17mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R017FB

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 $R_{DS(ON)}$ = 17mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=291nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved

Application

- EV Charger
- Sever / Telecom Power

Symbol

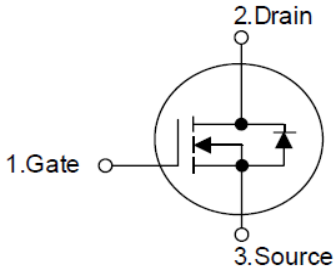

Figure 1 Symbol of SRC60R017FB

Package Type

TO-247

Figure 2 Package Types of SRC60R017FB

Ordering Information

SRC60R017FB□□–□

Circuit Type

Package
T: TO-247

E: Lead Free
G: Green

Blank: Tube
TR: Tape & Reel

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
TO-247	SRC60R017FBT-E	SRC60R017FBT-G	SRC60R017FBTE	SRC60R017FBTG	Tube

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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>1Hz		V_{GSS}	±30	V
Continuous Drain Current	T_C=25ºC	I_D	120	A
	T_C=125ºC		54	
Pulsed Drain Current (Note 2)		I_{DM}	360	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	600	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.6	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	9.0	A
Continuous Diode Forward Current		I_S	120	A
Diode Pulse Current		$I_{S.PULSE}$	360	A
MOSFET dv/dt Ruggedness, V_{DS}<=480V		dv/dt	80	V/ns
Reverse Diode dv/dt, V_{DS}<=480V, I_{SD}<=I_D		dv/dt	50	V/ns
Operating Junction Temperature		T_J	150	ºC
Storage Temperature		T_{STG}	-55 to 150	ºC
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	ºC

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} = 9.0A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-247	R_{thJC}			0.21	**ºC** /W
Thermal resistance, Junction-to-Ambient	TO-247	R_{thJA}			62	**ºC** /W

17mΩ, 600V, Super Junction N-Channel Power MOSFET **SRC60R017FB**

Electrical Characteristics

T_J = 25℃, 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=2.9mA	3.0	4.0	5.0	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=40A		14.3	17	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		1.0		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=50V, V_{GS}=0V, f=1MHz		12.7		nF
Output Capacitance		C_{OSS}			546		pF
Reverse Transfer Capacitance		C_{RSS}			2.0		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…480V		291		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			2379		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=400V, I_D=60A R_G=1.8Ω, V_{GS}=10V		30		ns
Rise Time		t_r			27		
Turn-off Delay Time		$t_{d(off)}$			125		
Fall Time		t_f			6		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=480V, I_D=60A V_{GS}=0 to 10V		73.6		nC
Gate to Drain Charge		Q_{gd}			120		
Gate Charge Total		Q_g			291		
Gate Plateau Voltage		$V_{plateau}$			5.8		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=40A dI$_F$/dt=100A/us		184		ns
Reverse Recovery Charge		Q_{rr}			1.47		uC
Peak Reverse Recovery Current		I_{rrm}			16		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

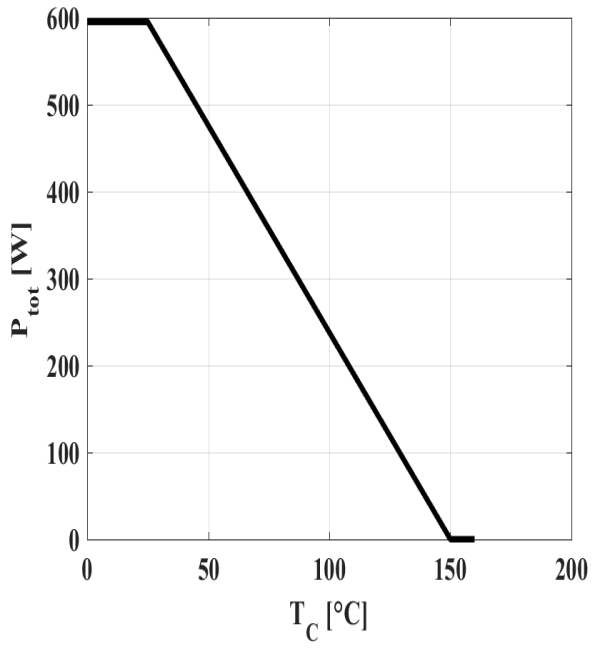
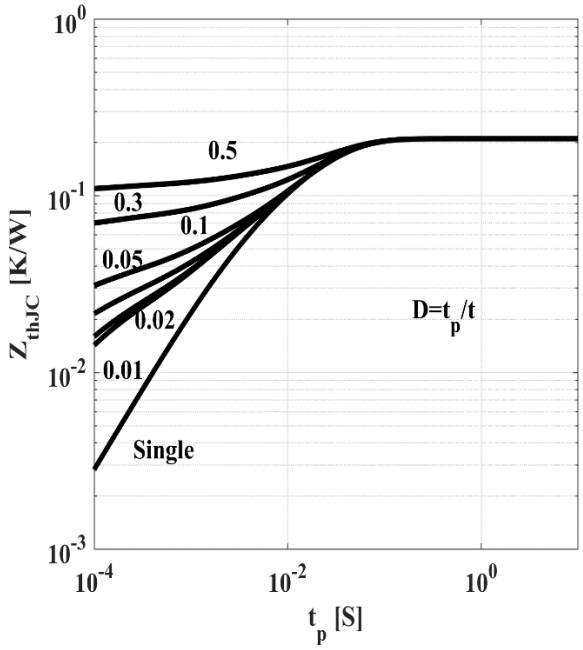
Figure 3: Power Dissipation	Figure 4: Max. Transient Thermal Impedance
	
$P_{tot} = f(T_c)$	$Z_{(thJC)} = f(t_p)$; parameter: $D = t_p/T$

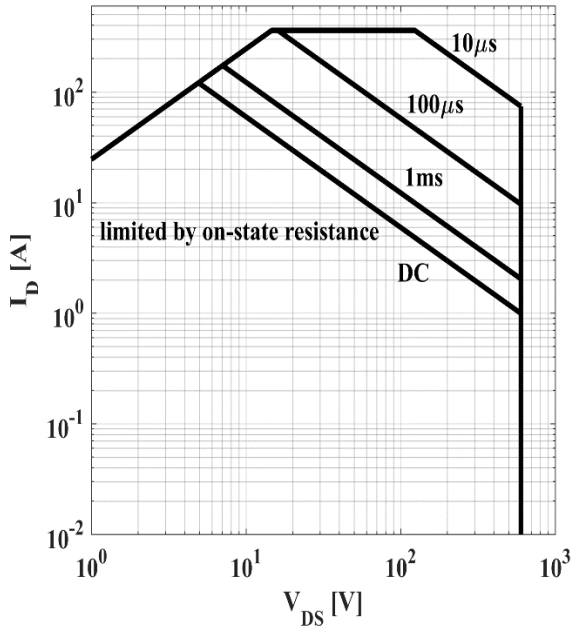
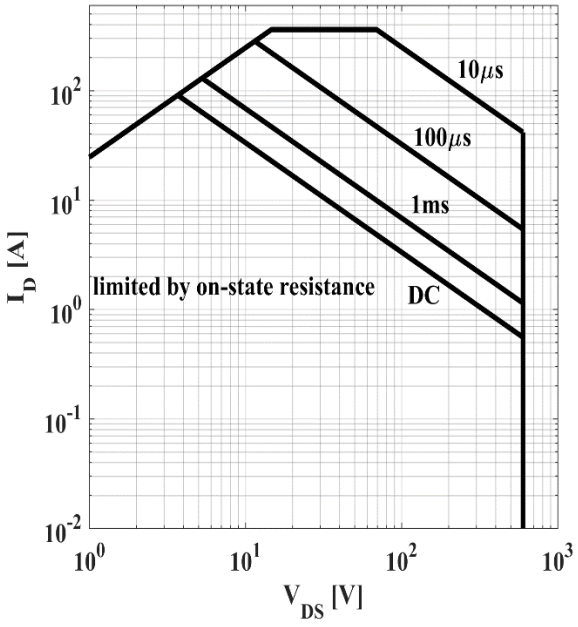
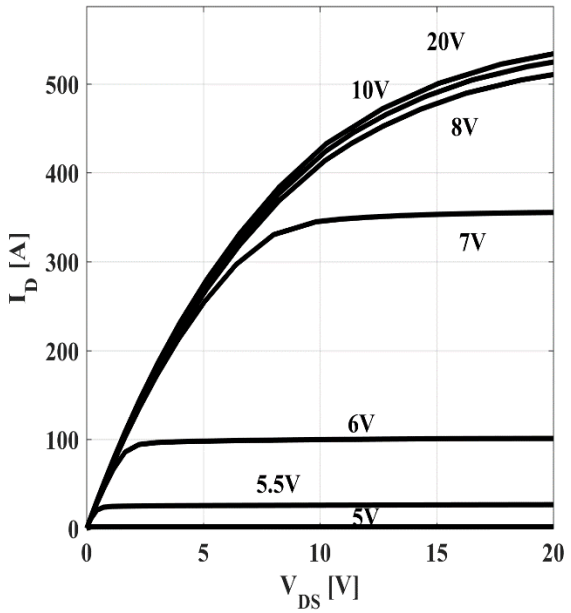
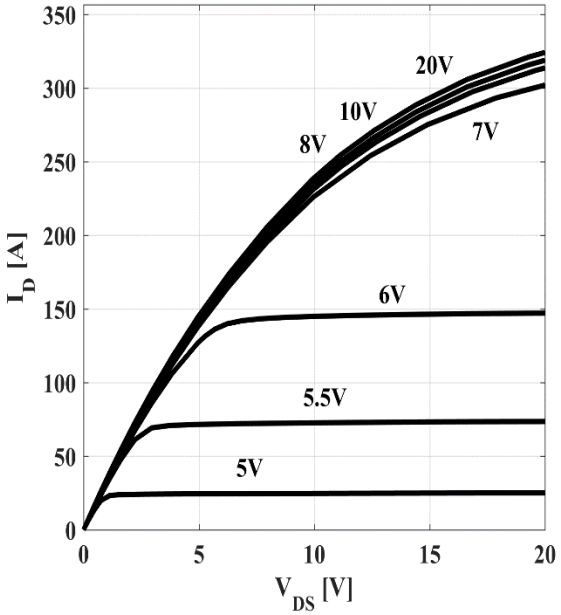
Figure 5: Safe Operating Area	Figure 6: Safe Operating Area
	
$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p	$I_D = f(V_{DS})$; T_c= 80ºC; V_{GS}>7V; parameter t_p

Figure 7: Typ. Output Characteristics



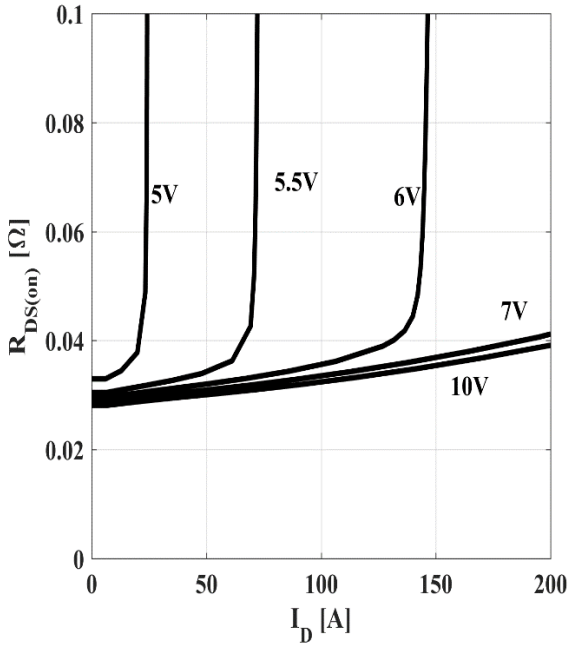
$I_D = f(V_{DS})$; Tj= 25ºC; parameter: V_{GS}

Figure 8: Typ. Output Characteristics



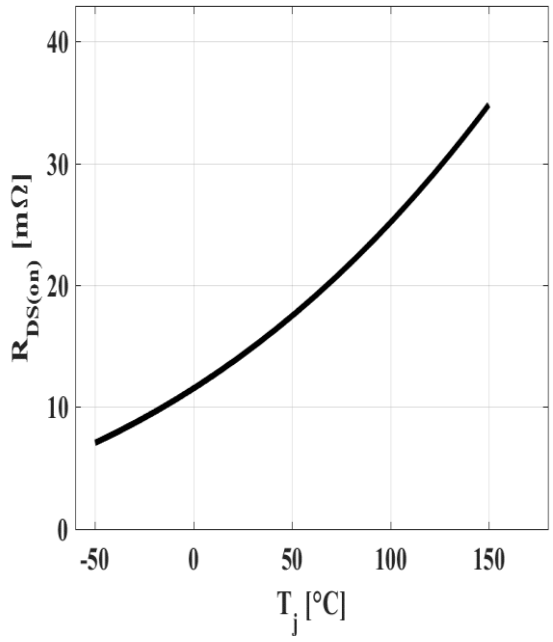
$I_D = f(V_{DS})$; T_j= 125ºC; parameter: V_{GS}

Figure 9: Typ. Drain-Source On-State Resistance



$R_{DS(ON)} = f(I_D)$; T_j=125ºC; parameter: V_{GS}

Figure 10: Typ. Drain-Source On-State Resistance



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

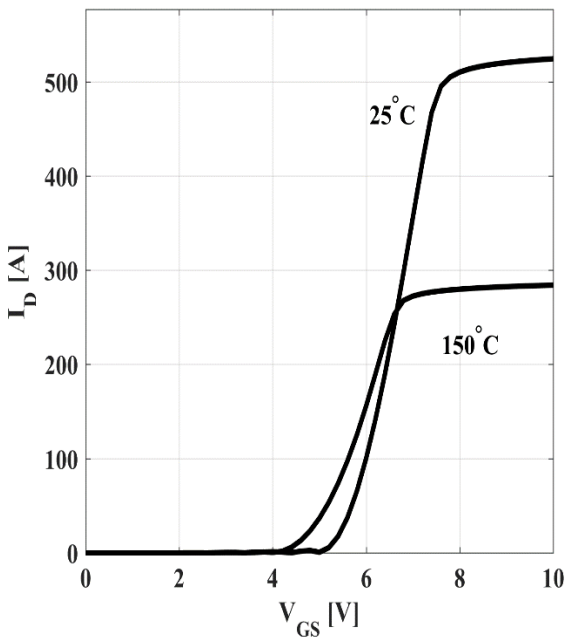
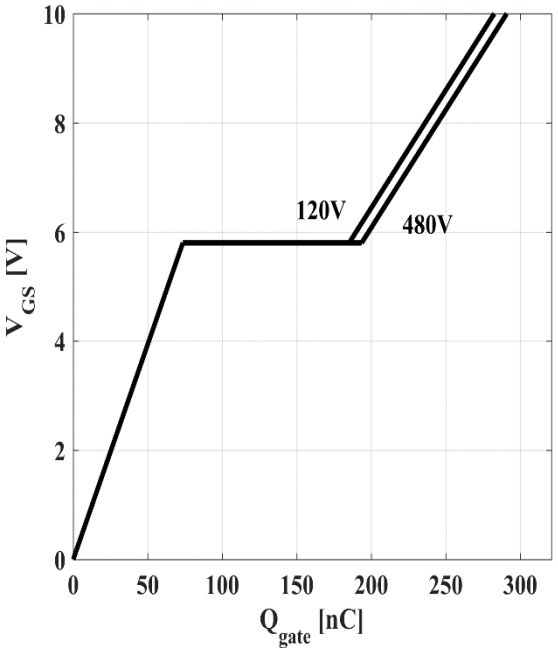
Figure 11: Typ. Transfer Characteristics	Figure 12: Typ. Gate Charge
	
$I_D = f(V_{GS})$; V_{DS} = 20V	V_{GS}= f(Q_{gate}), I_D= 60A pulsed

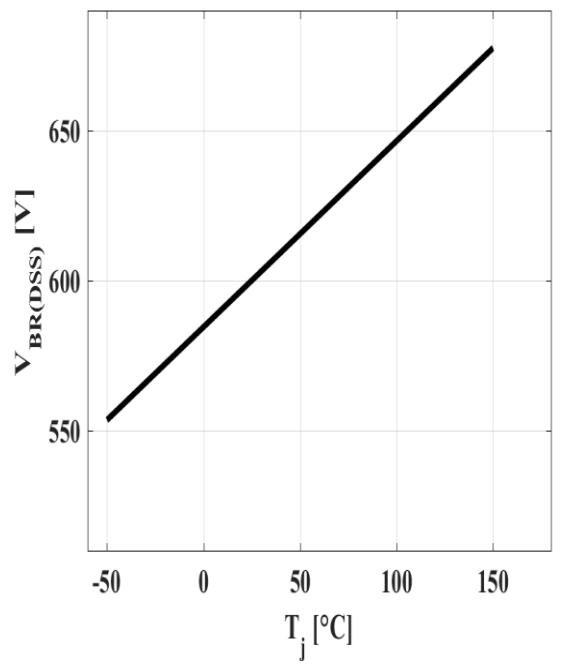
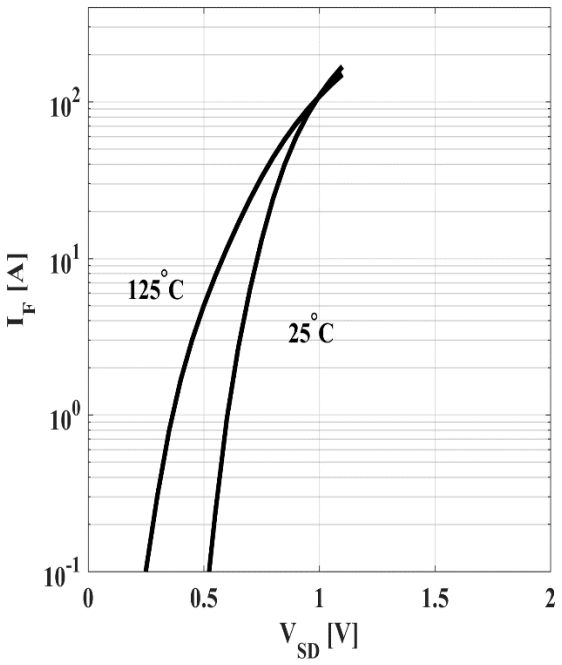
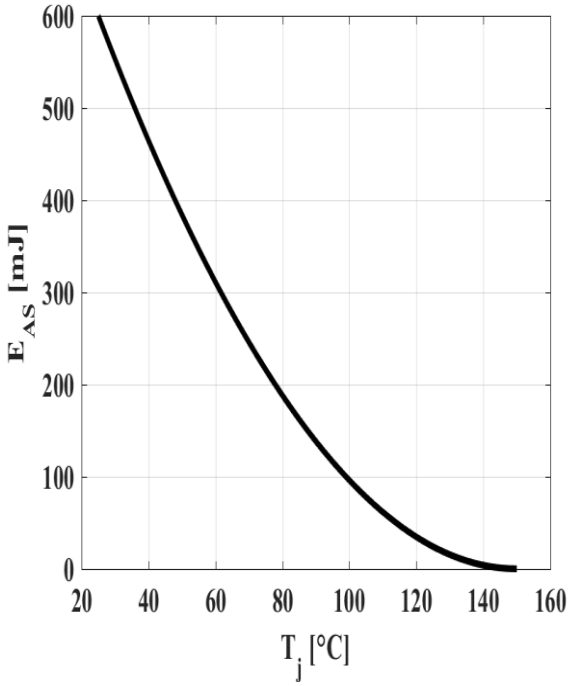
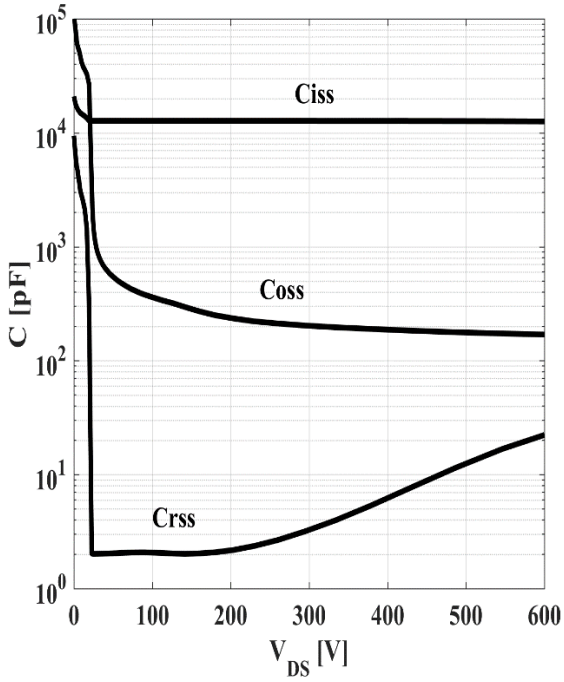
Figure 13: Drain-Source Breakdown Voltage	Figure 14: Forward Characteristics of Reverse Diode
	
$V_{BR(DSS)}$=f(T_j); I_D=20mA	I_F=f(V_{SD}); parameter: T_j

Figure 15: Avalanche Energy



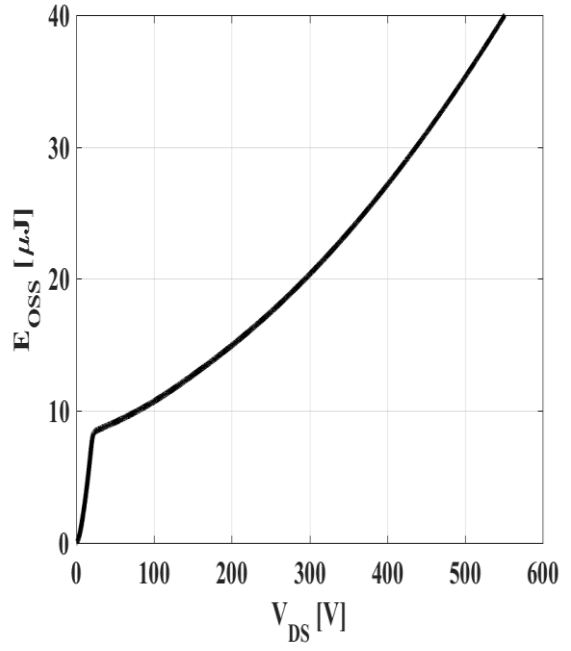
$E_{AS}=f(T_j)$; I_D=9.0A; V_{DD}=60V

Figure 16: Typ. Capacitances



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

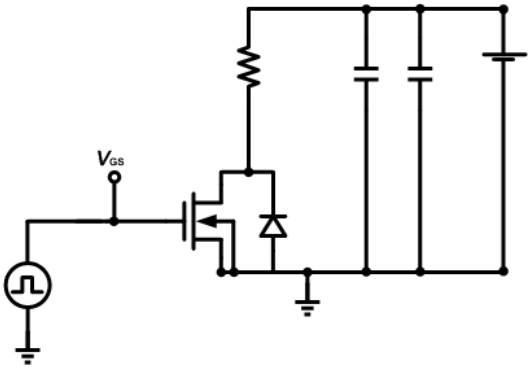
Figure 17: C_{OSS} Stored Energy

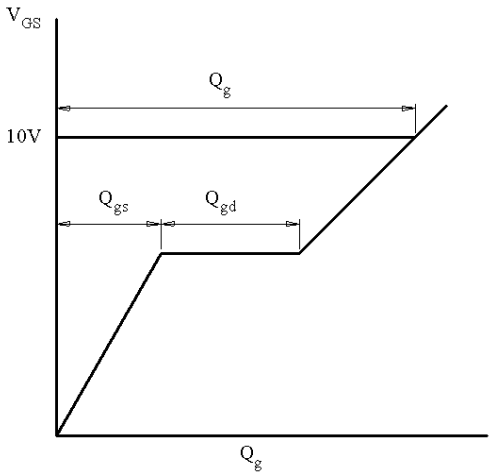


$E_{OSS}=f(V_{DS})$

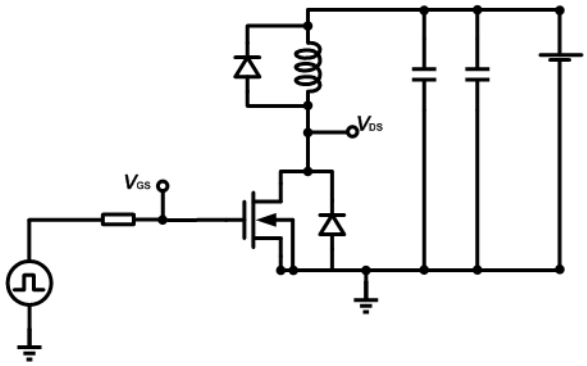
Test Circuits

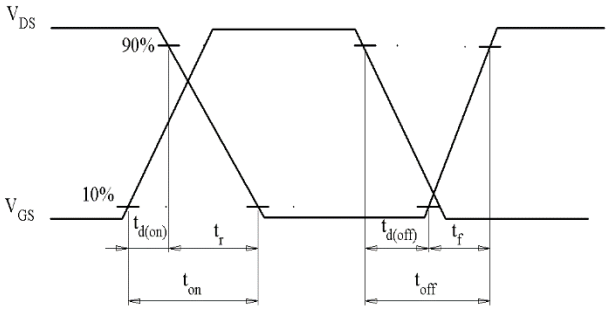
1. Gate Charge Test Circuit & Waveform



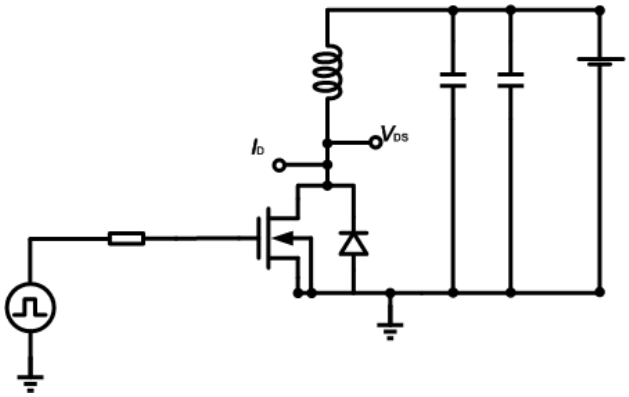


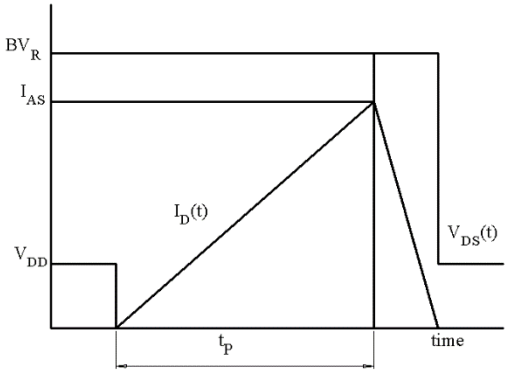
2. Switch Time Test Circuit



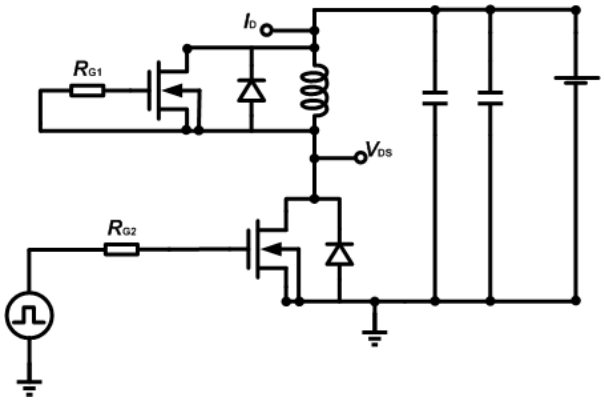


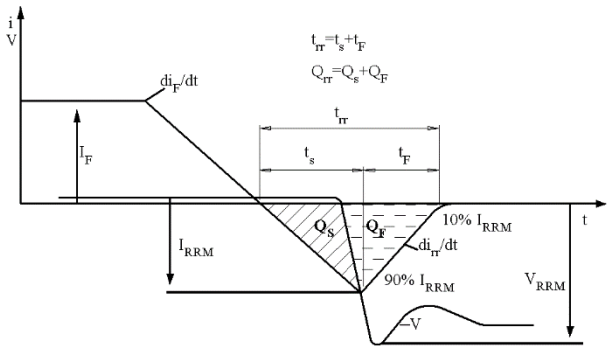
3. Unclaimed Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

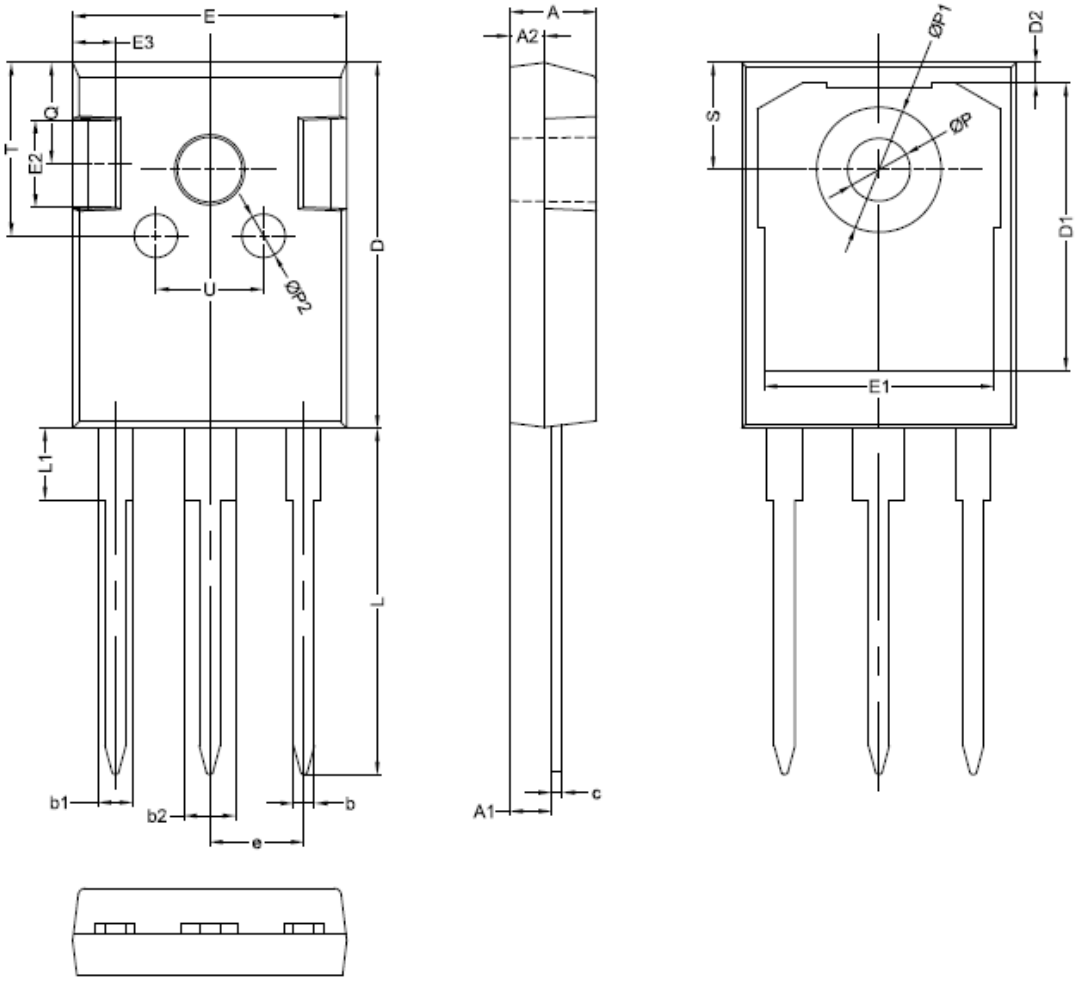




17mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R017FB

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	-

17mΩ, 600V, Super Junction N-Channel Power MOSFET SRC60R017FB

Shenzhen Sanrise Technology Co., LTD.

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