100mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R100B

General Description

The Sanrise SRC65R100B 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 SRC65R100B break down voltage is 650V and it has a high rugged avalanche characteristics. The SRC65R100B is available in TO-247, TO-220C, TO-263-2 packages.

Symbol

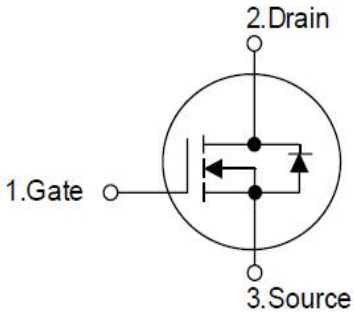


Figure 1 Symbol of SRC65R100B

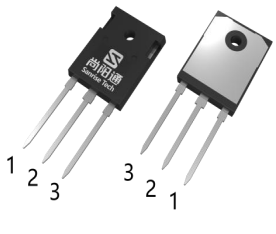
Features

- Ultra Low $R_{DS(ON)}$ = 100mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Qg=130nC typ.
- Fast switching capability
- Robust design with better EAS performance
- Qualified according to AEC Q101
- Green Product (RoHS compliant)
- Ultra-fast body diode

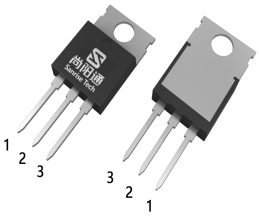
Application

- On-Board Charger
- DC/DC Converter
- Auxiliary Inverter

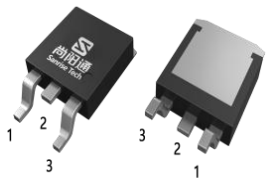
Package Type



TO-247



TO-220C



TO-263

Figure 2 Package Types of SRC65R100B

Ordering Information

SRC65R100B□□–GA

Circuit Type

Package

T: TO-247
TC: TO-220C
S2: TO-263-2

A: Automotive
G: Green
Blank: Tube

Package	Part Number	Marking ID	Packing Type
TO-247	SRC65R100BT-GA	SRC65R100BTGA	Tube
TO-220C	SRC65R100BTC-GA	SRC65R100BTCGA	Tube
TO-263-2	SRC65R100BS2TR-GA	SRC65R100BS2GA	Tape & Reel

100mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R100B

Absolute Maximum Ratings[Note 1]

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage (static)		V_{GSS}	±20	V
Gate-Source Voltage (dynamic), AC (f>1 Hz)		V_{GSS}	±30	V
Continuous Drain Current	T_C=25ºC	I_D	35	A
	T_C=100ºC		22	
	T_C=125ºC		15	
Pulsed Drain Current (Note 2)		I_{DM}	105	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	135	mJ
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	1425	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.2	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	2	A
Continuous Diode Forward Current		I_S	35	A
Diode Pulse Current		$I_{S.PULSE}$	105	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
Power Dissipation（Tc=25℃,TO-247,TO-220C,TO-263-2）		P_{tot}	265	W
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} = 2A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C. Finish goods test condition.
4. I_{AS} =6.5A, V_{DD} = 60V, R_G = 25Ω, Starting T_J = 25°C. Typical Eas

Thermal characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Thermal resistance, Junction-to-Case	TO-247	R_{thJC}			0.47	ºC /W
	TO-220C				0.47	
	TO-263-2				0.47	
Thermal resistance, Junction-to-Ambient	TO-247	R_{thJA}			58	ºC /W
	TO-220C				58	
	TO-263-2				58	

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	650			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=650V, V_{GS}=0V			10	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	nA
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=800uA	3.0	4.0	5.0	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=18A		91	100	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		0.7		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=400V, V_{GS}=0V, f=100kHz		2601		pF
Output Capacitance		C_{OSS}			65		
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…480V		92		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			601		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=400V, I_D=21A R_G=3Ω, V_{GS}=10V		46		ns
Rise Time		t_r			16		
Turn-off Delay Time		$t_{d(off)}$			59		
Fall Time		t_f			9		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=480V, I_D=21A V_{GS}=0 to 10V		37		nC
Gate to Drain Charge		Q_{gd}			63		
Gate Charge Total		Q_g			130		
Gate Plateau Voltage		$V_{plateau}$			6.5		V
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=18A		0.9	1.1	V
Reverse Recovery Time		t_{rr}	V_R=400V, I_F=24A dI_F/dt=100A/us		124		ns
Reverse Recovery Charge		Q_{rr}			0.87		uC
Peak Reverse Recovery Current		I_{rrm}			12		A

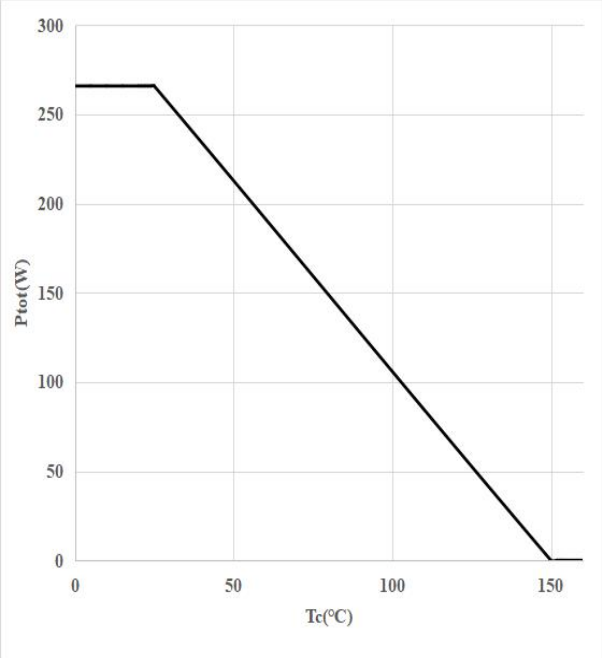
Note:

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

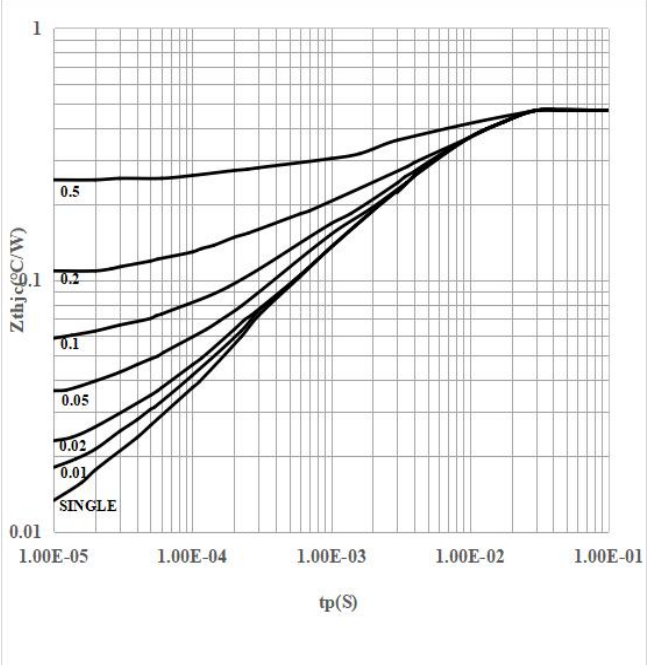
Typical Performance Characteristics

Figure 3: Power Dissipation



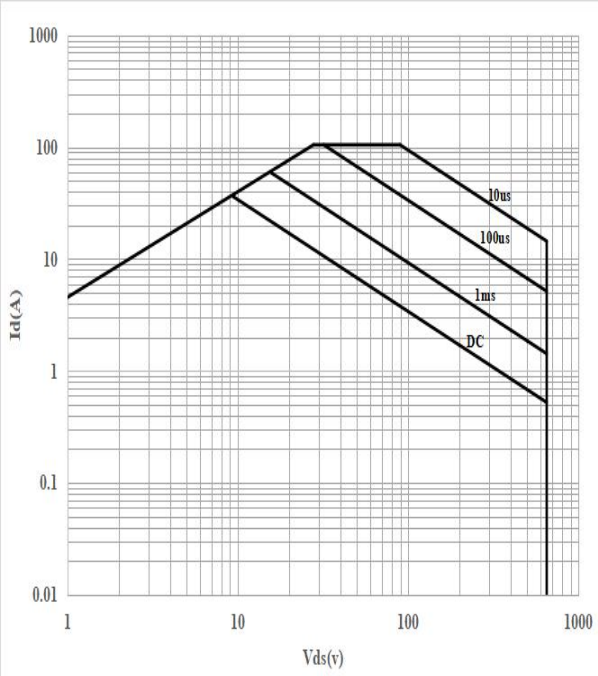
$P_{tot} = f(T_c)$

Figure 4: Max. Transient Thermal Impedance



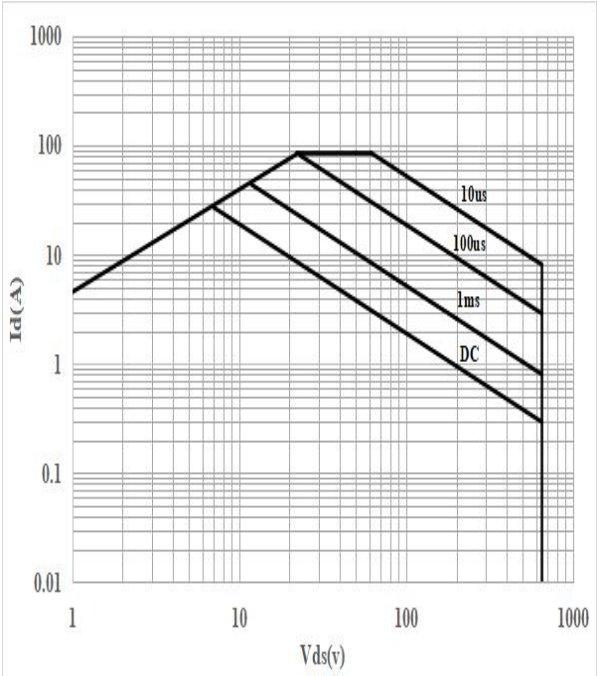
$Z_{(thJC)} = f(t_p)$; parameter: $D = t_p/T$

Figure 5: Safe Operating Area



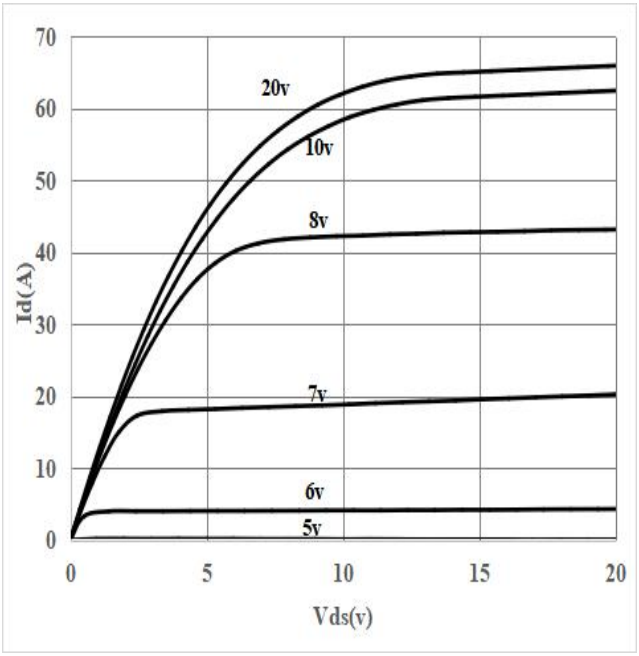
$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p

Figure 6: Safe Operating Area



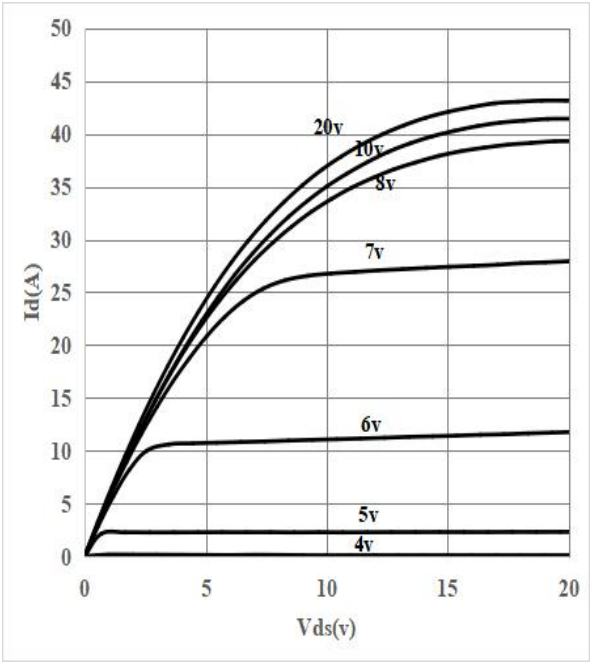
$I_D = f(V_{DS})$; T_c= 80ºC; V_{GS}>7V; parameter t_p

Figure 7: Typ. Output Characteristics



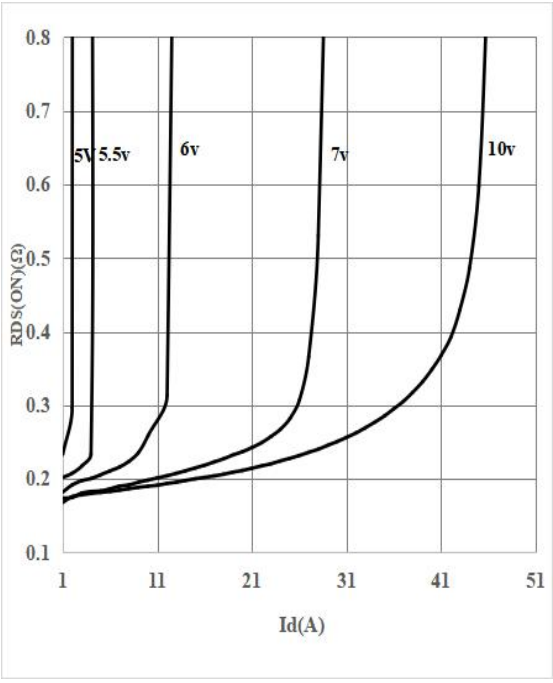
$I_D = f(V_{DS})$; Tj= 25ºC; parameter: V_{GS}

Figure 8: Typ. Output Characteristics



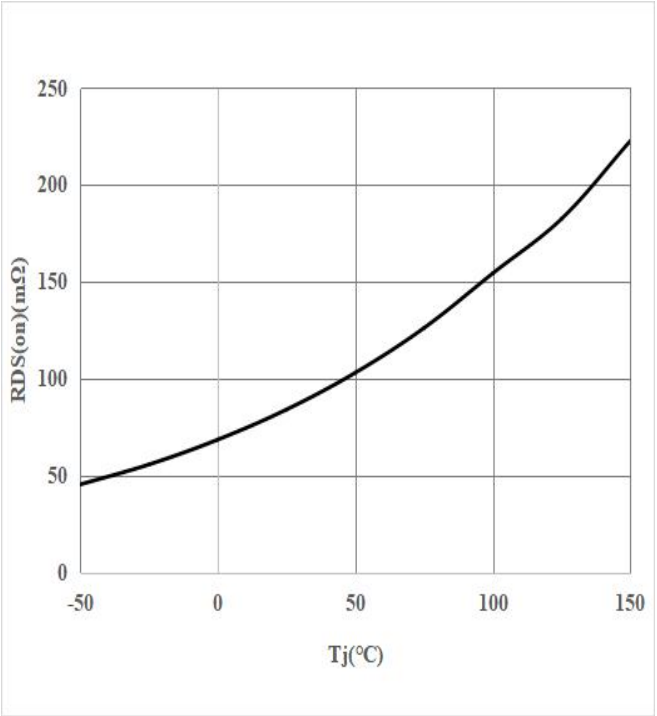
$I_D = f(V_{DS})$; T_j= 125ºC; parameter: V_{GS}

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



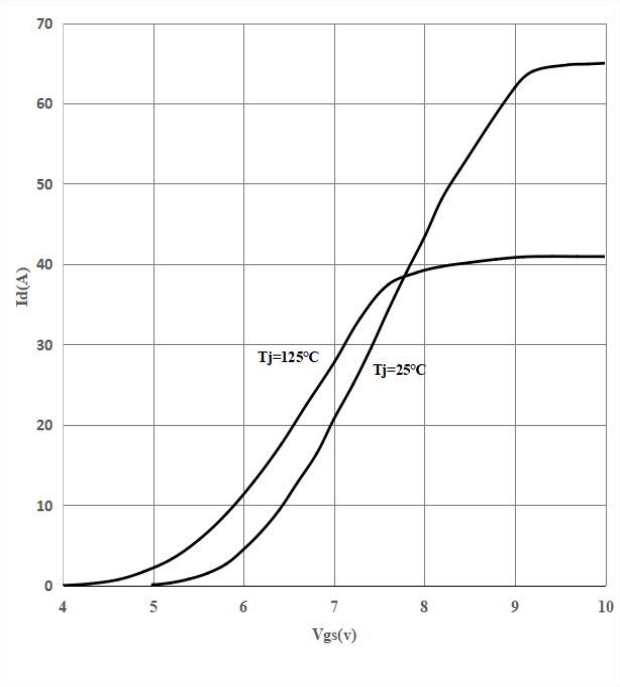
$R_{DS(ON)}$ =f(I_D); T_j=125ºC; parameter: V_{GS}

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



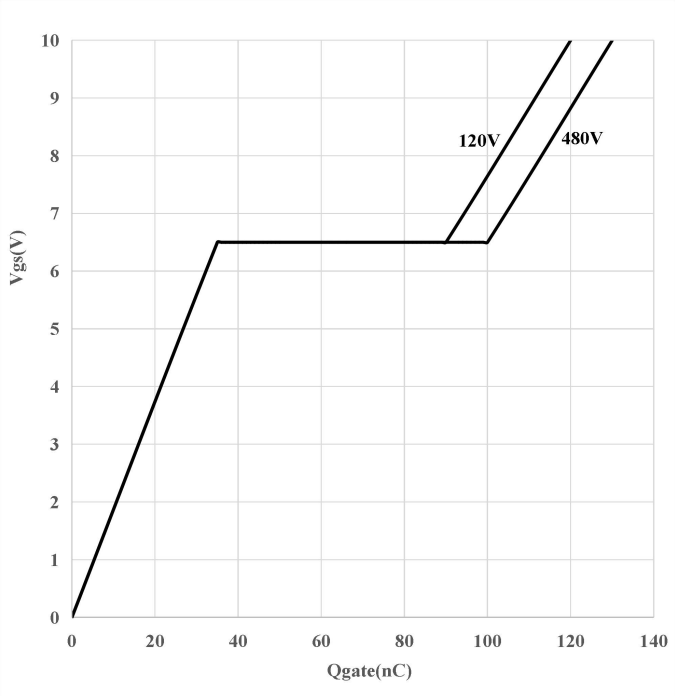
$R_{DS(ON)}$=f(T_j); I_D=18A; V_{GS}=10V

Figure 11: Typ. Transfer Characteristics



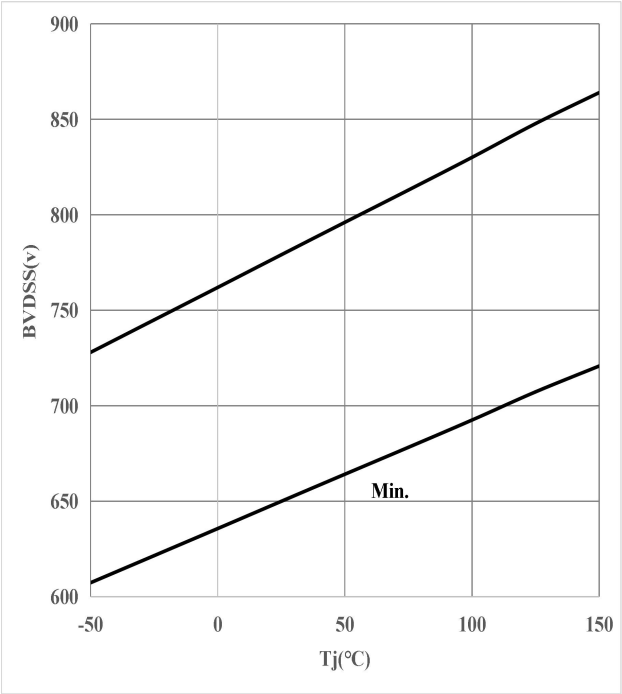
$I_D = f(V_{GS})$; $V_{DS} = 20V$

Figure 12: Typ. Gate Charge



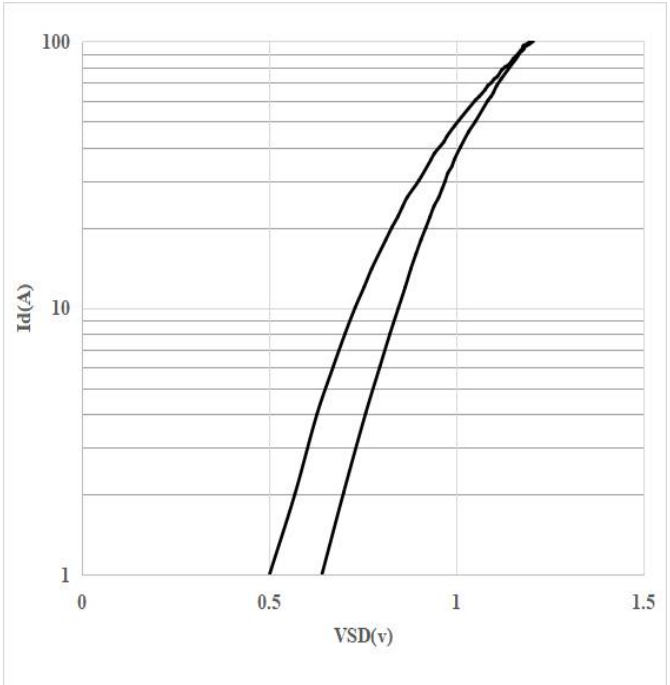
$V_{GS} = f(Q_{gate})$, I_D=21A pulsed

Figure 13: Drain-Source Breakdown Voltage



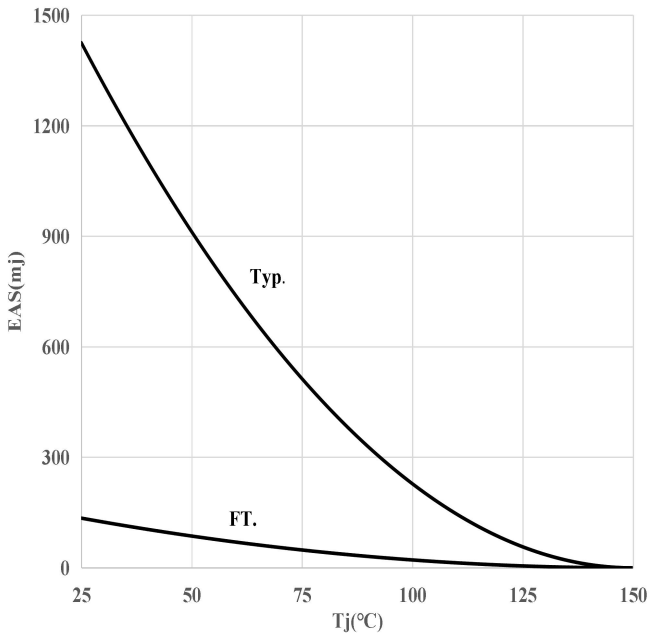
$V_{BR(DSS)}=f(T_j)$; I_D=10mA

Figure 14: Forward Characteristics of Reverse Diode



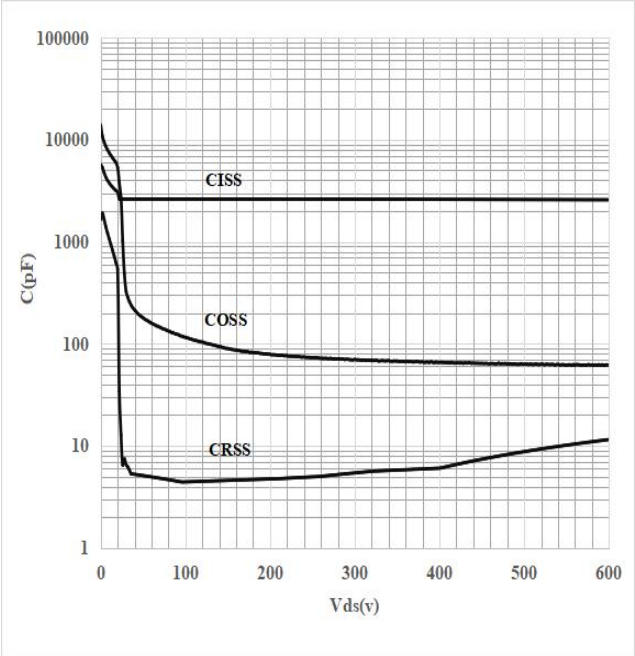
$I_F=f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy



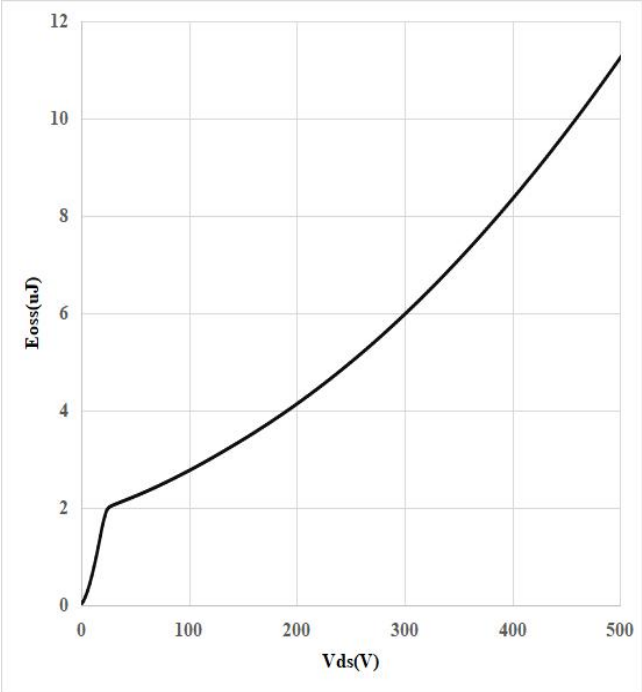
$E_{AS}=f(T_j)$; $V_{DD}=60V$

Figure 16: Typ. Capacitances



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

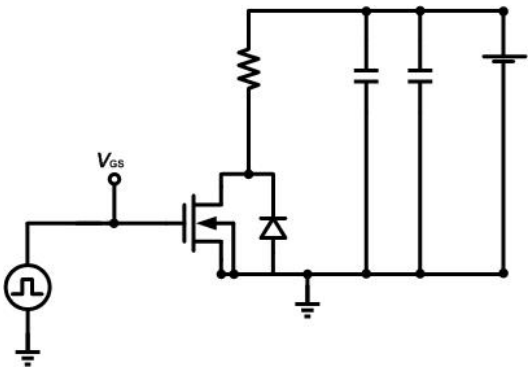
Figure 17: C_{OSS} Stored Energy

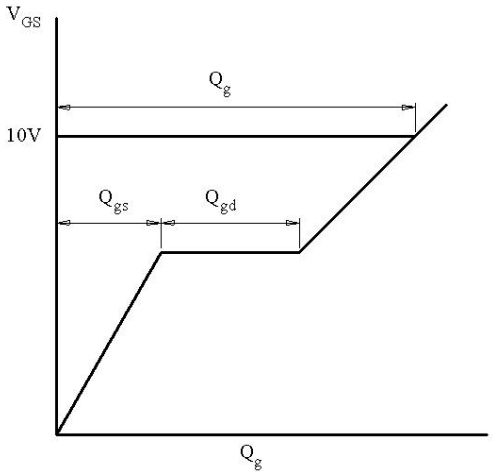


$E_{OSS}=f(V_{DS})$

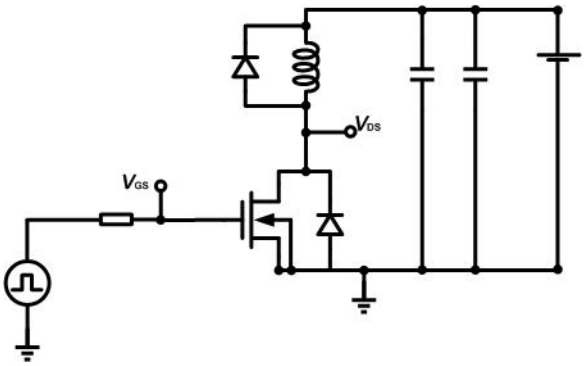
Test Circuits

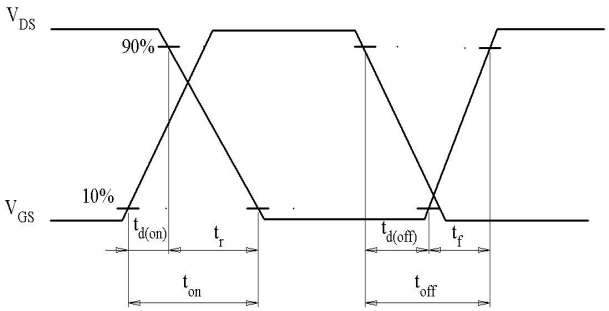
1. Gate Charge Test Circuit & Waveform



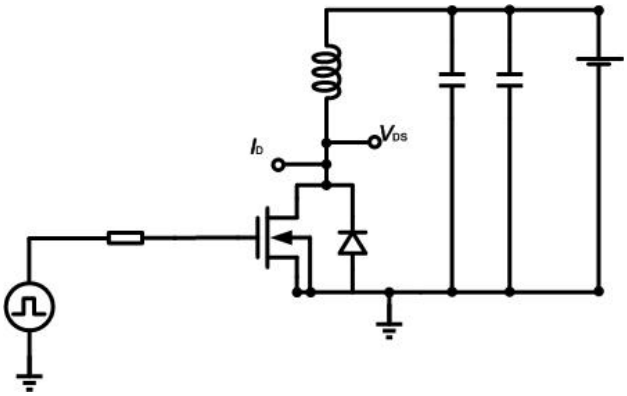


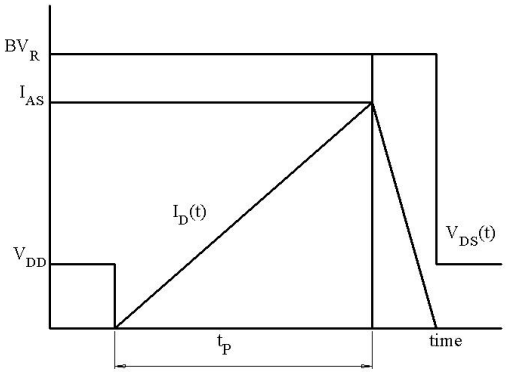
2. Switch Time Test Circuit



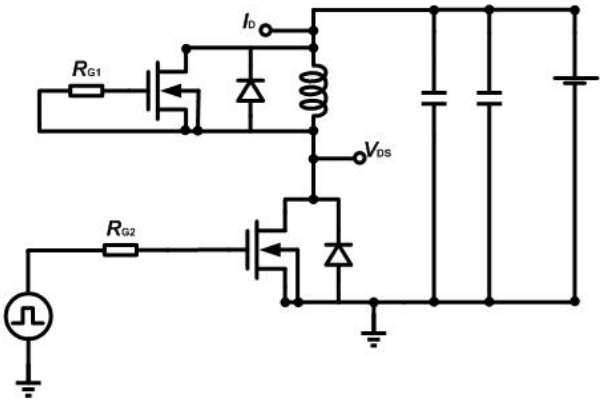


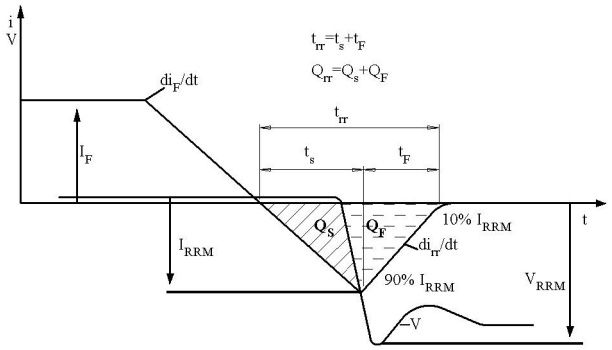
3. Unclaimed Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics



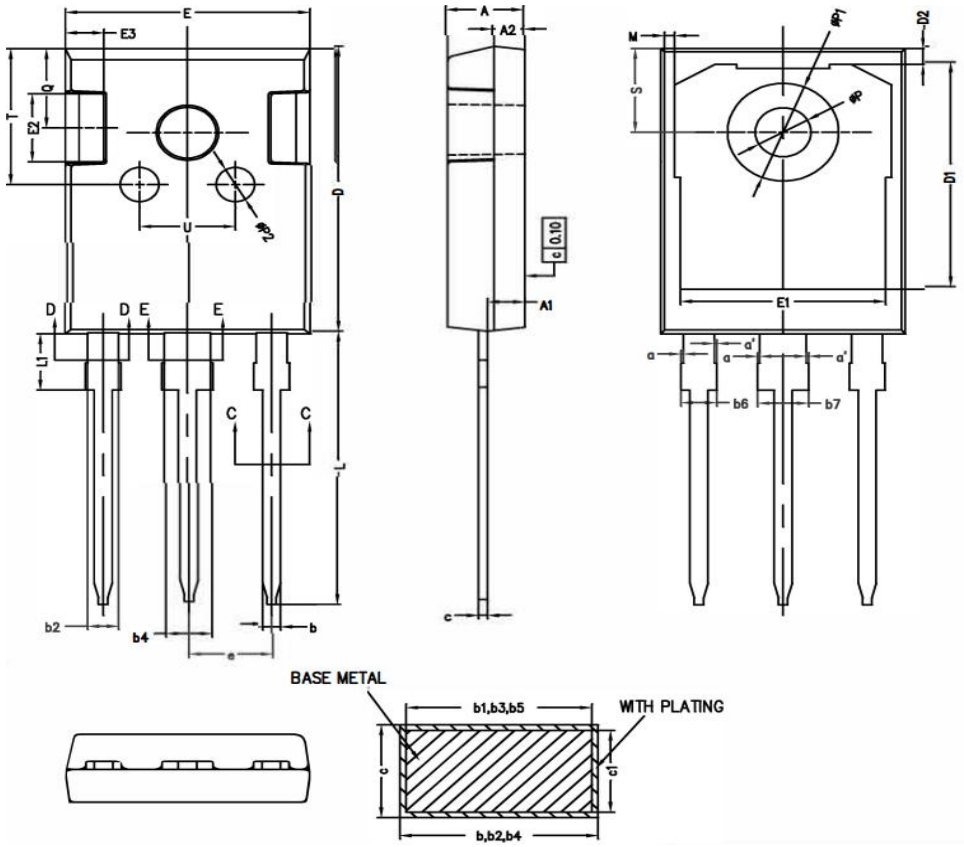


100mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R100B

Mechanical Dimensions

TO-247(Package 1)

Unit: mm



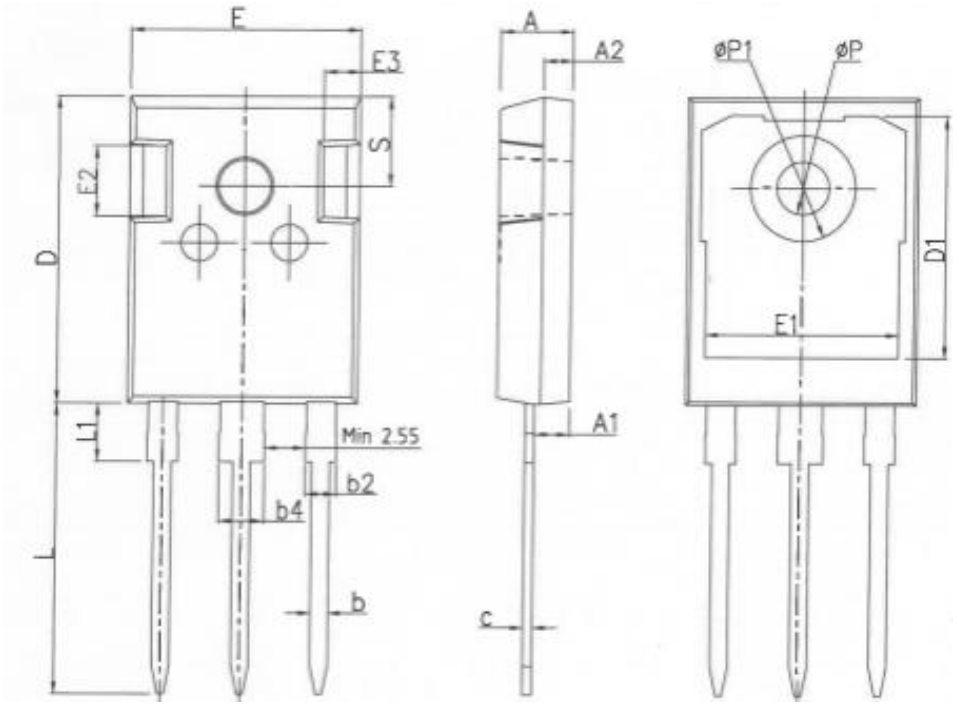
Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	E2	4.90	5.00	5.10
A1	2.31	2.41	2.51	E3	2.40	2.50	2.60
A2	1.90	2.00	2.10	e	5.34	5.44	5.54
b	1.12	-	1.22	L	19.80	19.92	20.10
b1	1.11	1.16	1.18	L1	3.95	4.13	4.30
b2	1.96	-	2.06	P	3.50	3.60	3.70
c	0.59	-	0.66	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				

100mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R100B

Mechanical Dimensions

TO-247(Package 2)

Unit: mm

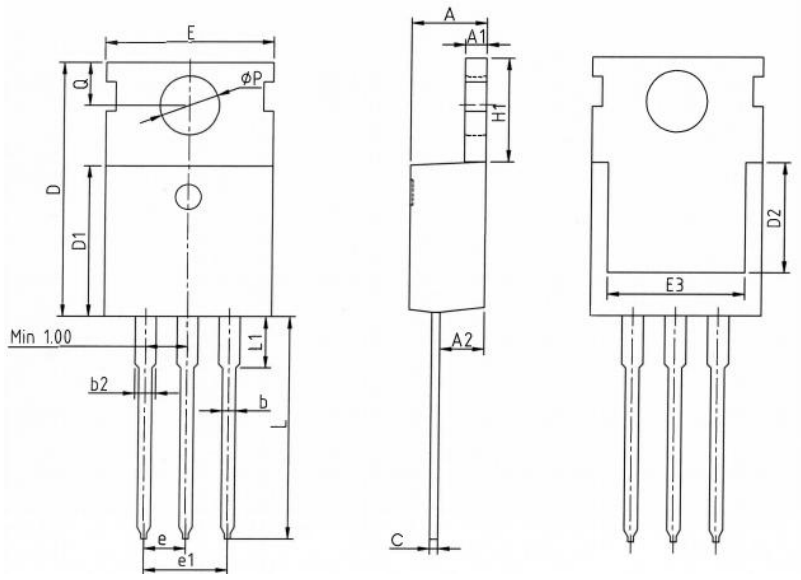


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.80	5.00	5.20	E	15.50	15.80	16.10
A1	2.21	2.41	2.59	E1	13.00	13.30	13.60
A2	1.85	2.00	2.15	E2	4.80	5.00	5.20
b	1.11	1.21	1.36	E3	2.30	2.50	2.70
b2	1.91	2.01	2.21	e	5.44BSC		
b4	2.91	3.01	3.21	M	0.35	-	0.95
c	0.51	0.61	0.75	a’	0	-	0.15
D	20.70	21.00	21.30	L	19.62	19.92	20.22
D1	16.25	16.55	16.85	L1	-	-	4.30
ϕP	3.40	3.60	3.80	S	6.15BSC		
ϕP1	-	-	7.30				

100mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R100B

Mechanical Dimensions

TO-220C **Unit: mm**

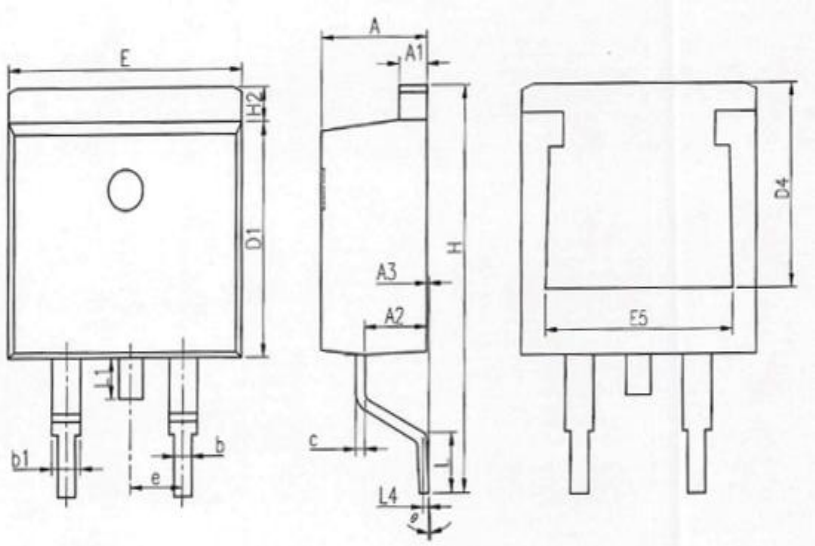


Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.37	4.57	4.70
A1	1.25	-	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	6.30	7.10
E	9.70	10.00	10.30
E3	7.00	7.80	8.60
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00

100mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R100B

Mechanical Dimension

TO-263-2 **Unit: mm**



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
A3	0.00	0.13	0.25
b	0.70	0.81	0.96
b1	1.17	1.27	1.47
c	0.30	0.38	0.53
D1	8.50	8.70	8.90
D4	6.60	-	-
E	9.86	10.16	10.36
E5	7.06	-	-
e	2.54(BSC)		
H	14.70	15.10	15.50
H2	1.07	1.27	1.47
L	2.00	2.30	2.60
L1	1.40	1.55	1.70
L4	0.25(BSC)		
θ	0°	5°	8°

100mΩ, 650V, Super Junction N-Channel Power MOSFET SRC65R100B

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