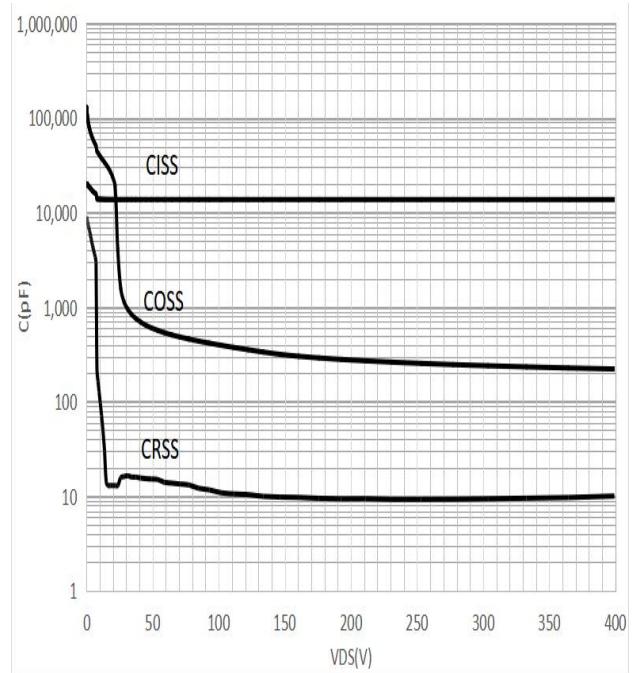
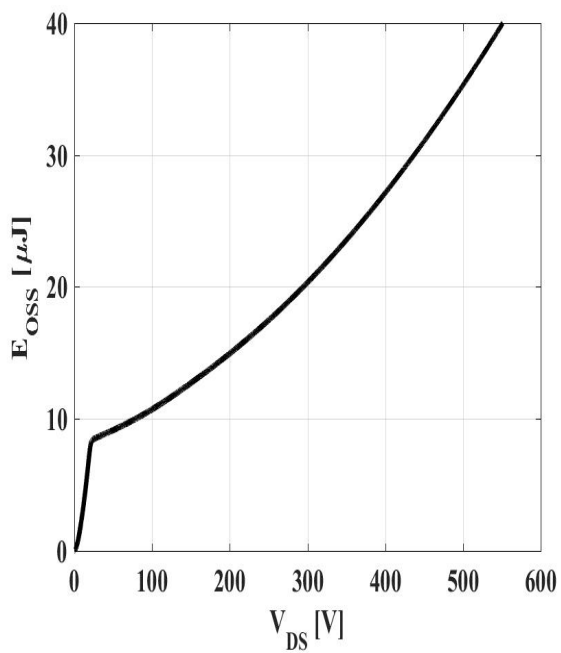
Figure 11: Typ. Transfer Characteristics

 $I_D = f(V_{GS}); V_{DS} = 20V$
Figure 12: Typ. Gate Charge

 $V_{GS} = f(Q_{gate}), I_D = 60A \text{ pulsed}$
Figure 13: Drain-Source Breakdown Voltage

 $\text{Minimum } V_{BR(DSS)} = f(T_j); I_D = 10mA$
Figure 14: Forward Characteristics of Reverse Diode

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

Figure 15: Avalanche Energy


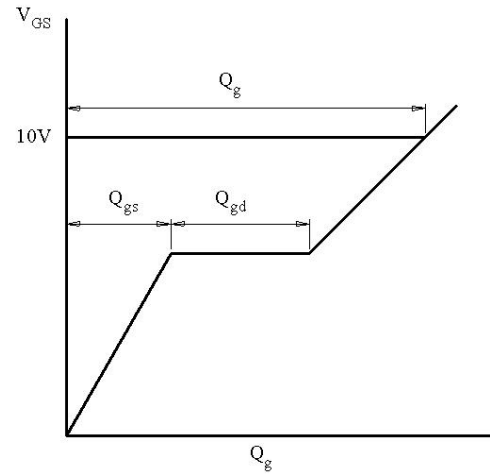
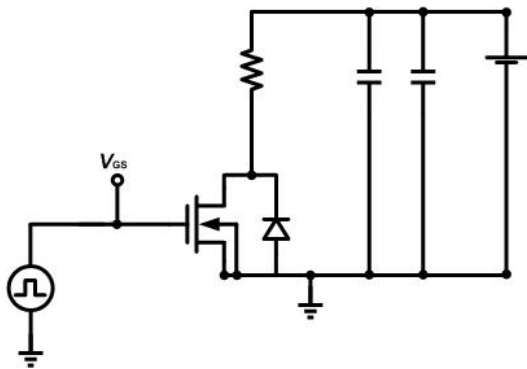
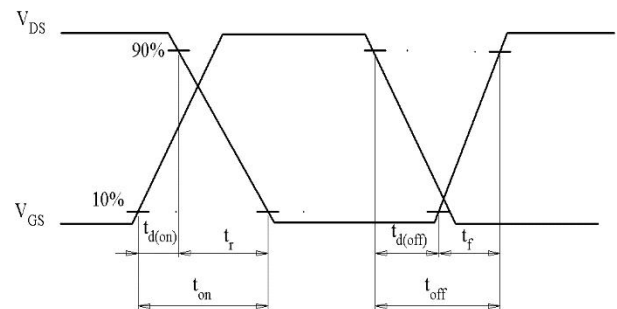
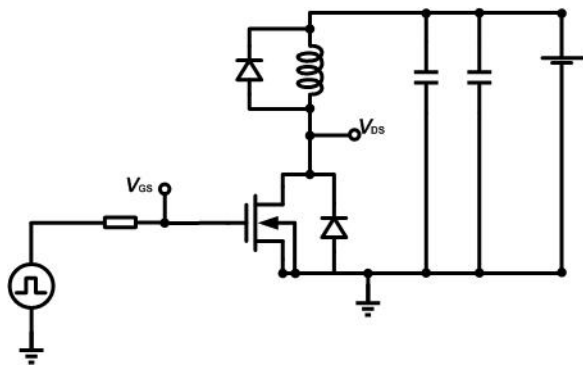
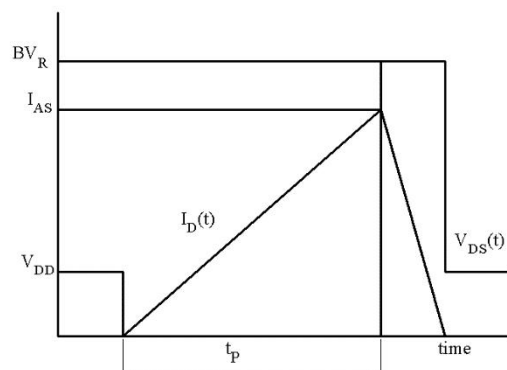
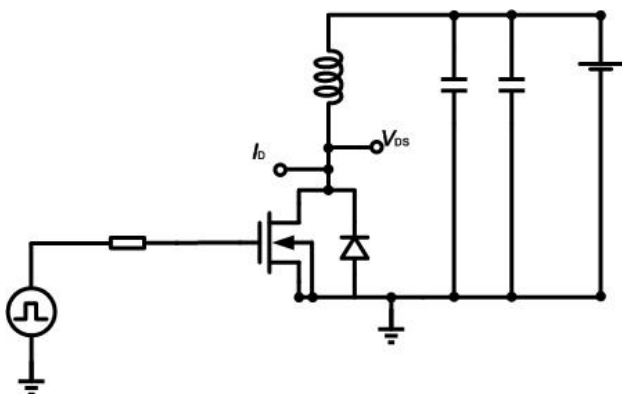
$$E_{AS}=f(T_j); V_{DD}=60V$$

Figure 16: Typ. Capacitances


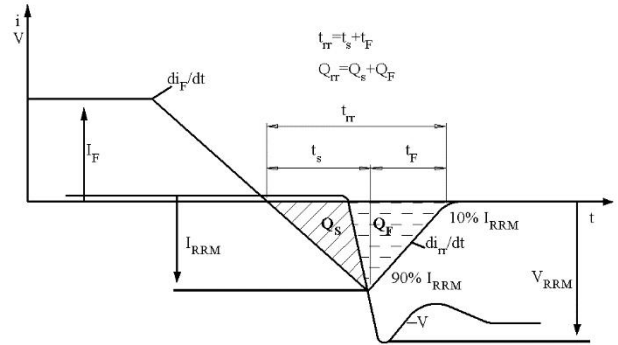
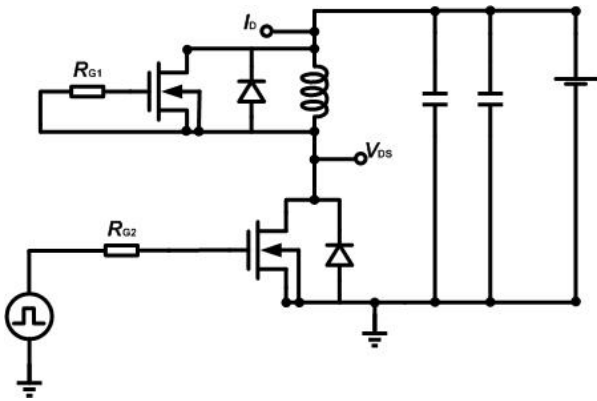
$$C=f(V_{DS}); V_{GS}=0; f=100KHz$$

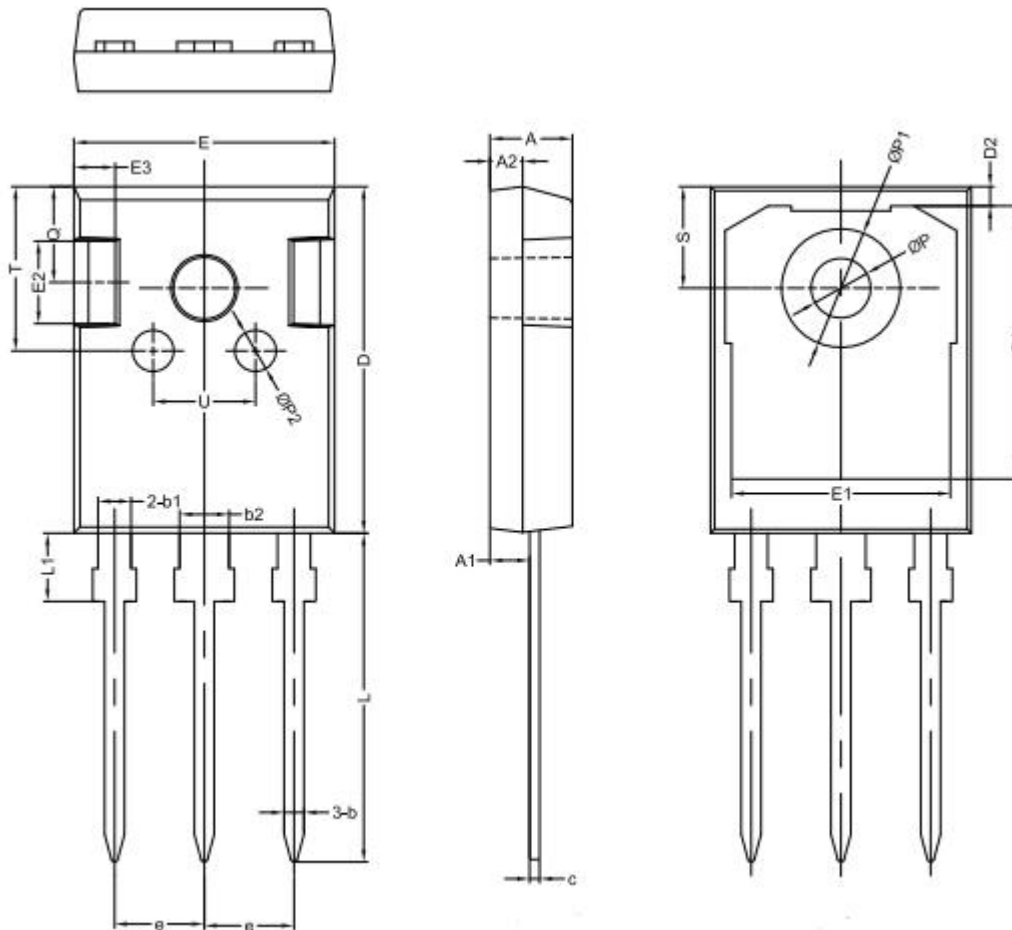
Figure 17: Coss Stored Energy


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

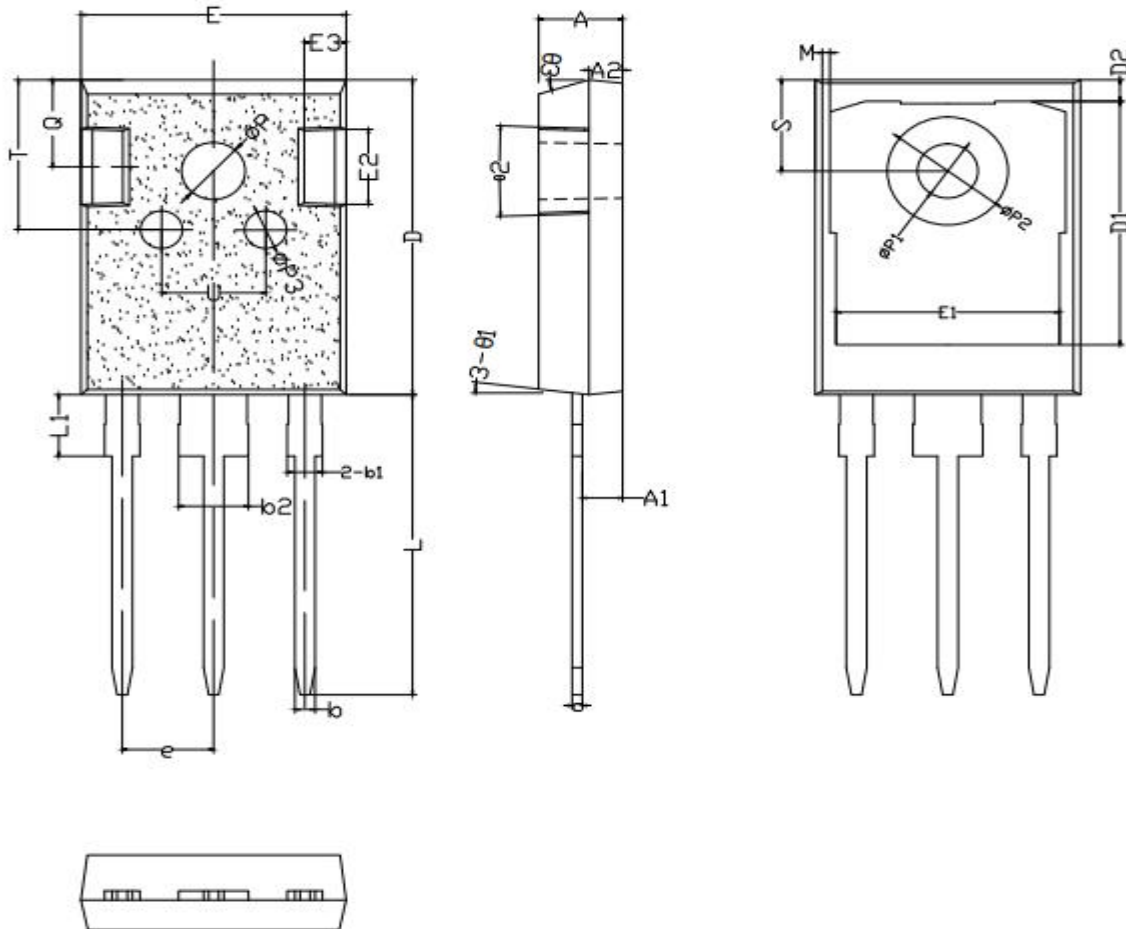
Test Circuits
1. Gate Charge Test Circuit & Waveform

2. Switch Time Test Circuit

3. Unclaimed Inductive Switching Test Circuit & Waveforms


4. Test Circuit and Waveform for Diode Characteristics

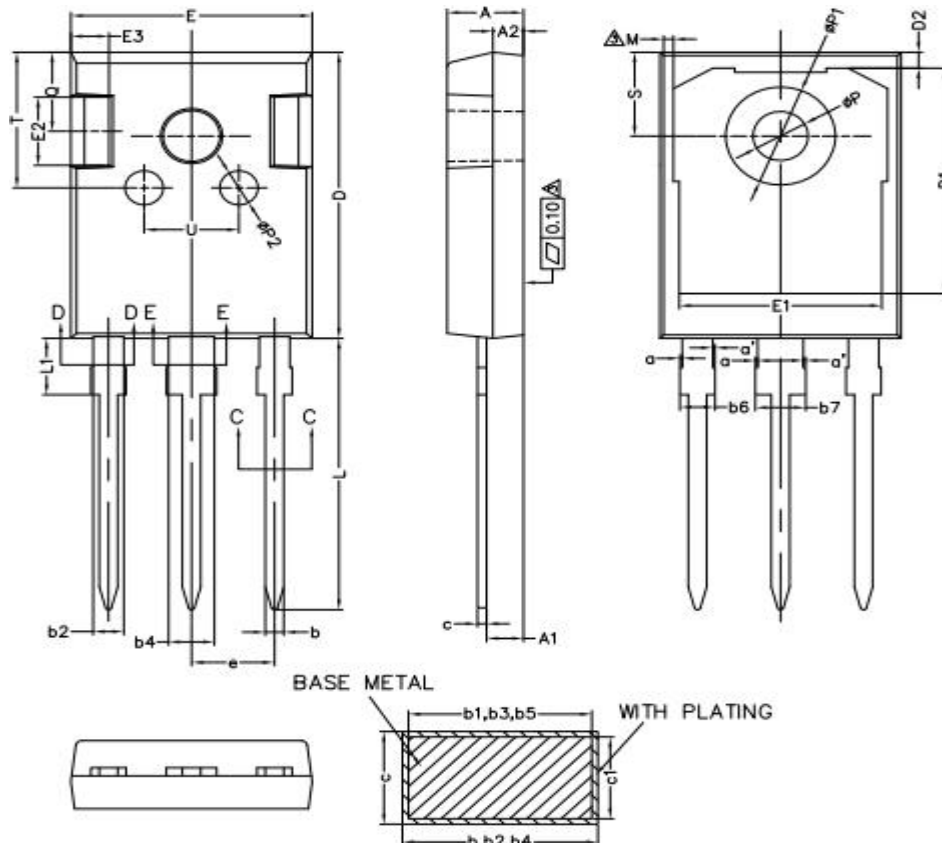


Mechanical Dimensions
TO-247(Package 1)
Unit: mm


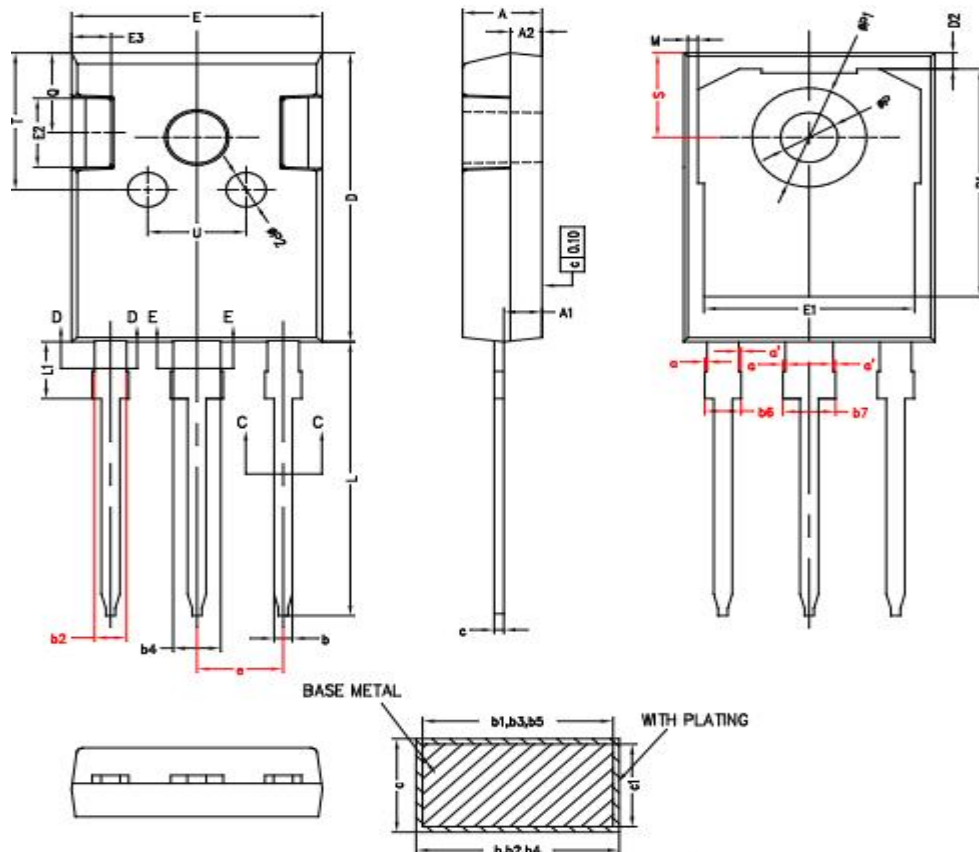
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	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E1	-	13.30	-
A1	2.21	2.41	2.61	E2	-	5.00	-
A2	1.90	2.00	2.10	E3	-	2.50	-
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	-	2.00	-	L1	-	4.13	-
b2	-	3.00	-	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	-	7.19	-
D	20.80	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
Θ1	5°	7°	9°	ΦP3	2.40	2.50	2.60
Θ2	1°	3°	5°	Θ3	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				



Shenzhen Sanrise Technology Co., LTD.

<http://www.sanrise-tech.com>

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