

General Description

The Sanrise SRC60R029FBS 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 SRC60R029FBS break down voltage is 600V and it has a high rugged avalanche characteristics.

The SRC60R029FBS is available in TO-247 package.

Features

- Ultra Low $R_{DS(ON)} = 29m\Omega @ V_{GS} = 10V$.
- $V_{ds}@T_{jmax}=650v$.
- Ultra Low Gate Charge, $Q_g=163nC$ typ.
- Fast switching capability
- Robust design with better EAS performance
- Optimized switching process
- Non-automotive Qualified
- Ultra-fast body diode

Application

- EV Charger
- High Performance PS

Symbol

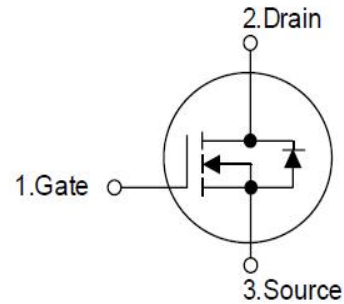
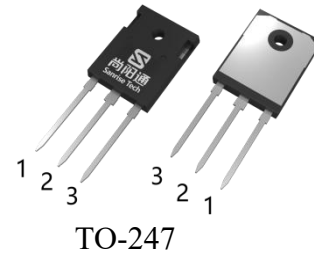


Figure 1 Symbol of SRC60R029FBS

Package Type



TO-247

Figure 2 Package Type of SRC60R029FBS

Ordering Information

SRC60R029FBS□□-□		
Circuit Type	_____	E: Lead Free
Package	_____	G: Green
T : TO-247		Blank: Tube

Package	Part Number	Marking ID	Packing Type
TO-247	SRC60R029FBST-G	SRC60R029FBSTG	Tube

Absolute Maximum Ratings^{Note 1}

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage (static)		V_{GSS}	±20	V
Gate-Source Voltage (dynamic), AC ($f > 1$ Hz)		V_{GSS}	±30	V
Power Dissipation($T_C=25^{\circ}\text{C}$, TO-247)		P_{tot}	520	W
Continuous Drain Current	$T_C=25^{\circ}\text{C}$	I_D	95	A
	$T_C=100^{\circ}\text{C}$		59	
	$T_C=125^{\circ}\text{C}$		42	
Pulsed Drain Current (Note 2)		I_{DM}	284	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	413	mJ
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	5529	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.4	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	3.8	A
Continuous Diode Forward Current		I_S	95	A
Diode Pulse Current		$I_{S,PULSE}$	284	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. $I_{AS}=3.5\text{A}$, $V_{DD}=60\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$. Finish goods test condition.
3. $I_{AS}=12.8\text{A}$, $V_{DD}=60\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$. Typical Eas.

Thermal Resistance

Parameter (TO247-package)	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	-		0.24	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	-		68	

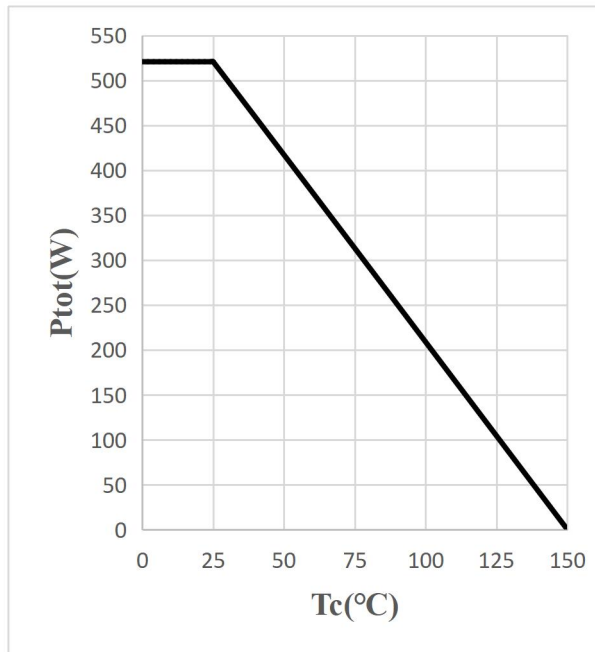
Electrical Characteristics

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

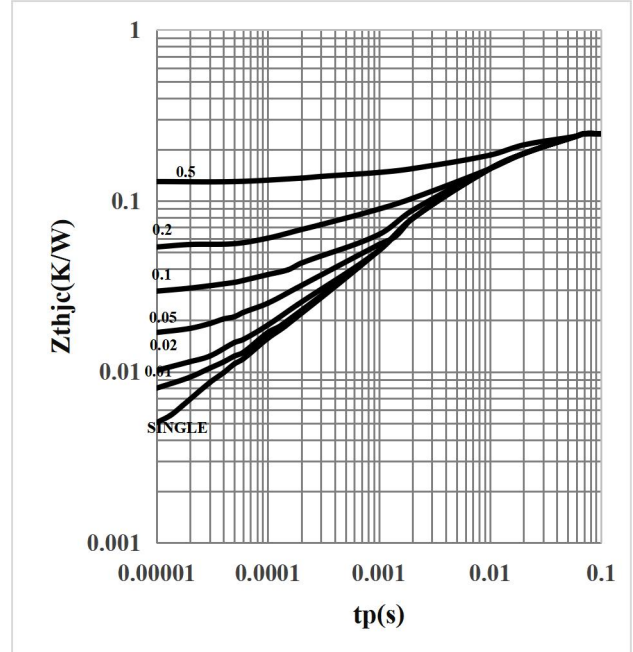
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250uA	600			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =600V, V _{GS} =0V			20	uA
Gate-Body Leakage Current	Forward	I _{GSSF}	V _{GS} =20V, V _{DS} =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 =250uA	3.5	4.5	5.5	V
Static Drain-Source On-Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =34A		22	29	mΩ
Gate Resistance		R _G	f=1MHz, Open Drain		2.1		Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =400V, V _{GS} =0V, f=100KHz		7.3		nF
Output Capacitance		C _{OSS}			176		pF
Effective output capacitance, energy related ^{NOTE5}		C _{O(er)}	V _{GS} =0V, V _{DS} =0...480V		252		pF
Effective output capacitance, time related ^{NOTE6}		C _{O(tr)}			1649		
Turn-on Delay Time		t _{d(on)}	V _{DD} =400V, I _D =34A R _G =3Ω, V _{GS} =12V		71		ns
Rise Time		t _r			18		
Turn-off Delay Time		t _{d(off)}			117		
Fall Time		t _f			12		
Gate Charge Characteristics							
Gate to Source Charge		Q _{gs}	V _{DD} =400V, I _D =34A V _{GS} =0 to 10V		57		nC
Gate to Drain Charge		Q _{gd}			74		
Gate Charge Total		Q _g			163		
Gate Plateau Voltage		V _{plateau}			7.6		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =34A		0.9	1.1	V
Reverse Recovery Time		t _{rr}	V _R =400V, I _F =34A dI _F /dt=100A/us		244		ns
Reverse Recovery Charge		Q _{rr}			2.42		uC
Peak Reverse Recovery Current		I _{rrm}			15.8		A

Note:

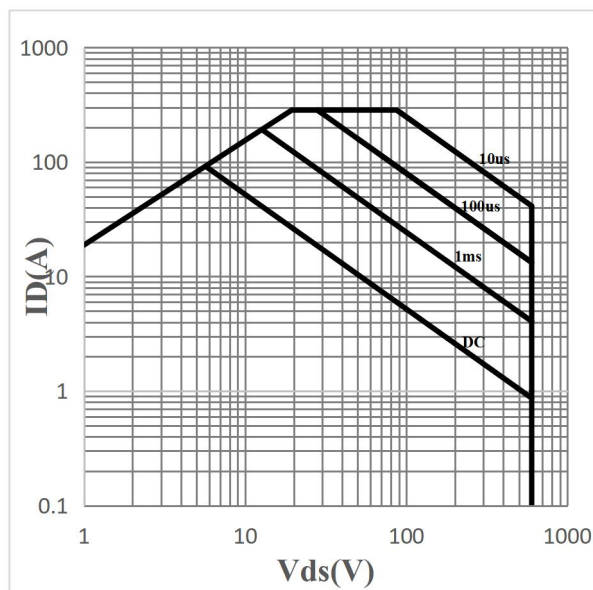
- $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 480V
- $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 480 V

Typical Performance Characteristics
Figure 3: Power Dissipation


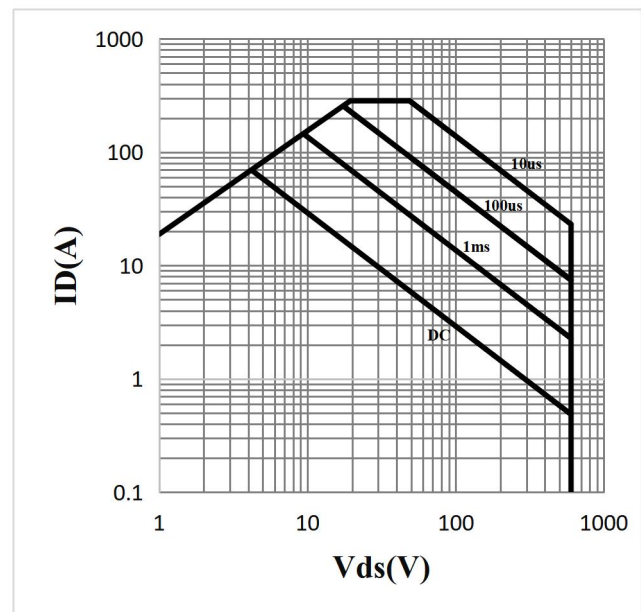
$$P_{\text{tot}} = f(T_c)$$

Figure 4: Max. Transient Thermal Impedance


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

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


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

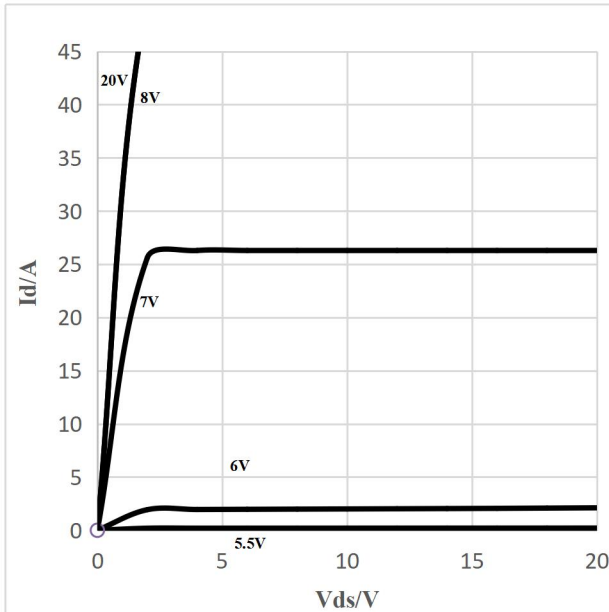
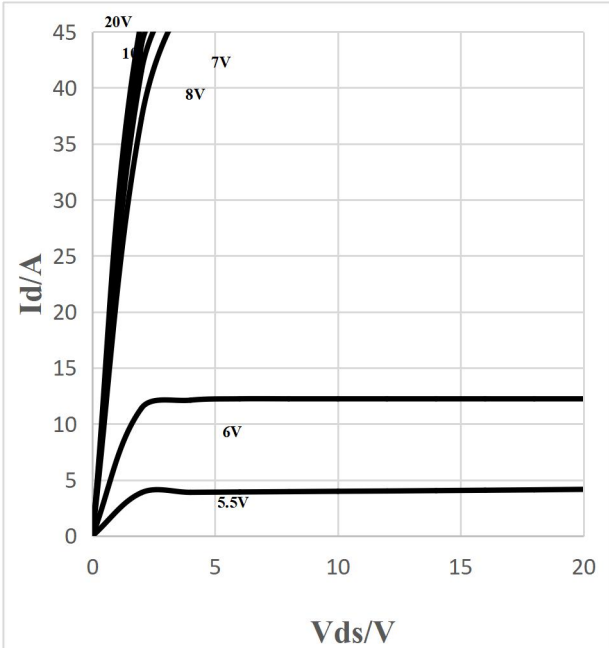
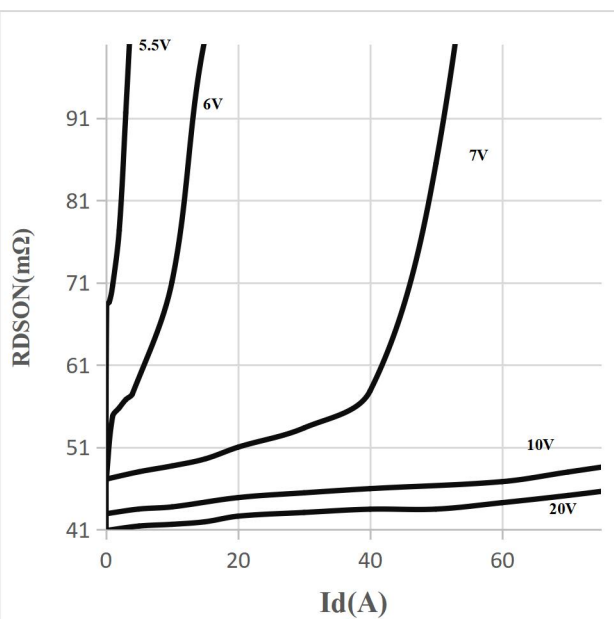
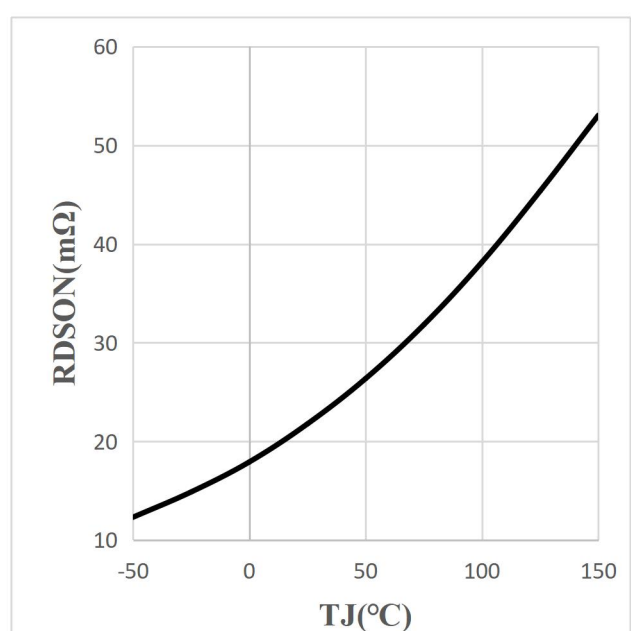
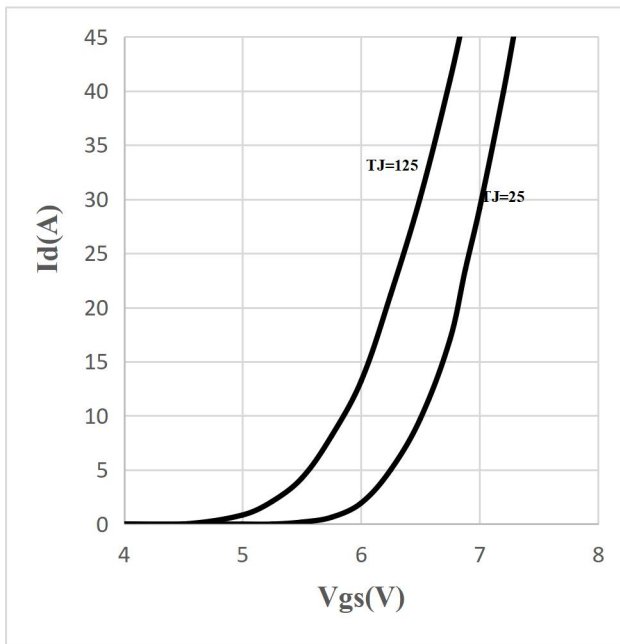
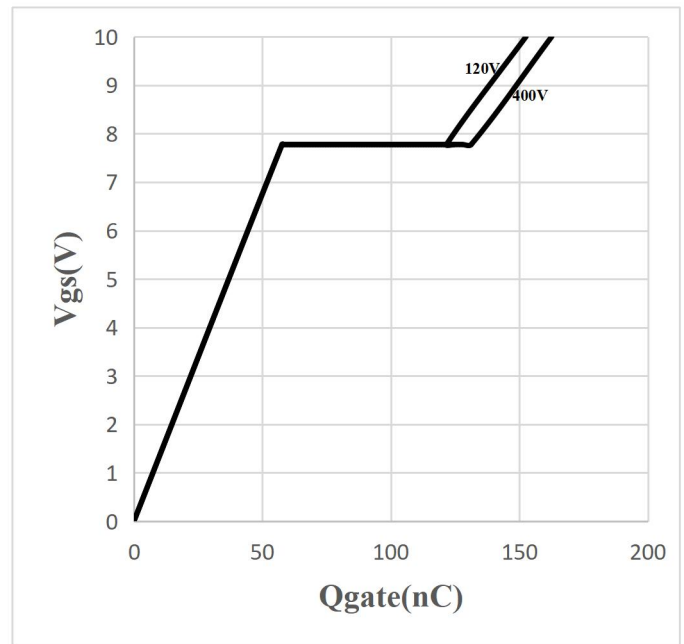
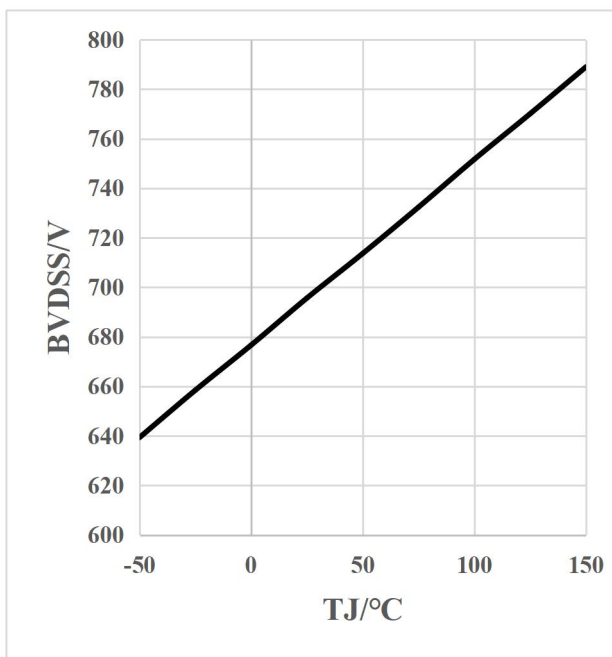
29mΩ, 600V, Super Junction N-Channel Power MOSFET
SRC60R029FBS
Figure 7: Typ. Output Characteristics

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

 $R_{DS(ON)} = f(T_j); I_D = 34\text{A}; V_{GS} = 10\text{V}$

Figure 11: Typ. Transfer Characteristics


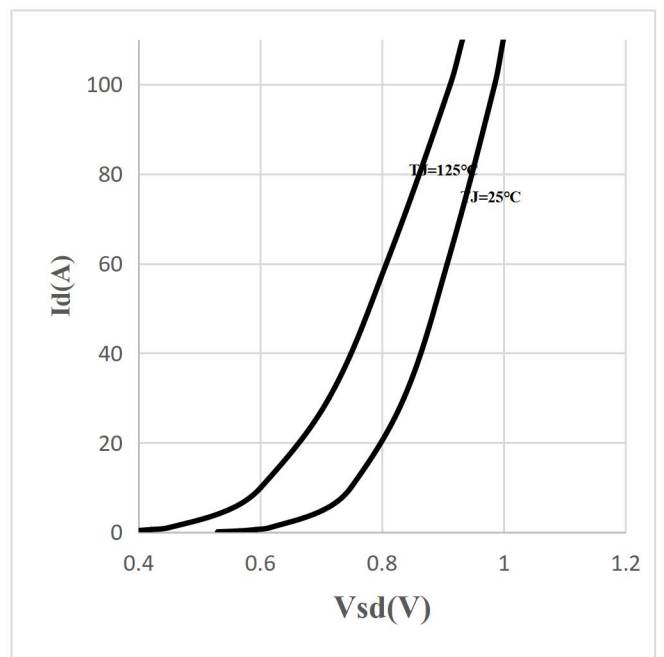
$$I_D = f(V_{GS}); V_{DS} = 20V$$

Figure 12: Typ. Gate Charge


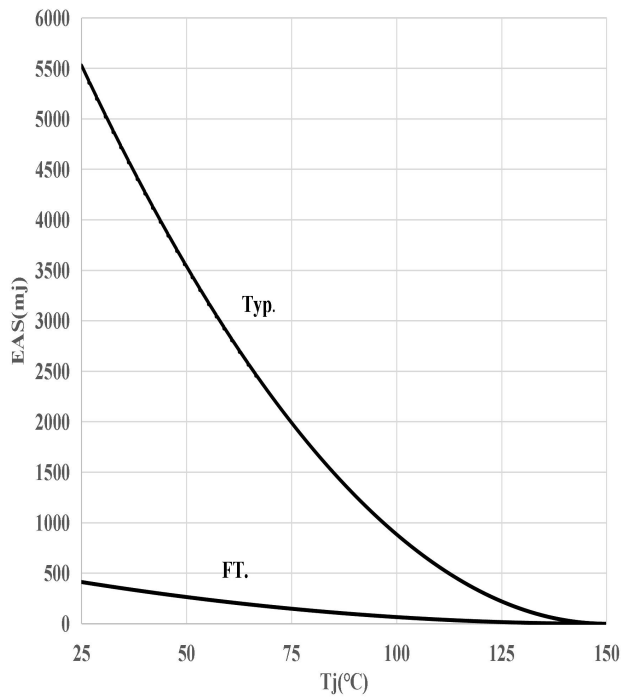
$$V_{GS} = f(Q_{gate}), I_D = 34A \text{ pulsed}$$

Figure 13: Drain-Source Breakdown Voltage


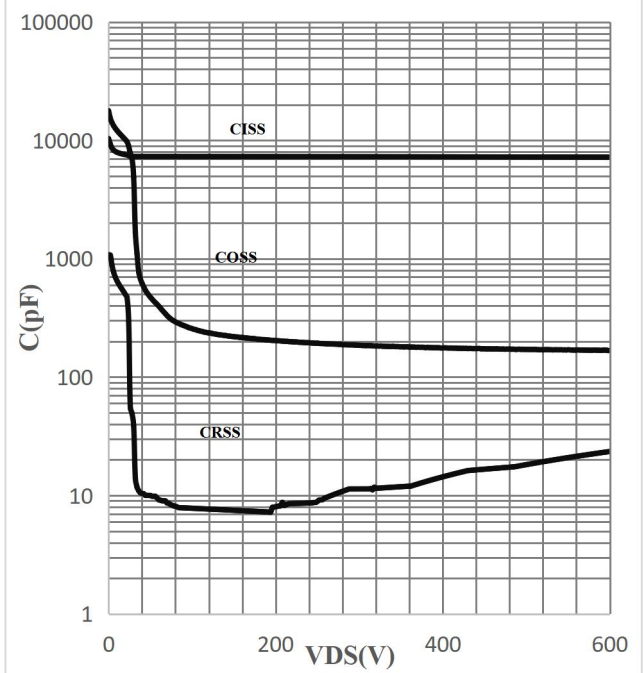
$$V_{BR(DSS)} = f(T_J); I_D = 10mA$$

Figure 14: Forward Characteristics of Reverse Diode


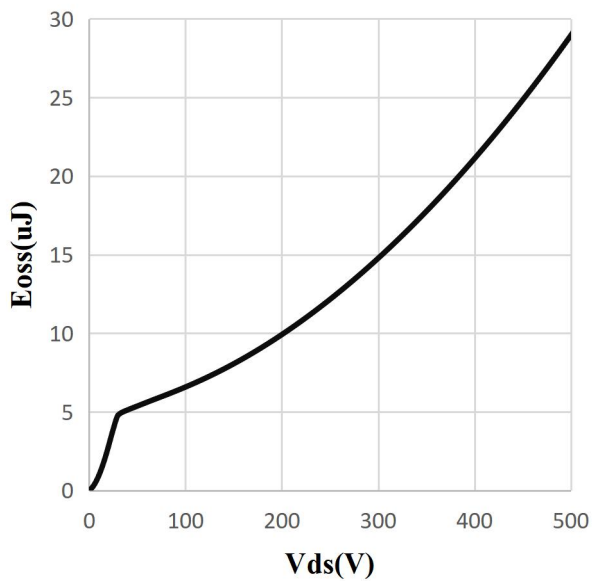
$$I_F = f(V_{SD}); \text{parameter: } T_J$$

Figure 15: Avalanche Energy


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

Figure 16: Typ. Capacitances


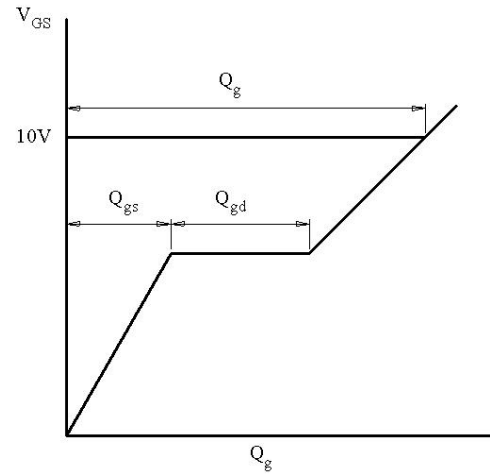
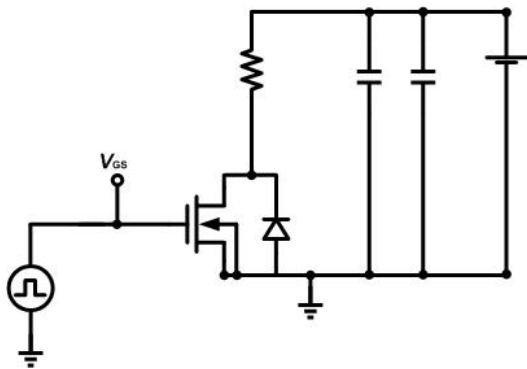
$$C=f(V_{DS}); V_{GS}=0; f=100KHz$$

Figure 17: Coss Stored Energy


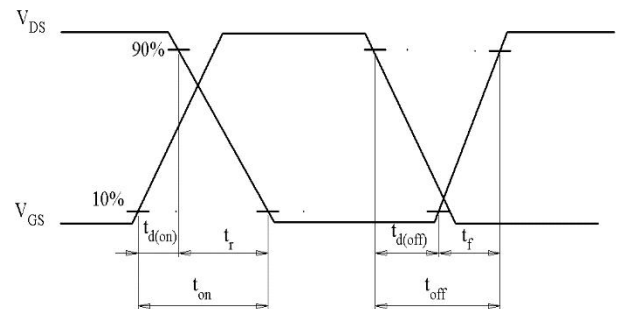
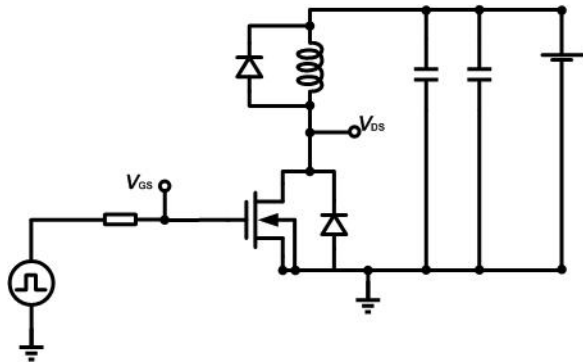
$$E_{oss}=f(V_{DS})$$

Test Circuits

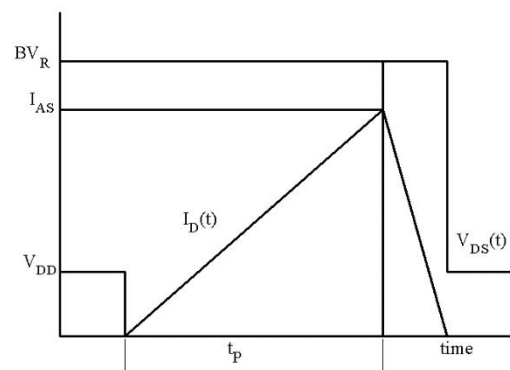
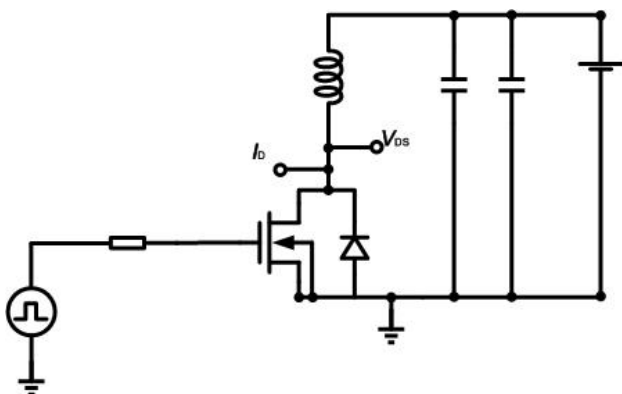
1. Gate Charge Test Circuit & Waveform



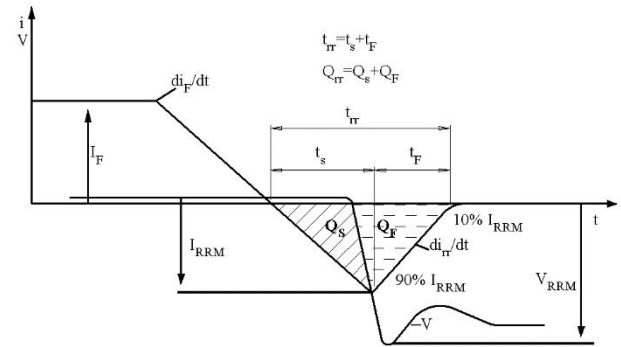
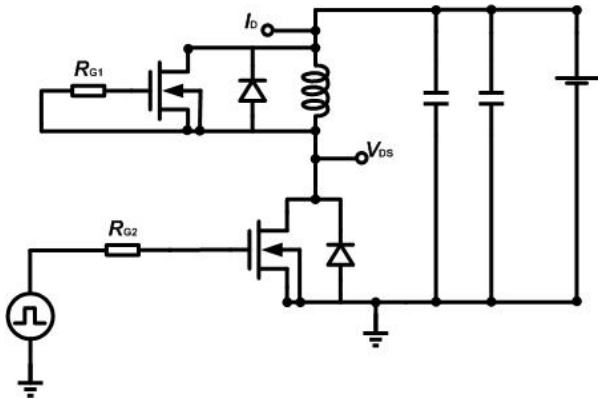
2. Switch Time Test Circuit

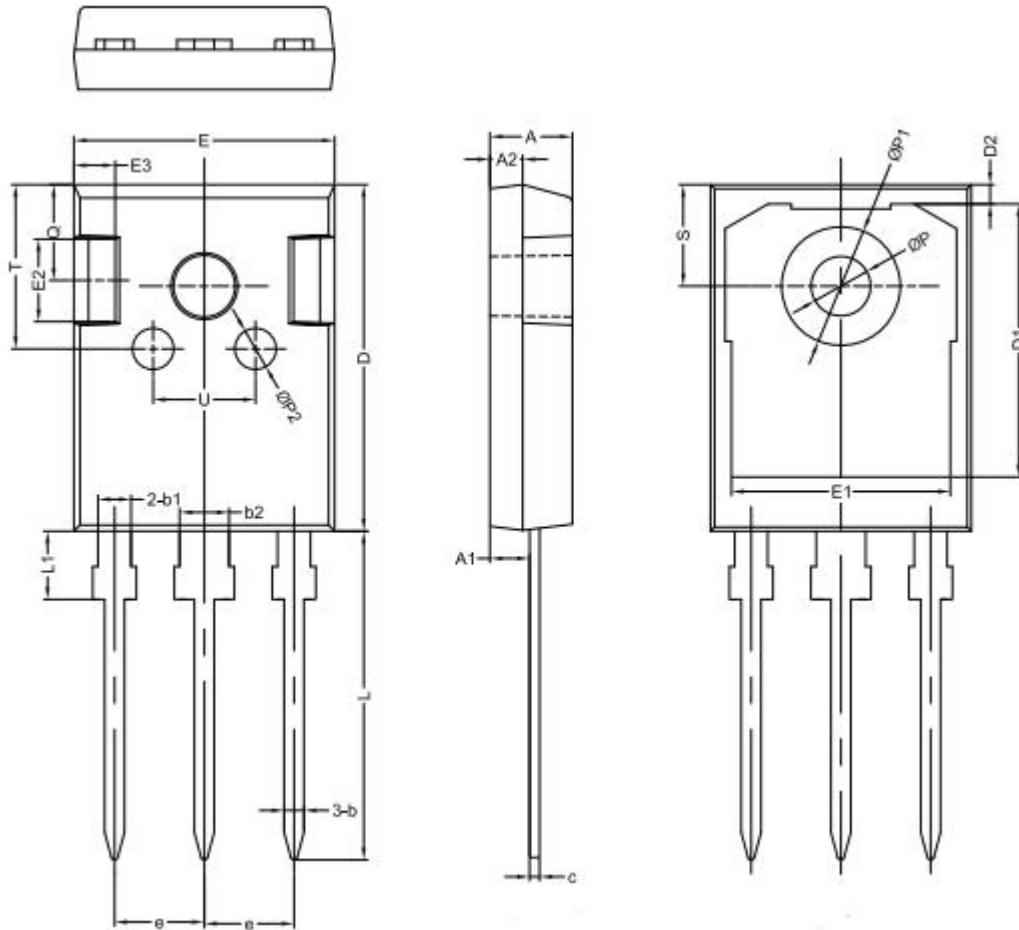


3. Unclaimed Inductive Switching Test Circuit & Waveforms

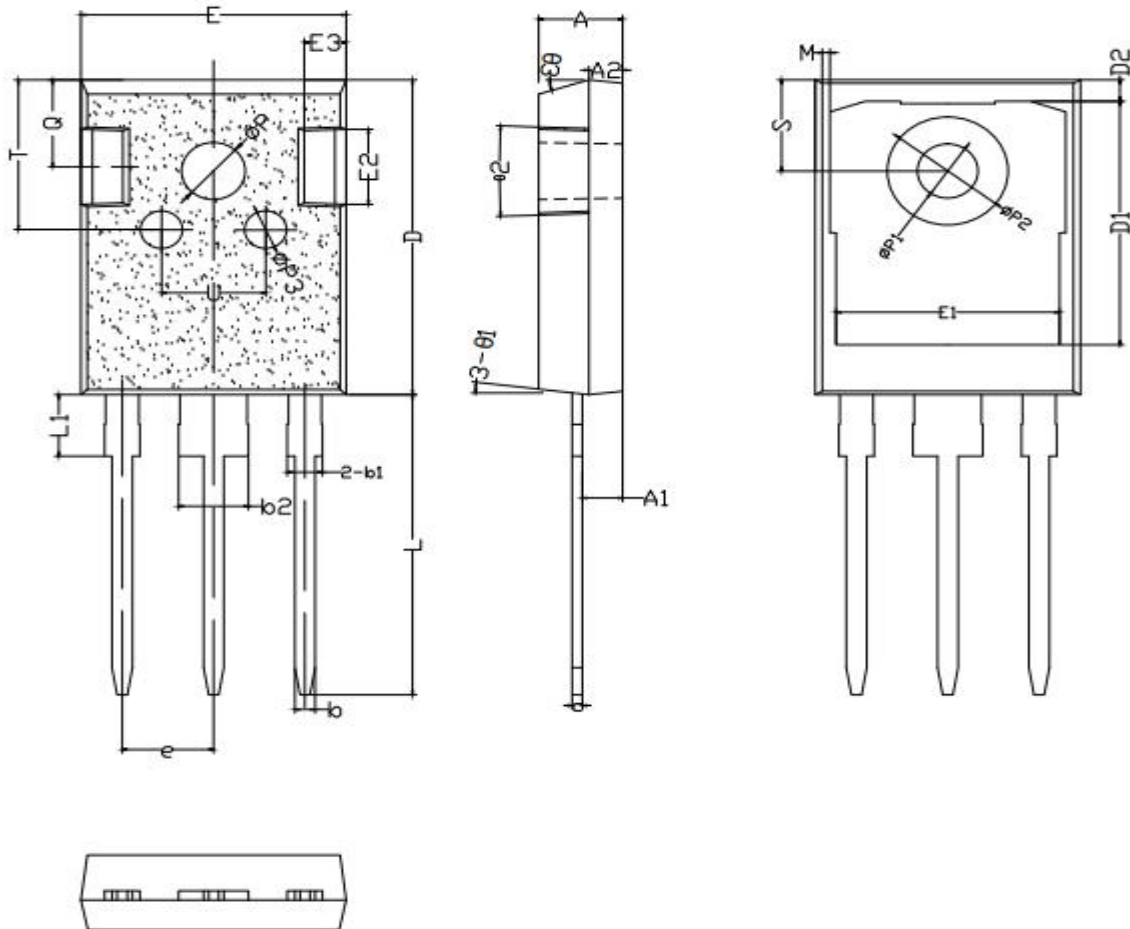


4. Test Circuit and Waveform for Diode Characteristics

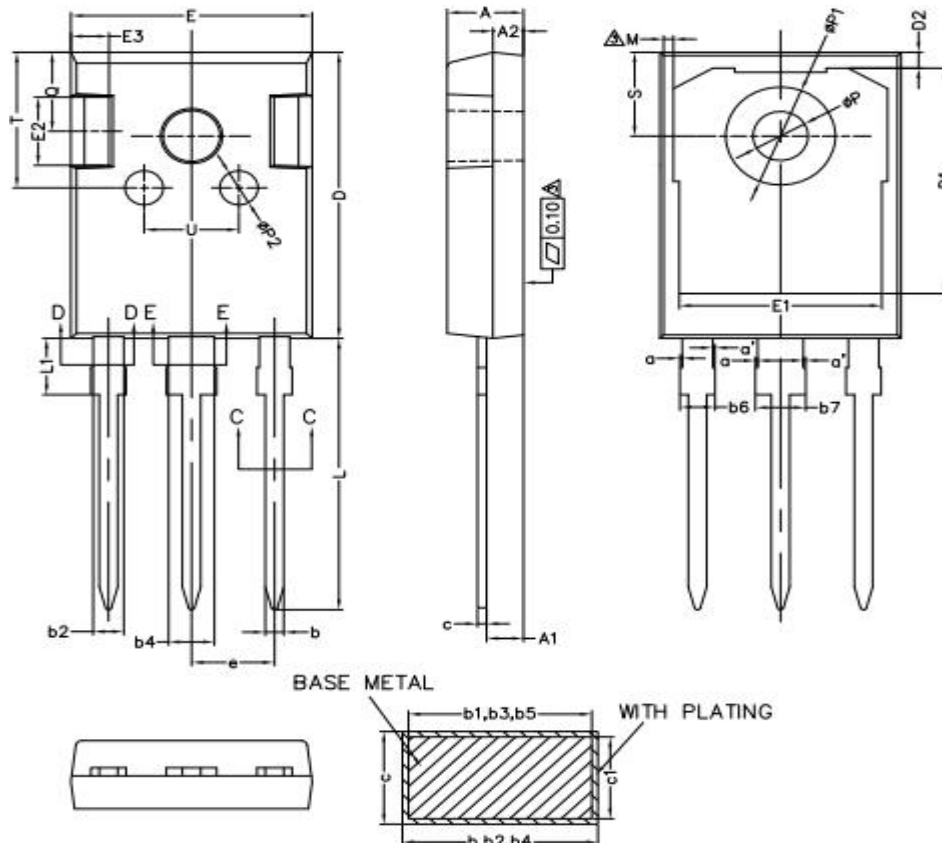


Mechanical Dimensions
TO-247(Package 1)
Unit: mm


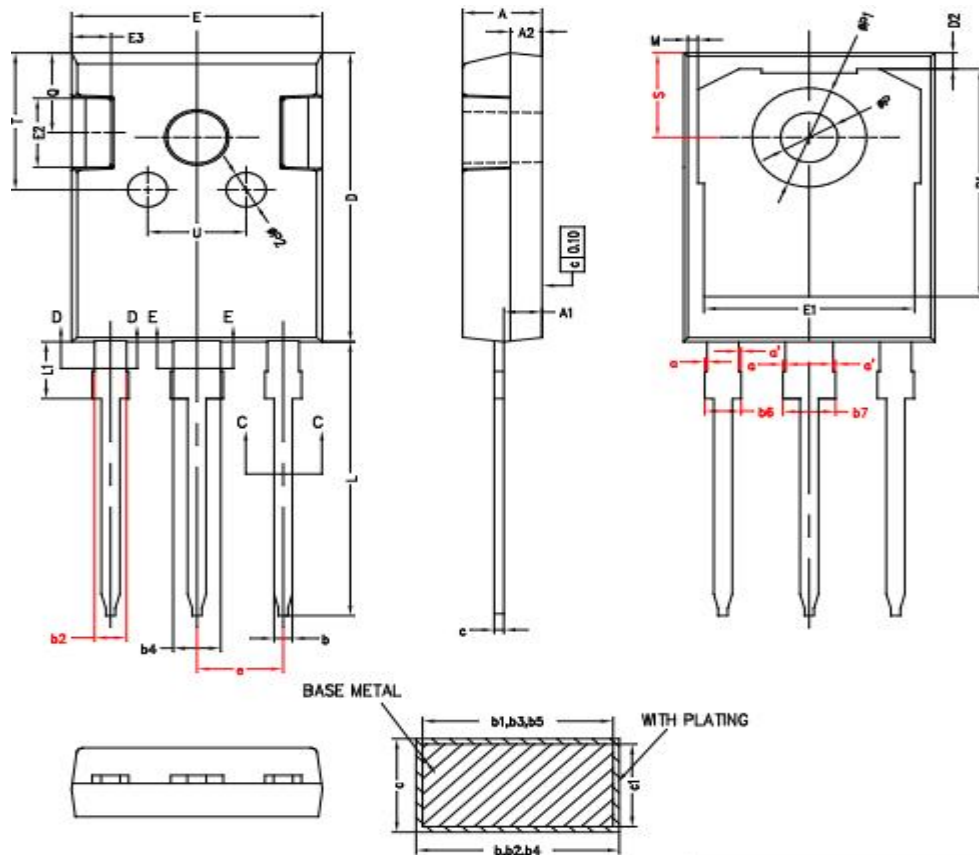
Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E1	-	13.30	-
A1	2.21	2.41	2.61	E2	-	5.00	-
A2	1.90	2.00	2.10	E3	-	2.50	-
b	1.10	1.20	1.35	L	19.42	19.92	20.42
b1	-	2.00	-	L1	-	4.13	-
b2	-	3.00	-	P	3.50	3.60	3.70
c	0.55	0.60	0.75	P1	-	7.19	-
D	20.80	21.00	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
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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