CRXQC40M120G2Z

SiC MOSFET 1200V, 40mΩ, 66A

Features

- CRM G2 SIC MOSFET Technology
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
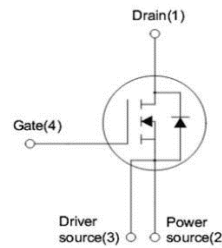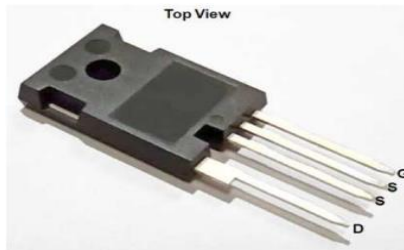- Avalanche Ruggedness
- Fast Reverse Recovery

Applications

- Solar Inverters
- High Voltage DC/DC Converters
- On Board Charger(OBC)
- EV Charger

Product Summary

VDS	1200V
$R_{DS(on)\_typ}$	40mΩ
I_D	66A

100% Avalanche Tested

RoHS   H F

Package Marking and Ordering Information

Part #	Marking	Package	Packing	Qty
CRXQC40M120G2Z	CRXQC40M120G2Z	TO-247-4C	Tube	25pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DSmax}	1200	V
Continuous drain current V_{GS}=15V，T_C = 25°C V_{GS}=15V，T_C = 100°C	I_D	66 47	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D(pulse)}$	132	A
Avalanche energy, single pulse (L=10mH, Rg=25Ω)	E_{AS}	940	mJ
Gate-Source voltage (dynamic)[a1]	V_{GSmax}	-10/+22	V
Gate-Source voltage (static)[a2]	V_{GSop}	-5/+18	V
Power dissipation (T_C=25°C,T_J=175°C)	P_D	240	W
Operating Junction and Storage Temperature	T_j,T_{stg}	-55…175	°C

a1: When using MOSFET Body Diode V_{GSmax} = -5V/+22V

a2: MOSFET can also safely operate at 0/+18 V

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	R_{thJC}	0.62	°C/W
Thermal resistance, junction – ambient. Max	R_{thJA}	40	

Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

Static Characteristic

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Drain-source breakdown voltage	$V_{(BR)DSS}$	1200	-	-	V	V_{GS}=0V, I_D=250uA
Gate threshold voltage	$V_{GS(th)}$	1.8	-	3.6	V	V_{DS}=V_{GS},I_D=10mA
Zero gate voltage drain current	I_{DSS}	-	0.2	100	µA	V_{DS}=1200V,V_{GS}=0V T_j=25°C
		-	10	-		T_j=175°C
Gate-source leakage current	I_{GSS}	-	-	250	nA	V_{GS}=20V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	-	40	54	mΩ	V_{GS}=15V, I_D=33.3A, T_j=25°C
		-	75	-		T_j=175°C
Transconductance	g_{fs}	-	30	-	S	V_{DS}=20V,I_{DS}=33.3A

Dynamic Characteristic

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Internal Gate resistance	$R_{G(int)}$	-	2	-	Ω	f=1MHz
Input Capacitance	C_{iss}	-	2676	-	pF	V_{GS}=0V, V_{DS}=1000V, f=1MHz
Output Capacitance	C_{oss}	-	100	-		
Reverse Transfer Capacitance	C_{rss}	-	8.9	-		
Coss Stored Energy	E_{oss}	-	57	-	uJ	
Gate Total Charge	Q_g	-	106	-	nC	VGS=-5/15V VDS=800V ID=33.3A
Gate-Source charge	Q_{gs}	-	33	-		
Gate-Drain charge	Q_{gd}	-	29	-		
Turn-on delay time	$t_{d(on)}$	-	62	-	ns	VDD=800V,ID=33.3A VGS=-5V/15V, RG=10Ω，L=100uH
Rise time	t_r	-	30	-		
Turn-off delay time	$t_{d(off)}$	-	61	-		
Fall time	t_f	-	18.6	-		
Turn-On Switching Energy	$E_{(on)}$	-	1223	-	uJ	
Turn Off Switching Energy	$E_{(off)}$	-	193	-		

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	3.5	-	V	V_{GS}=0V,I_F=20A
		-	3.2	-	V	V_{GS}=0V,I_F=20A, T_j=175℃
Continuous Diode Forward Current	I_S	-	-	66	A	V_{GS}=0V
Maximum Pulsed Current	$I_{S,max}$	-	-	132	A	pulse width t_P limited by Tjmax
Body Diode Reverse Recovery Time	t_{rr}	-	36	-	ns	di/dt=1000A/us IF=33.3A Vdd=800V Tj=25℃
Body Diode Reverse Recovery Charge	Q_{rr}	-	170	-	nC	
Body Diode Peak Reverse Recovery Current	I_{rrm}	-	9.9	-	A	
Body Diode Reverse Recovery Time	t_{rr}	-	52	-	ns	di/dt=1000A/us IF=33.3A Vdd=800V, Tj=175℃
Body Diode Reverse Recovery Charge	Q_{rr}	-	530	-	nC	
Body Diode Peak Reverse Recovery Current	I_{rrm}	-	15	-	A	

Typical Performance Characteristics

Fig 1. Output Characteristics (Tj=-55℃)
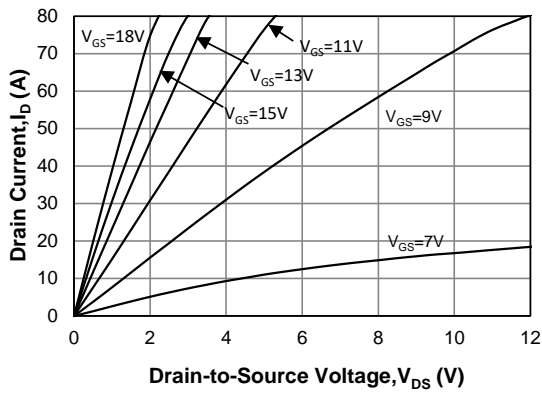
Fig 2. Output Characteristics (Tj=25℃)
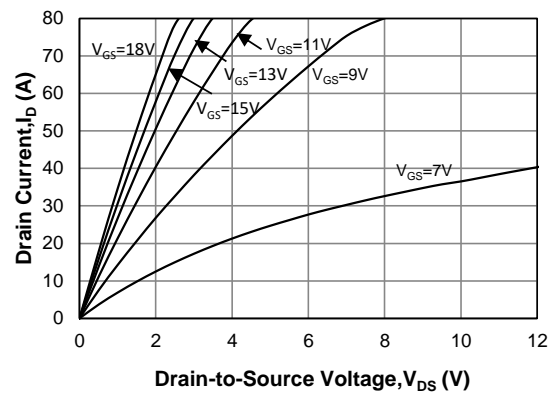
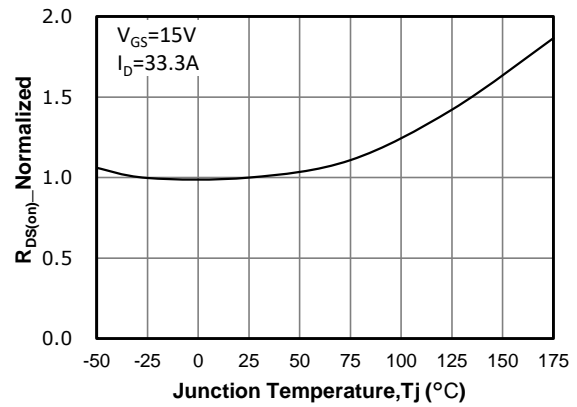Fig 3. Output Characteristics (Tj=175℃)
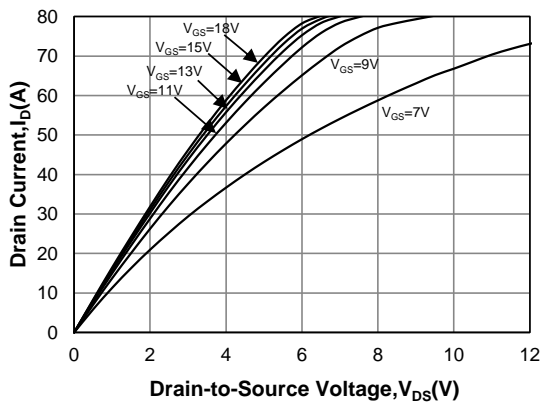
Fig 4: Rds(on) vs. Temperature

Fig 5: On-Resistance vs. Drain Current For Various Temperatures

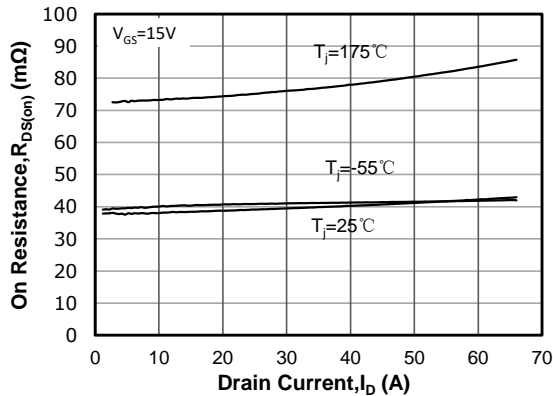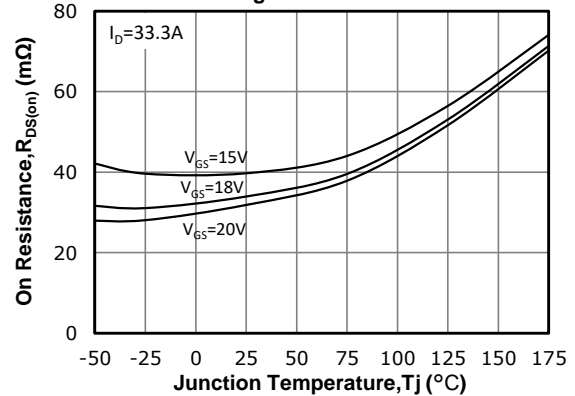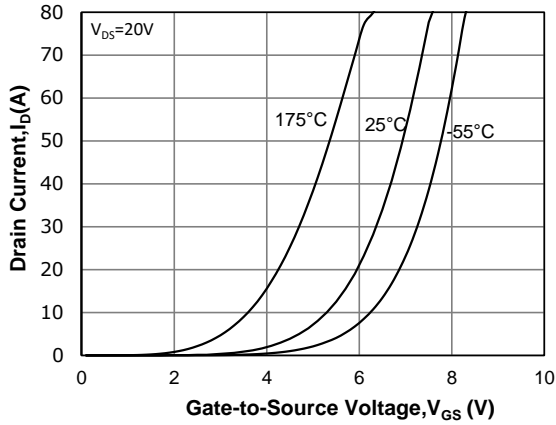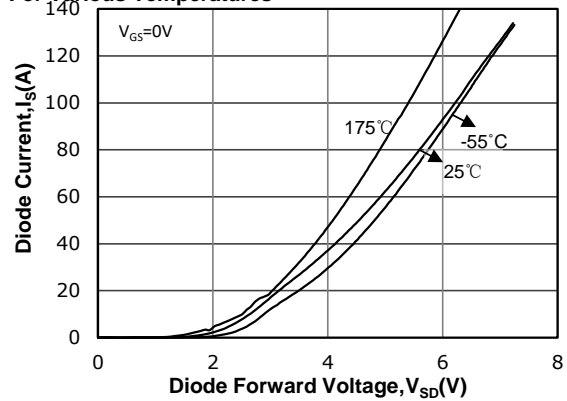Fig 6: Rds(on) vs. Temperature For Various Gate Voltage

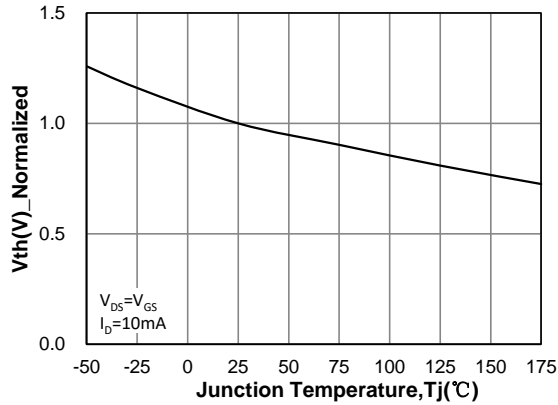**Fig 7: Transfer Characteristics**

Drain Current,I_D(A) vs Gate-to-Source Voltage,V_{GS} (V)

V_{DS}=20V

175°C   25°C   -55°C

Fig 8: Body-diode Forward Characteristics For Various Temperatures

Diode Current,I_S(A) vs Diode Forward Voltage,V_{SD}(V)

V_{GS}=0V

175°C   -55°C   25°C

Fig 9: VGS(th) Vs Tj Characteristics

Vth(V)_Normalized vs Junction Temperature,Tj(°C)

V_{DS}=V_{GS}
I_D=10mA

Fig 10: 3rd Quadrant Characteristic at 25°C

Drain-Source Curent, I_{DS}(A) vs Drain-to-Source Voltage,V_{DS}(V)

V_{GS}=0V
V_{GS}=5V
V_{GS}=10V
V_{GS}=15V
V_{GS}=18V
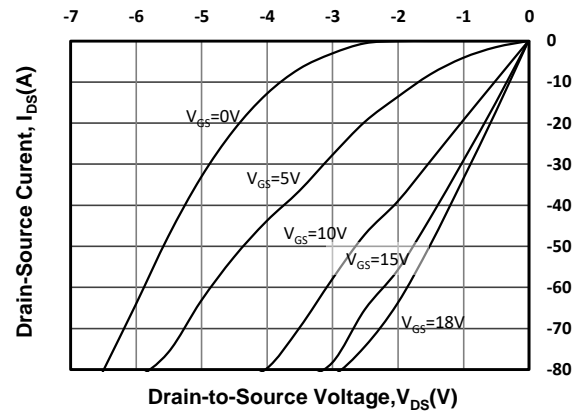
Fig 11：Gtate Charge Characteristics

Gate-to-Source Voltage,Vgs(V) vs Gate Charge,Qg(nC)

Conditions：
VGS=-5/15V
VDS=800V
ID=33.3A
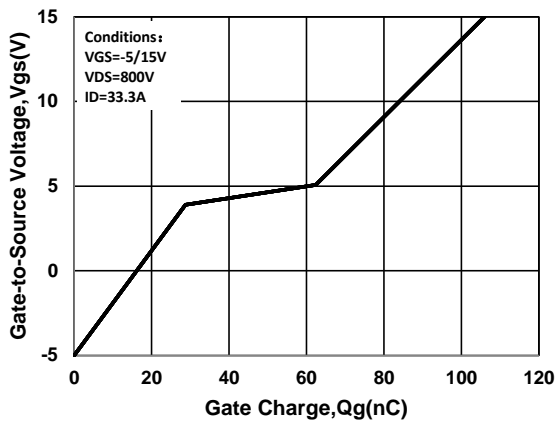
Fig 12: Capacitance Characteristics

Capacitance,C (pF) vs Drain-to-Source Voltage,V_{DS} (V)

Ciss
Coss
Crss

V_{GS}=0V
f=1MHz
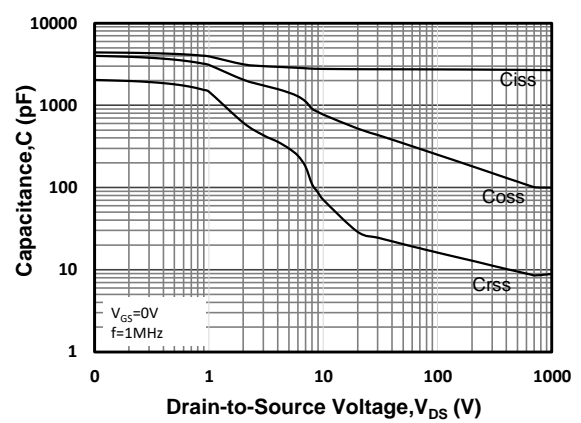
Fig 13: Continuous Drain Current vs. Case Temperature

Drain Current,I_D(A) vs Case Temperature,T_C(℃)
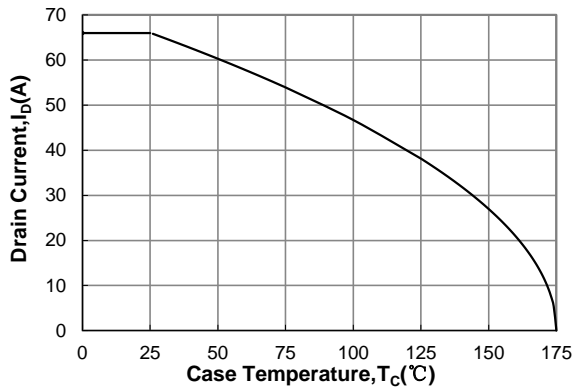
Fig 14: Maximum Power Dissipation vs. Case Temperature

Power Dissipation,P_D(W) vs Case Temperature,T_C(℃)
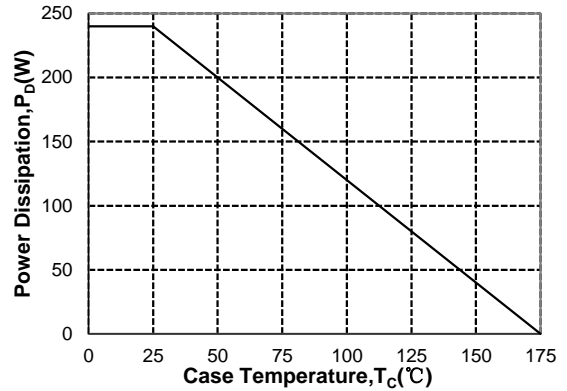
Fig 15: Safe Operating Area

ID, Drain Current,A vs Drain-to-Source Voltage,VDS(V)

Operation in This Area is Limited by $R_{DS(on)}$

10us
100μs
1ms
100ms

Single Pulse
Tc=25℃
Tj=175℃
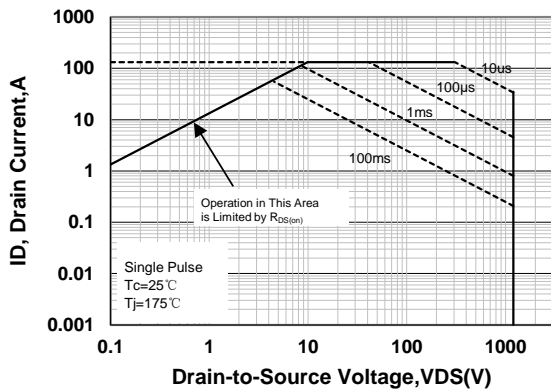
Fig 16:Output Capacitor Stored Energy

Stored Energy,E_{oss} (μJ) vs Drain-to-Source Voltage,VDS(V)
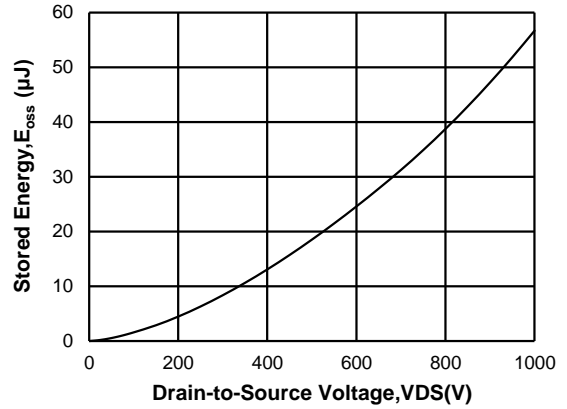
Fig 17: Max. Transient Thermal Impedance

Z_{thJC} (°C/W) vs t_p (sec)

D=0.5
0.3
0.1
0.05
0.02
0.01
Single pulse

P_{DM}
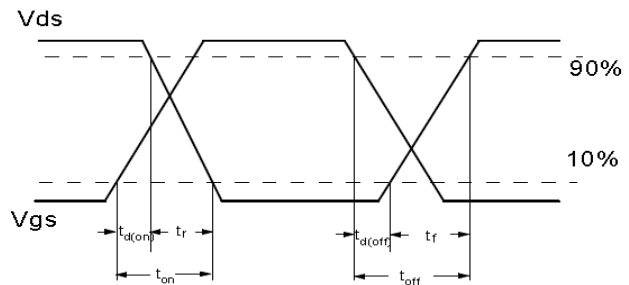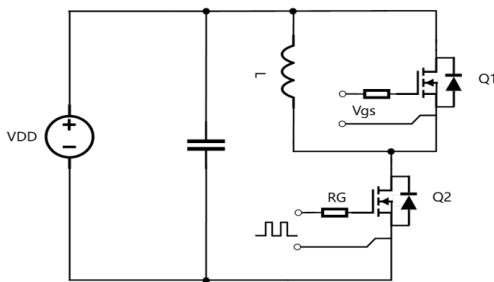t_1
t_2

Duty factor D=t1/t2
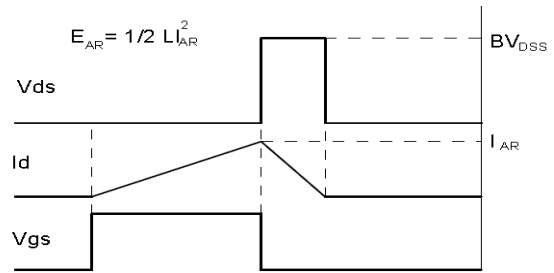T_{JM}-T_C=P_{DM}*Z_{thJC}(t)
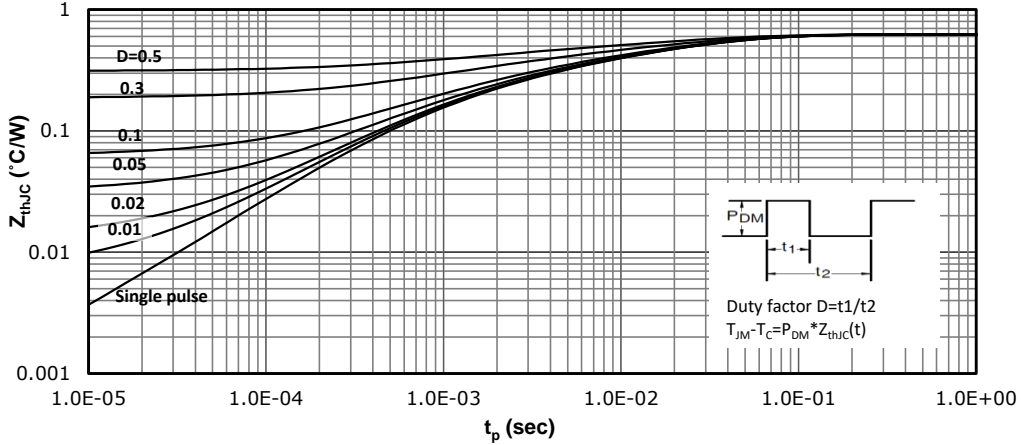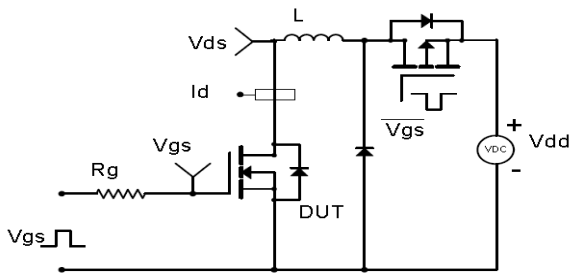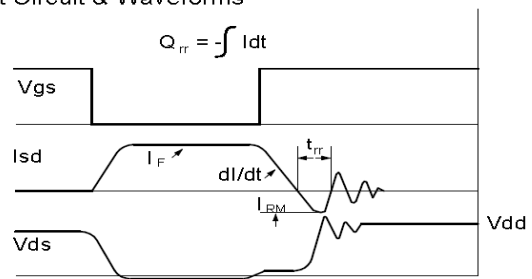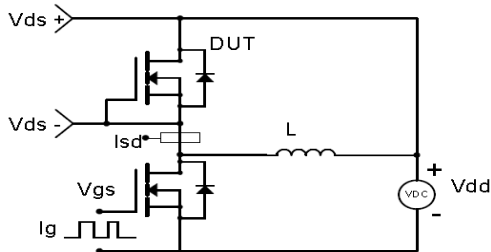
Test Circuit & Waveform

Gate Charge Test Circuit & Waveform
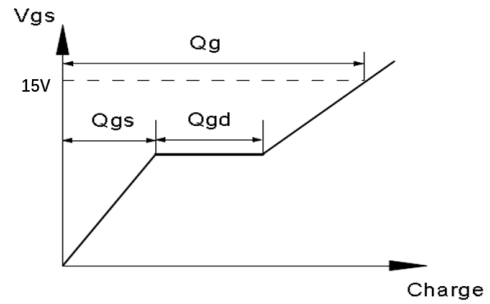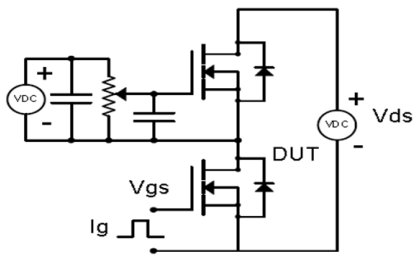
Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2\ LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int Idt$$

Package Outline: TO-247-4C
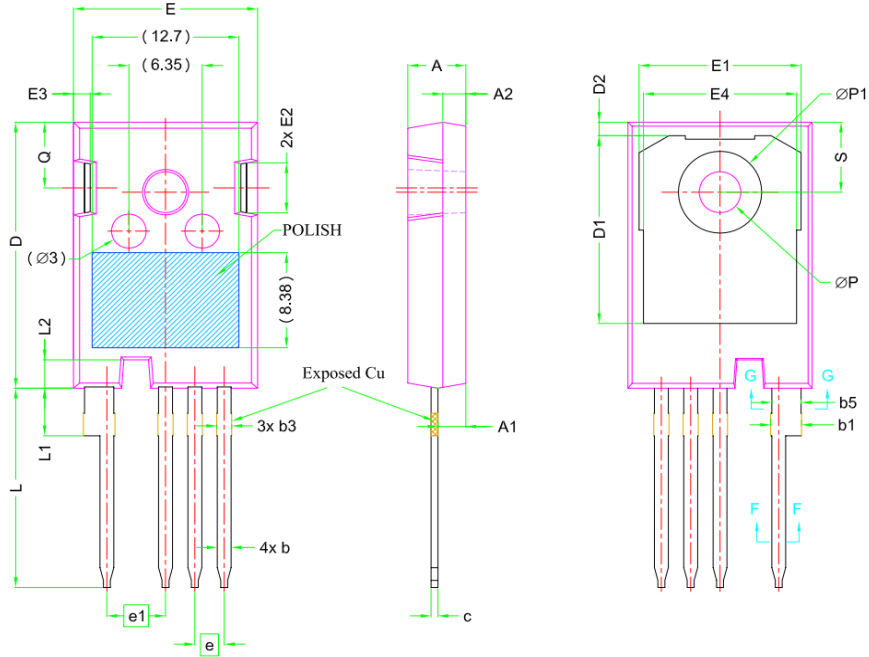
Items	Values(mm)	
	MIN	MAX
A	4.8	5.24
A1	2.29	2.54
A2	1.9	2.17
b	1	1.4
b1	2.3	3.03
b3	1.07	1.6
c	0.5	0.7
D	23.2	23.7
D1	16.15	17.75
D2	0.9	1.3
E	15.65	16.23
E1	13	14.25
E2	3.6	5.18
E3	1	1.9
e	2.54 BSC	
e1	5.08 BSC	
L	17.21	17.92
L1	3.9	4.44
L2	2.35	2.7
ΦP	3.51	3.65
ΦP1	7.19 REF.	
Q	5.49	6
S	6.04	6.3

Revision History

Revison	Date	Major changes
1.0	2024/3/29	Release of formal version

Disclaimer

Unless otherwise specified in the datasheet, the product is designed and qulified as a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability, such as automotive, aviation/aerospace and life-support devices or systems.

Any and all semicondutor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

CRM reserves the right to improve product design, function and reliability without notice.