

General Description

The Sanrise SRC60R022FB 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 SRC60R022FB break down voltage is 600V and it has a high rugged avalanche characteristics. The SRC60R022FB is available in TO-247 package.

Features

- Ultra Low $R_{DS(ON)} = 22m\Omega @ V_{GS} = 10V$.
- Ultra Low Gate Charge, $Q_g = 168nC$ typ.
- Intrinsic Fast-Recovery Body Diode
- Fast switching capability
- Robust design with better EAS performance

Application

- EV Charger
- Sever / Telecom

Symbol

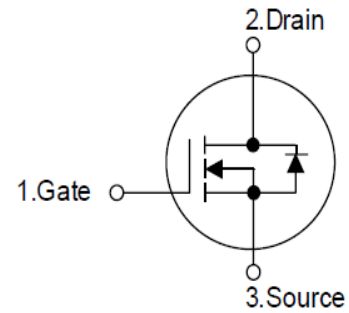


Figure 1 Symbol of SRC60R022FB

Package Type



TO-247

Figure 2 Package Type of SRC60R022FB

Ordering Information

		SRC60R022FB□□-□	
Circuit Type	_____	_____	E: Lead Free
Package	_____	_____	G: Green
T: TO-247			Blank: Tube
			TR: Tape & Reel

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-247	SRC60R022FBT-E	SRC60R022FBT-G	SRC60R022FBTE	SRC60R022FBTG	Tube

Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	±30	V
Continuous Drain Current	$T_C=25^{\circ}\text{C}$	I_D	115	A
	$T_C=125^{\circ}\text{C}$		51.4	
Pulsed Drain Current (Note 2)		I_{DM}	345	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	1600	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	1.6	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	9.0	A
Continuous Diode Forward Current		I_S	115	A
Diode Pulse Current		$I_{S,PULSE}$	345	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. $I_{AS} = 9.0\text{A}$, $V_{DD} = 60\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

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			10	uA
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 =3.0mA	3.0	4.0	5.0	V
Static Drain-Source On-Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =57A		18.6	22	mΩ
Gate Resistance		R _G	f=1MHz, Open Drain		1.6		Ω
Dynamic Characteristics							
Input Capacitance		C _{ISS}	V _{DS} =50V, V _{GS} =0V, f=1MHz		11.3		nF
Output Capacitance		C _{OSS}			533		pF
Reverse Transfer Capacitance		C _{RSS}			3.7		
Effective output capacitance, energy related ^{NOTE5}		C _{O(er)}	V _{GS} =0V, V _{DS} =0...400V		301.4		pF
Effective output capacitance, time related ^{NOTE6}		C _{O(tr)}			1835.7		
Turn-on Delay Time		t _{d(on)}	V _{DD} =400V, I _D =57A R _G =1.8Ω, V _{GS} =10V		29		ns
Rise Time		t _r			26		
Turn-off Delay Time		t _{d(off)}			74		
Fall Time		t _f			6		
Gate Charge Characteristics							
Gate to Source Charge		Q _{gs}	V _{DD} =480V, I _D =57A V _{GS} =0 to 10V		78		nC
Gate to Drain Charge		Q _{gd}			46.5		
Gate Charge Total		Q _g			168		
Gate Plateau Voltage		V _{plateau}			6.5		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _{SD} =57A		0.9	1.1	V
Reverse Recovery Time		t _{rr}	V _R =100V, I _F =57A dI _F /dt=100A/us		182		ns
Reverse Recovery Charge		Q _{rr}			1.43		uC
Peak Reverse Recovery Current		I _{rrm}			15.7		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 400V

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 400 V

Typical Performance Characteristics

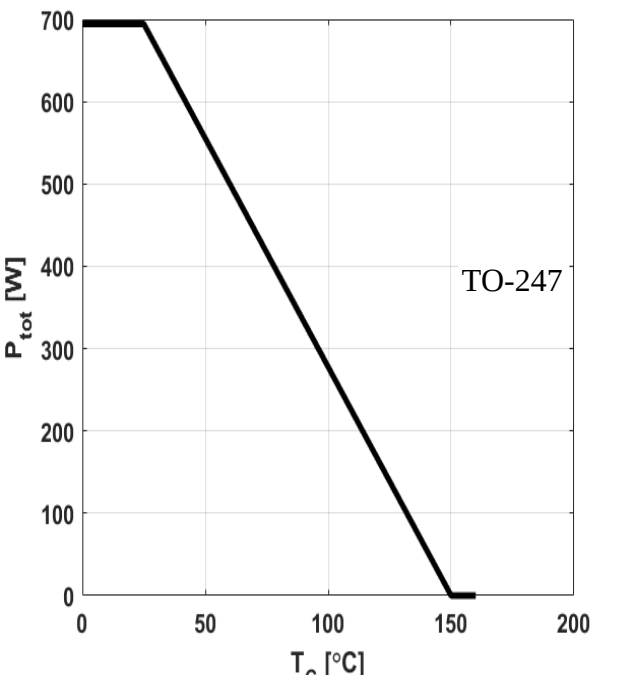
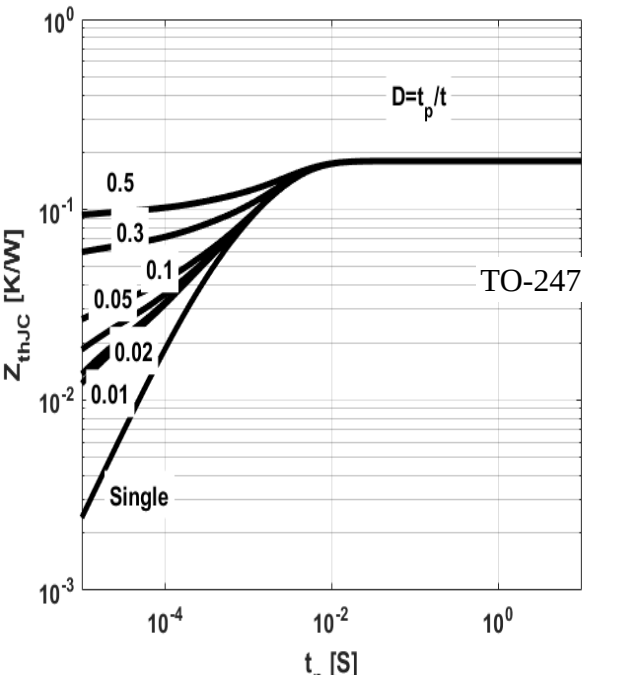
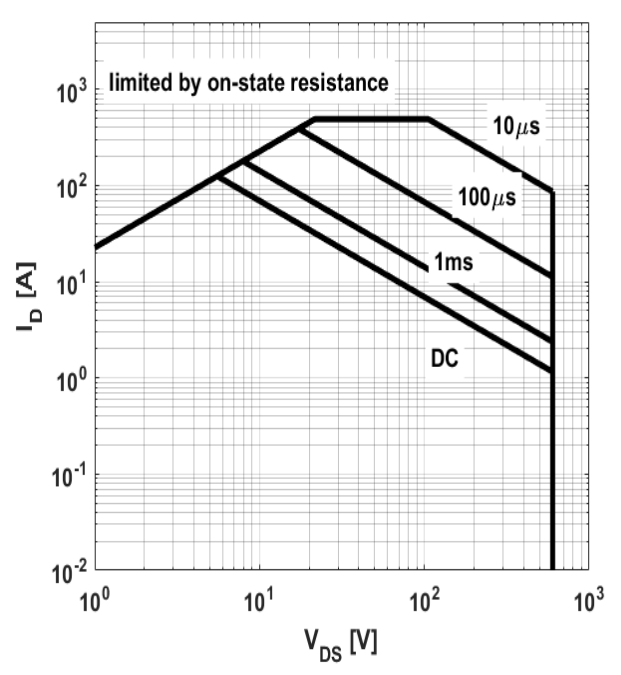
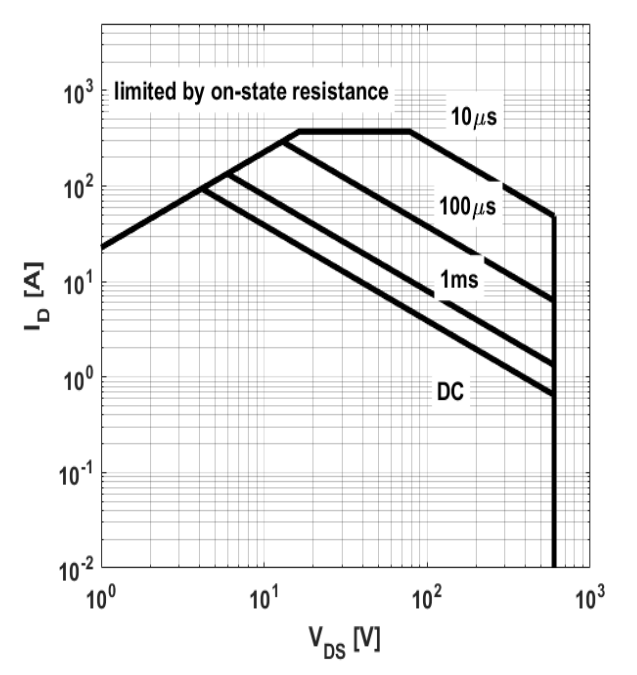
Figure 3: Power Dissipation  $P_{tot} = f(T_c)$	Figure 4: Max. Transient Thermal Impedance  $Z_{(th)JC} = f(t_p)$; parameter: $D = t_p / T$
Figure 5: Safe Operating Area  $I_D = f(V_{DS})$; $T_c = 25^\circ\text{C}$; $V_{GS} > 7\text{V}$; parameter t_p	Figure 6: Safe Operating Area  $I_D = f(V_{DS})$;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

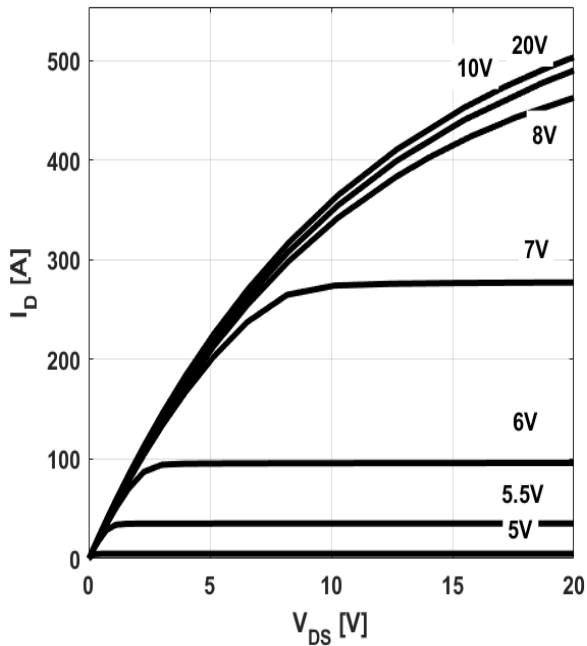
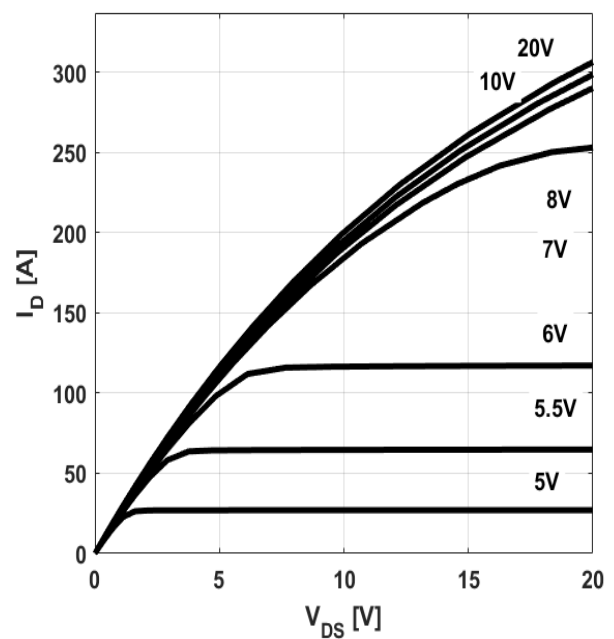
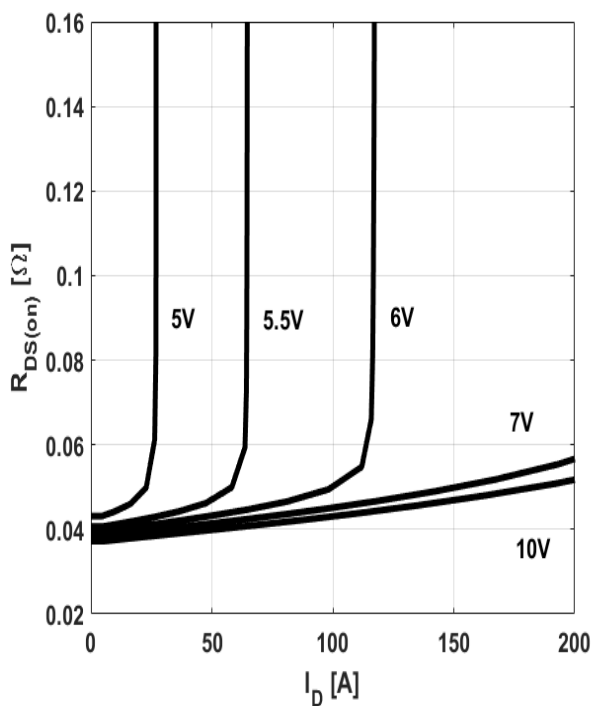
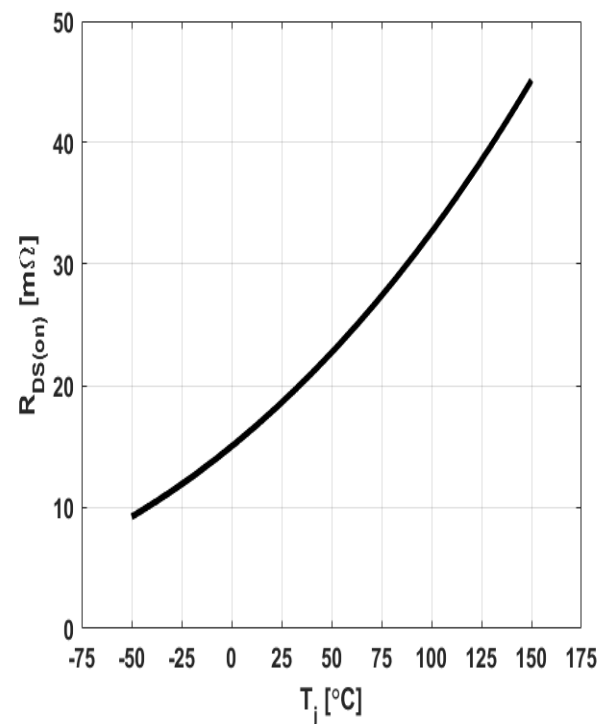
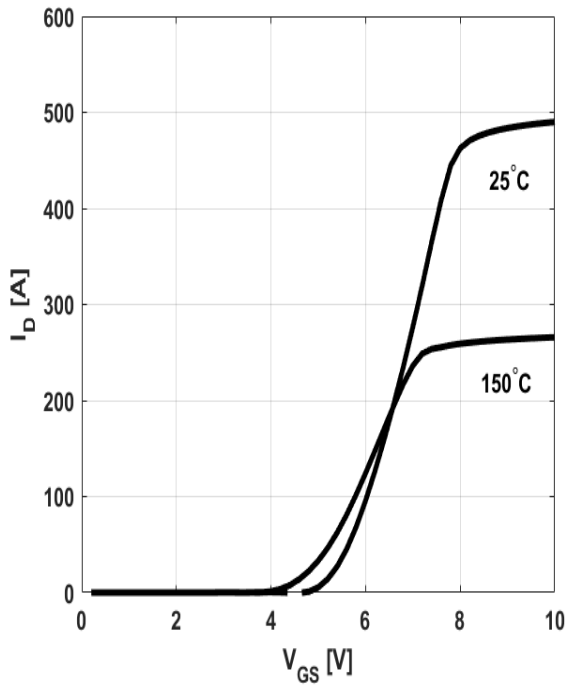
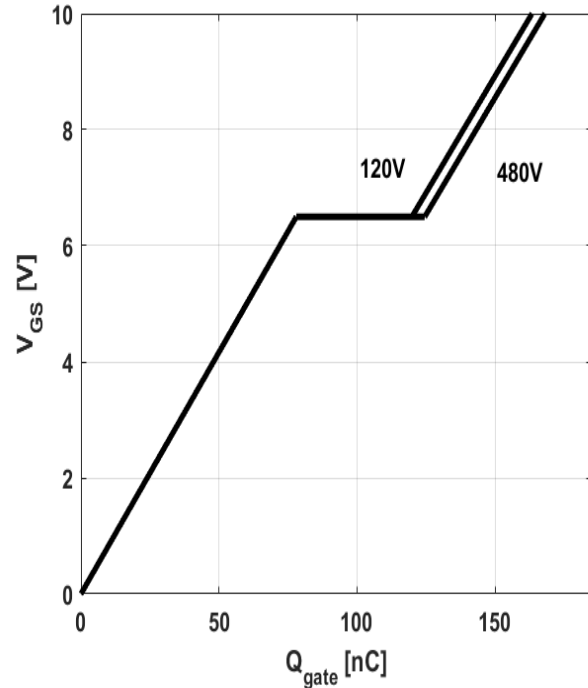
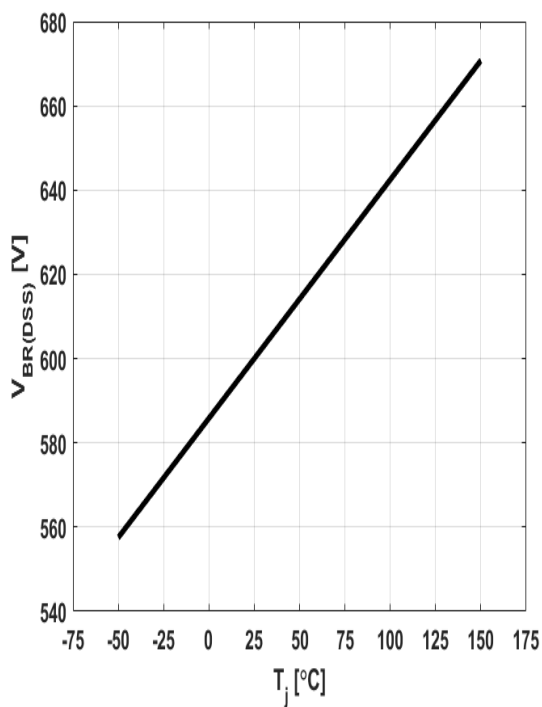
Figure 7: Typ. Output Characteristics

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

 $R_{DS(ON)} = f(T_j); I_D = 57\text{A}; V_{GS} = 10\text{V}$

Figure 11: Typ. Transfer Characteristics


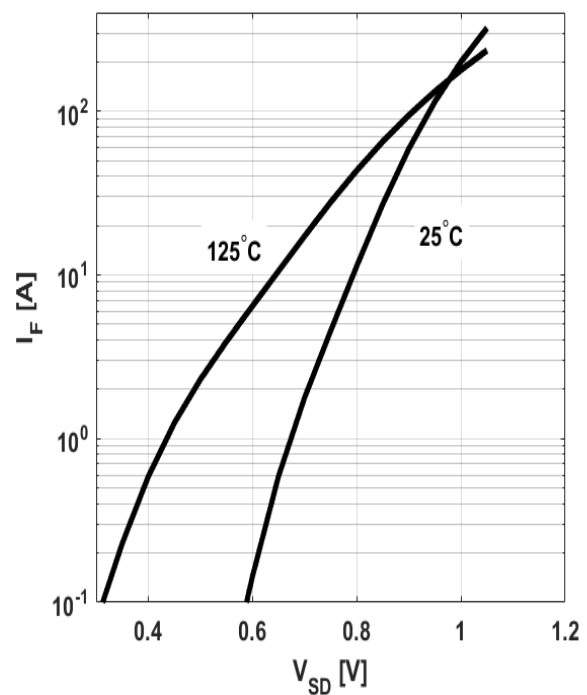
$$I_D = f(V_{GS}); V_{DS} = 20V$$

Figure 12: Typ. Gate Charge


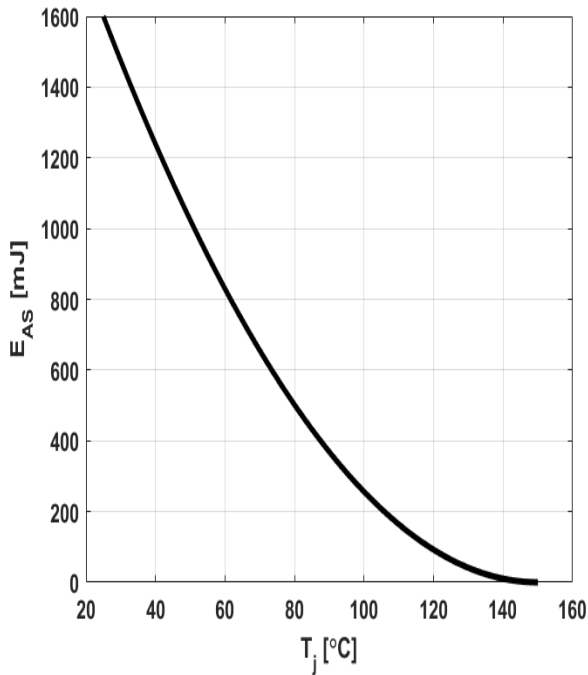
$$V_{GS} = f(Q_{gate}), I_D = 57A \text{ pulsed}$$

Figure 13: Drain-Source Breakdown Voltage


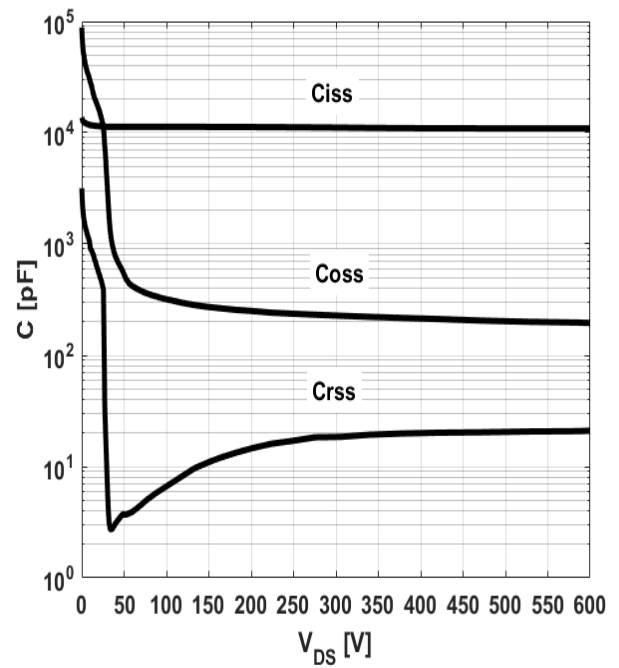
$$V_{BR(DSS)} = f(T_j); I_D = 10mA$$

Figure 14: Forward Characteristics of Reverse Diode


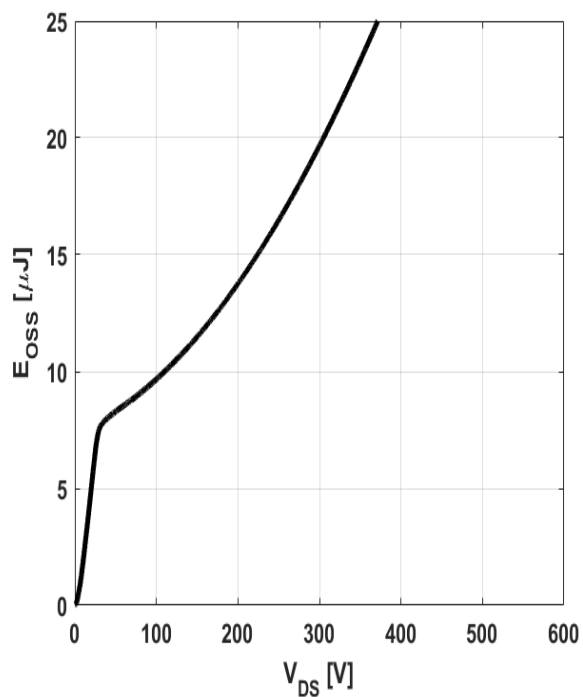
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

Figure 15: Avalanche Energy


$$E_{AS}=f(T_j); I_D=9.0A; V_{DD}=60V$$

Figure 16: Typ. Capacitances


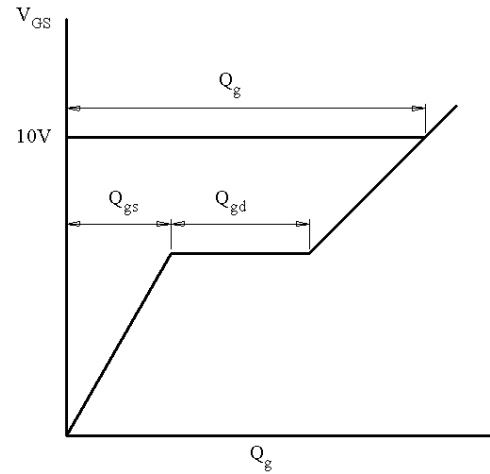
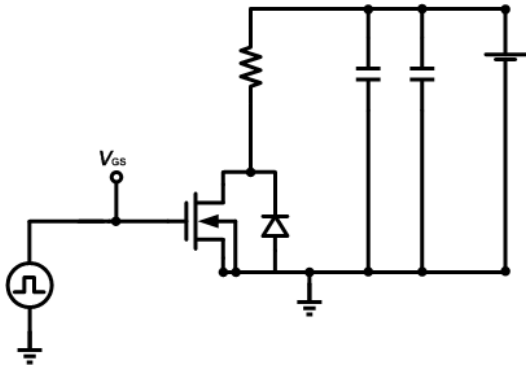
$$C=f(V_{DS}); V_{GS}=0; f=1MHz$$

Figure 17: Coss Stored Energy


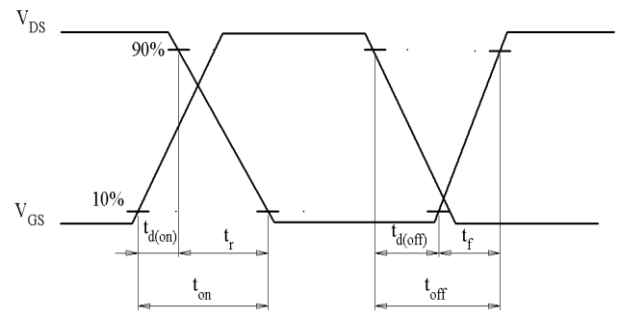
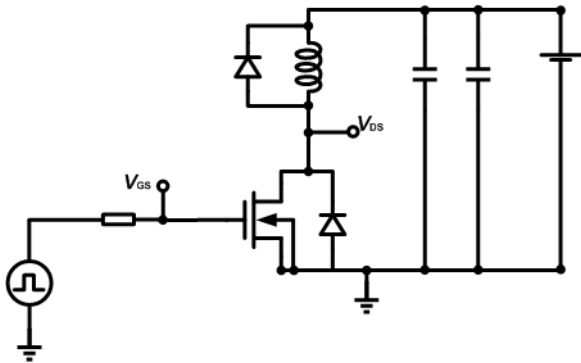
$$E_{OSS}=f(V_{DS})$$

Test Circuits

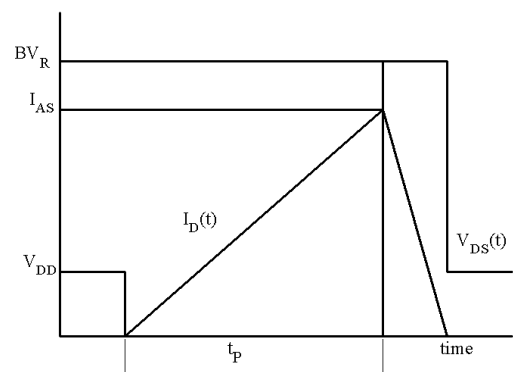
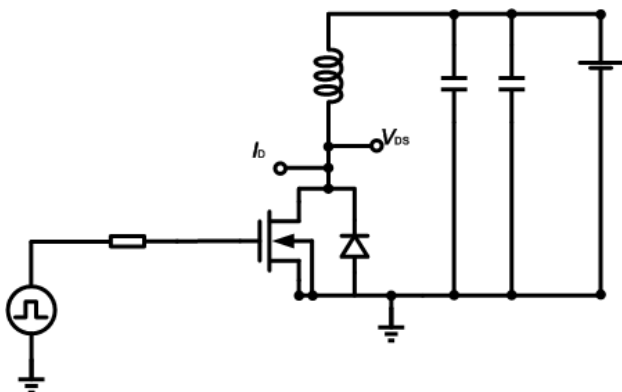
1. Gate Charge Test Circuit & Waveform



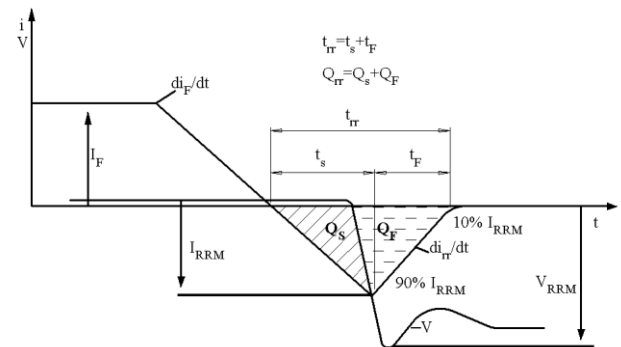
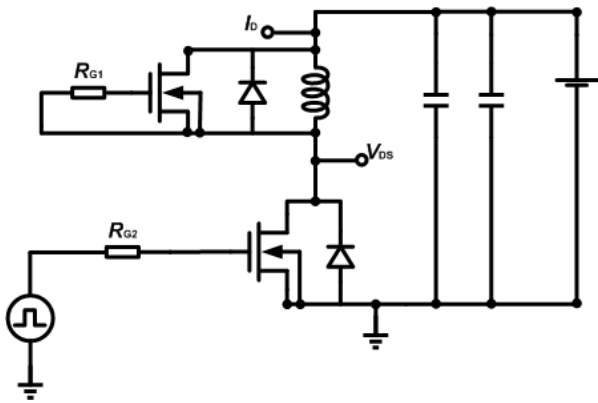
2. Switch Time Test Circuit

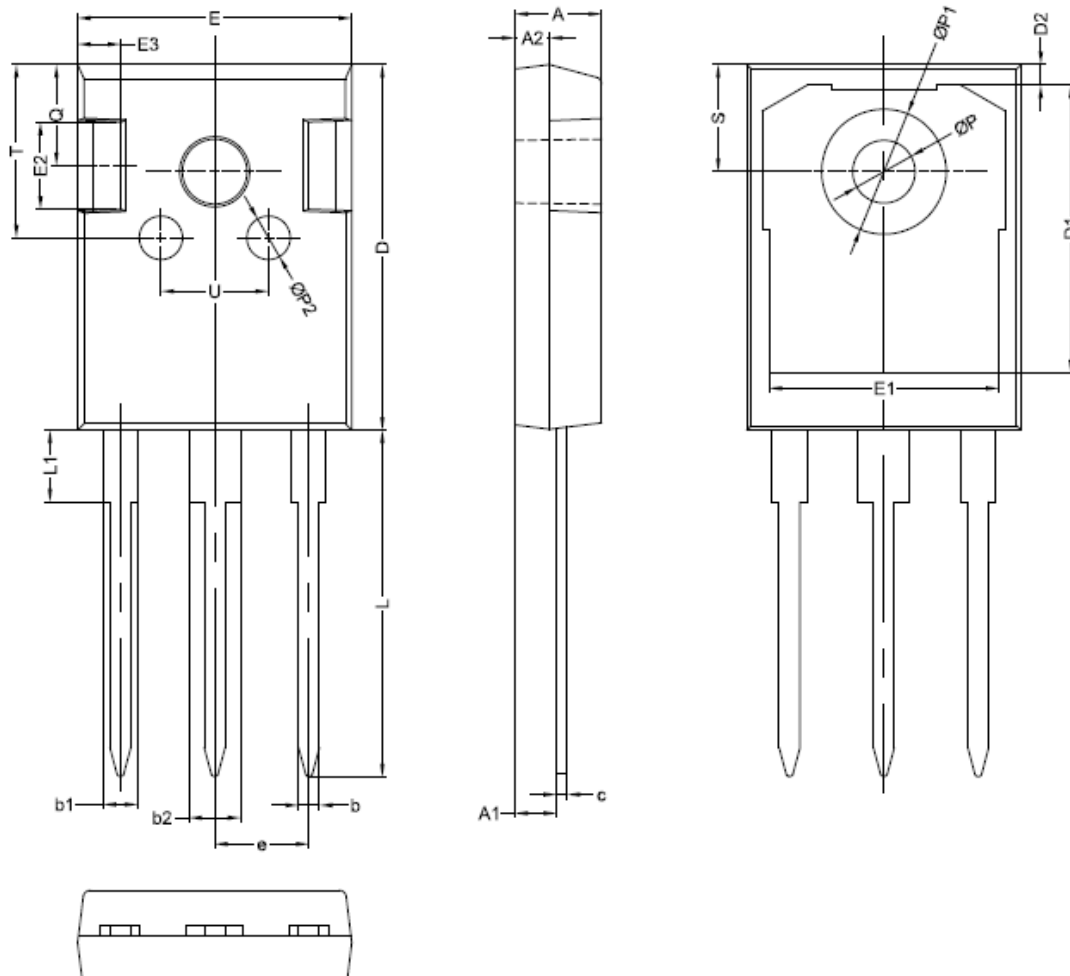


3. Unclaimed Inductive Switching Test Circuit & Waveforms



4. Test Circuit and Waveform for Diode Characteristics



Mechanical Dimensions
TO-247
Unit: mm


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E2	-	5.00	-
A1	2.21	2.41	2.61	E3	-	2.50	-
A2	1.90	2.00	2.10	e	5.44(BSC)		
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	-	-	7.40
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	16.00	T	-	10.00	-
E1	-	13.30	-	U	-	6.20	-



Sanrise Technology Limited Company

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

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