CRXQ45M065G2Z

SiC MOSFET 650V, 45mΩ, 49A

Features

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

Product Summary

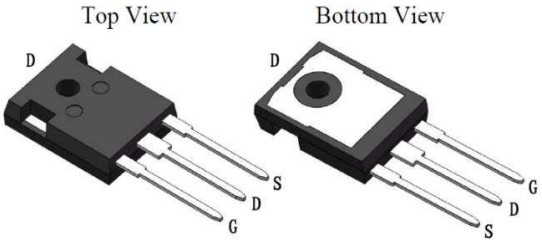
VDS	650V
$R_{DS(on)_typ}$	45mΩ
I_D	49A

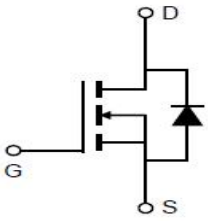
Applications

- Switching Mode Power Supply(SMPS)
- High Voltage DC/DC Converters
- On Board Charger(OBC)
- EV Charger

100% Avalanche Tested

RoHS HF





Package Marking and Ordering Information

Part #	Marking	Package	Packing	Qty
CRXQ45M065G2Z	CRXQ45M065G2Z	TO-247	Tube	25pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	650	V
Continuous drain current V_{GS}=15V，T_C = 25°C V_{GS}=15V，T_C = 100°C	I_D	 49 35	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D(pulse)}$	123	A
Avalanche energy, single pulse (L=10mH, Rg=25Ω)	E_{AS}	605	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	177	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/+18V

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	R_{thJC}	0.85	°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						
Drain-source breakdown voltage	$V_{(BR)DSS}$	650	-	-	V	V_{GS}=0V, I_D=250uA
Gate threshold voltage	$V_{GS(th)}$	1.8	-	3.6	V	V_{DS}=V_{GS},I_D=7mA
Zero gate voltage drain current	I_{DSS}	- -	1 10	100 -	μA	VDS=650V,VGS=0V T_j=25°C T_j=175°C
Gate-source leakage current	I_{GSS}	-	-	±100	nA	V_{GS}=-10/+22V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	45 58.5	60 -	mΩ	VGS=15V, ID=17.6A, T_j=25°C T_j=175°C
Drain-source on-state resistance	$R_{DS(on)}$	- -	35 45.5	50 -	mΩ	VGS=18V, ID=17.6A, T_j=25°C T_j=175°C
Transconductance	g_{fs}	-	16.7	-	S	VDS=20V,IDS=17.6A
Dynamic Characteristic						
Internal Gate resistance	$R_{G(int)}$	-	1.7	-	Ω	f=1MHz
Input Capacitance	C_{iss}	-	1595	-	pF	V_{GS}=0V, V_{DS}=600V, f=1MHz
Output Capacitance	C_{oss}	-	130	-		
Reverse Transfer Capacitance	C_{rss}	-	10.4	-		
Coss Stored Energy	E_{oss}	-	25	-	uJ	
Gate Total Charge	Q_g	-	74	-	nC	VGS=-5/18V VDS=400V ID=17.6A
Gate-Source charge	Q_{gs}	-	23.5	-		
Gate-Drain charge	Q_{gd}	-	15.8	-		
Turn-on delay time	$t_{d(on)}$	-	39	-	ns	VDD=400V,ID=17.6A VGS=-5V/15V， RG=2.5Ω，L=200uH
Rise time	t_r	-	11.5	-		
Turn-off delay time	$t_{d(off)}$	-	24.5	-		
Fall time	t_f	-	7.3	-		
Turn-On Switching Energy	$E_{(on)}$	-	129	-	uJ	
Turn Off Switching Energy	$E_{(off)}$	-	36	-		

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	3.0	-	V	VGS=0V,IF=8.8A
		-	2.6	-	V	VGS=0V,IF=8.8A, Tj=175℃
Continuous Diode Forward Current	I_S	-	-	49	A	V_{GS}=0V
Diode pulse Current	$I_{S,pulse}$	-	-	123	A	pulse width t_P limited by Tjmax
Body Diode Reverse Recovery Time	t_{rr}	-	16	-	ns	di/dt=1200A/us IF=17.6A Vdd=400V Tj=25℃
Body Diode Reverse Recovery Charge	Q_{rr}	-	87	-	nC	
Body Diode Peak Reverse Recovery Current	I_{rrm}	-	9.5	-	A	
Body Diode Reverse Recovery Time	t_{rr}	-	24	-	ns	di/dt=1200A/us IF=17.6A Vdd=400V Tj=175℃
Body Diode Reverse Recovery Charge	Q_{rr}	-	160	-	nC	
Body Diode Peak Reverse Recovery Current	I_{rrm}	-	11.8	-	A	

Typical Performance Characteristics

Fig 1. Output Characteristics (Tj=-55℃)

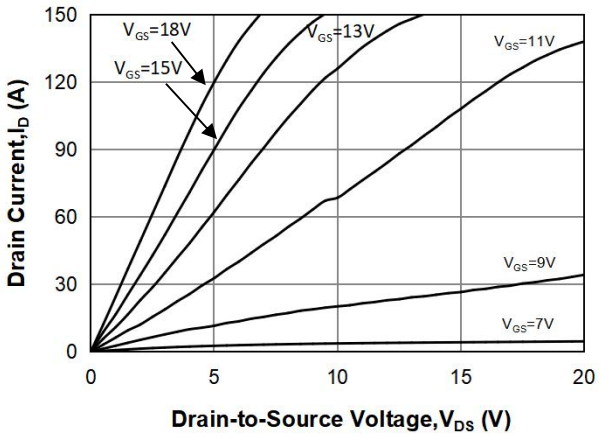


Fig 2. Output Characteristics (Tj=25℃)

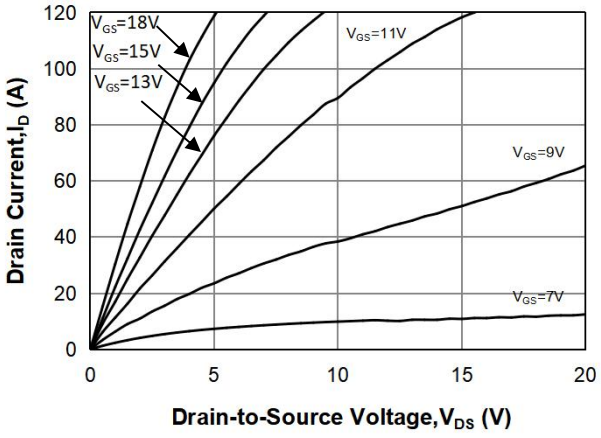


Fig 3. Output Characteristics (Tj=175℃)

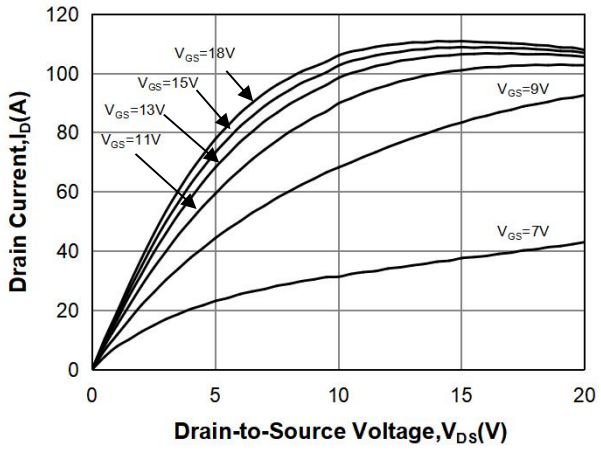


Fig 4: Rds(on) vs. Temperature

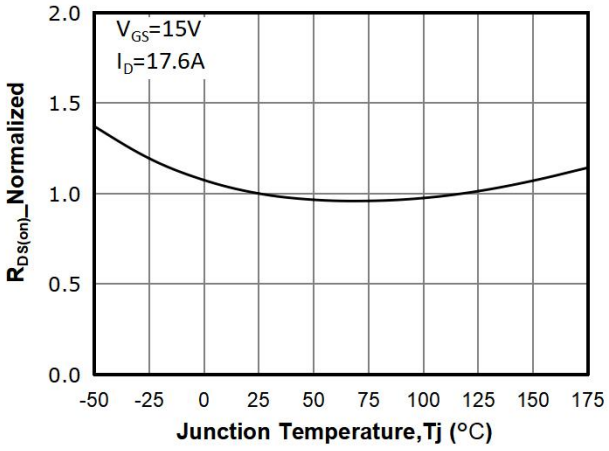


Fig 5: On-Resistance vs. Drain Current For Various Temperatures

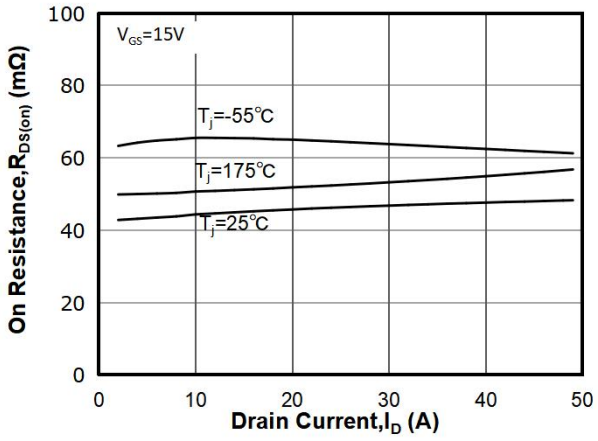


Fig 6: Rds(on) vs. Temperature For Various Gate Voltage

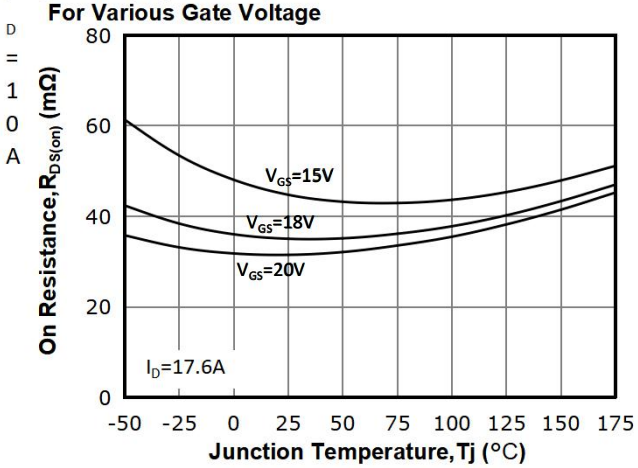


Fig 7: Transfer Characteristics

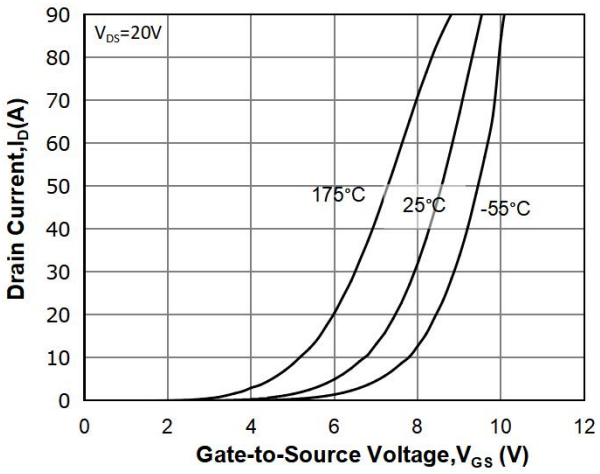


Fig 8: Body-diode Forward Characteristics For Various Temperatures

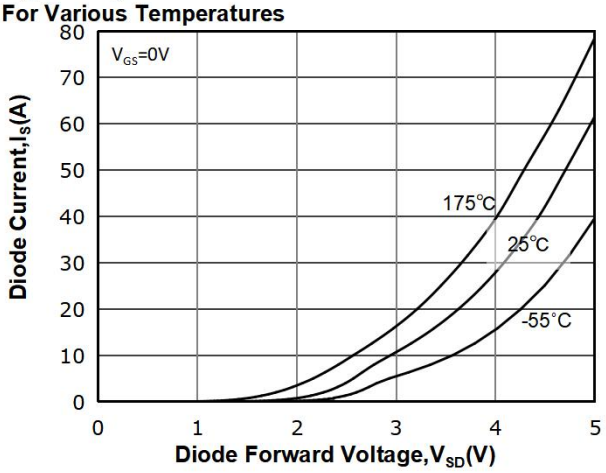


Fig 9: VGS(th) Vs Tj Characteristics

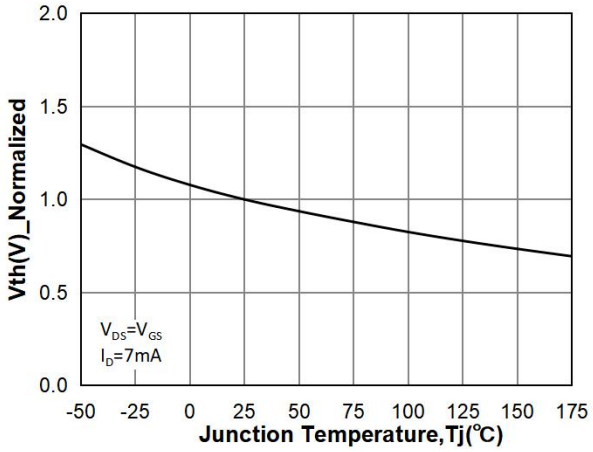


Fig 10: 3rd Quadrant Characteristic at 25℃

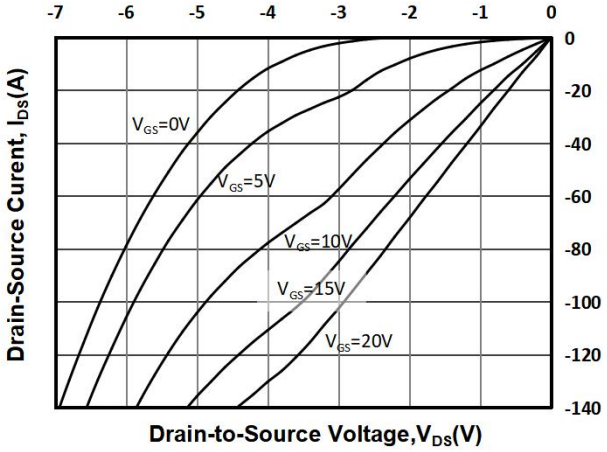


Fig 11：Gtate Charge Characteristics

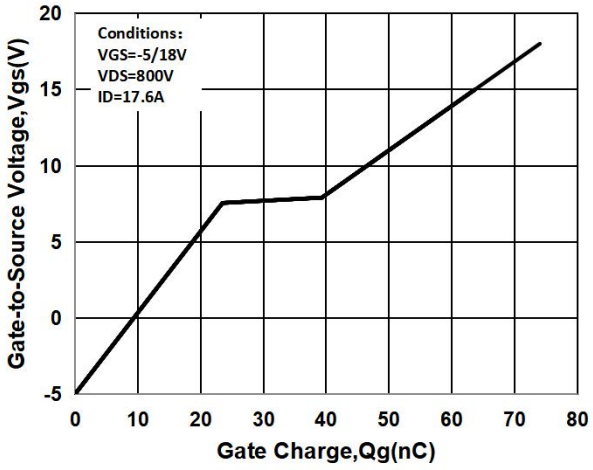


Fig 12: Capacitance Characteristics

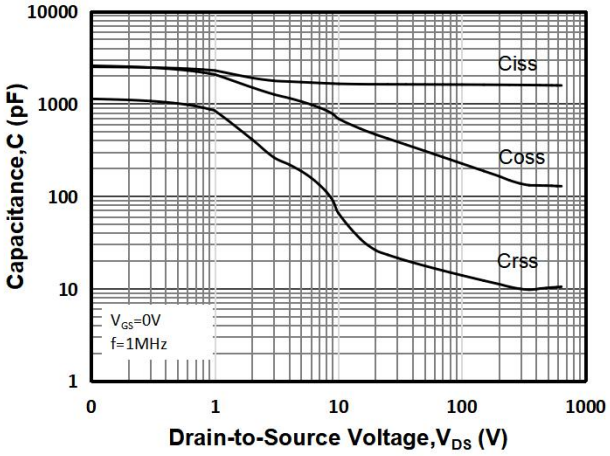


Fig 13: Continuous Drain Current vs. Case Temperature

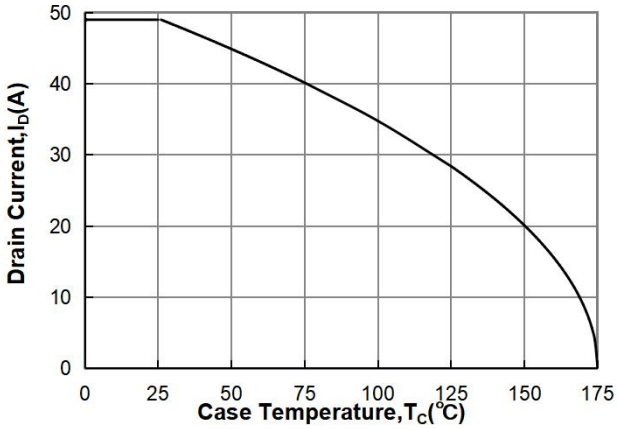


Fig 14: Maximum Power Dissipation vs. Case Temperature

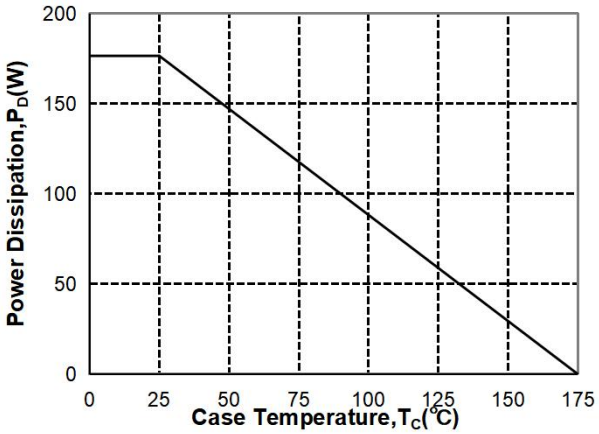


Fig 15: Safe Operating Area

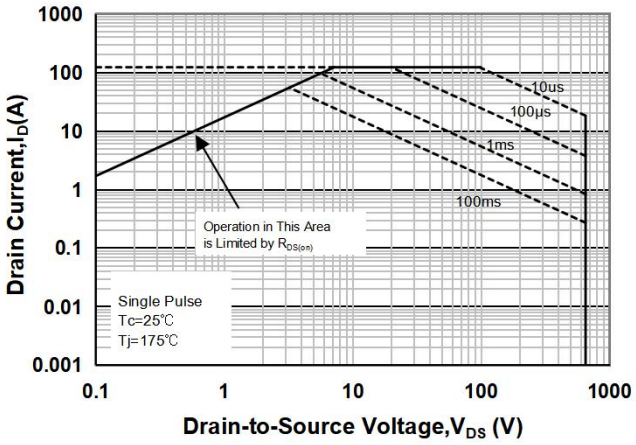


Fig 16:Output Capacitor Stored Energy

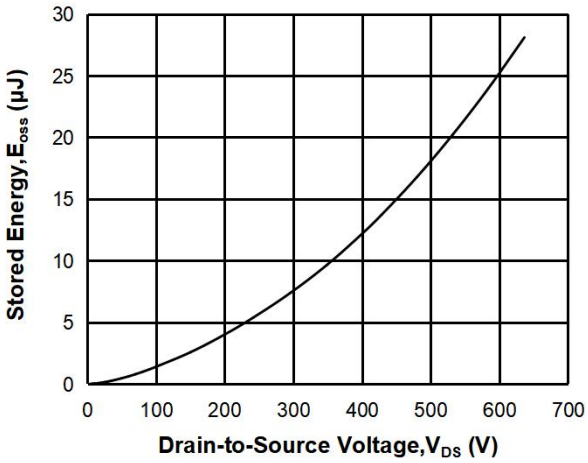


Fig 17: Max. Transient Thermal Impedance

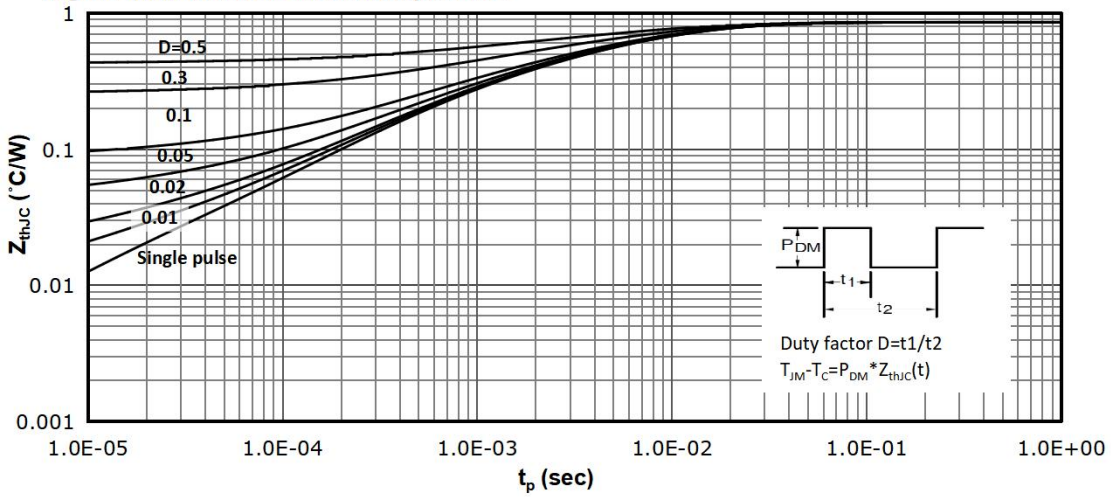


Fig 18: Rg(Ω) vs. Switching Times(us)

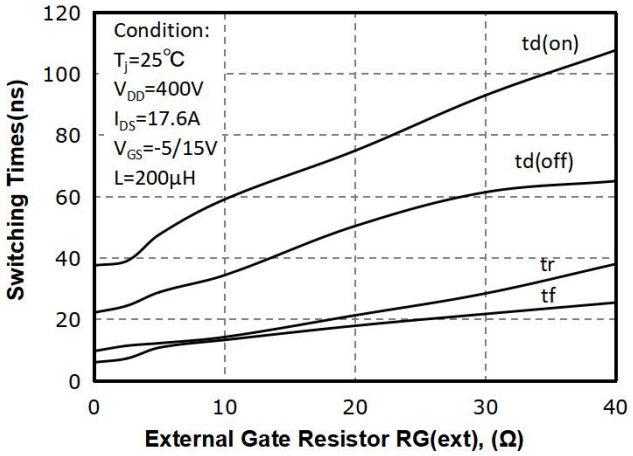


Fig 19: Rg(Ω) vs. Switching Loss(uJ)

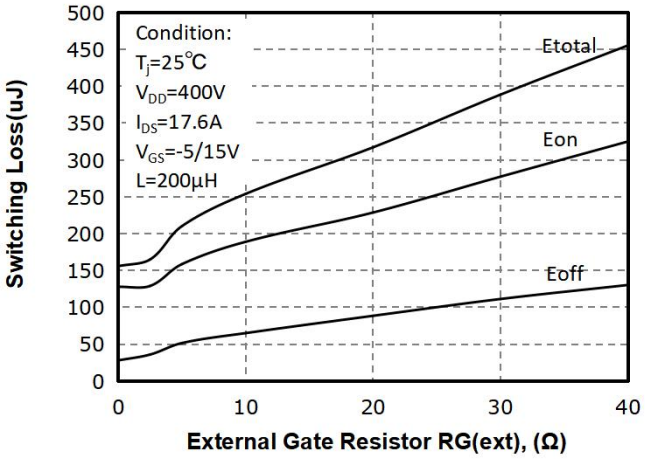


Fig 20: Temperature(°C) vs. Switching Loss(uJ)

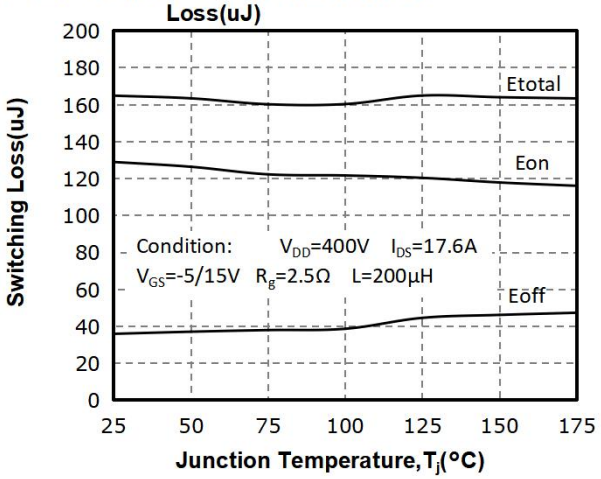
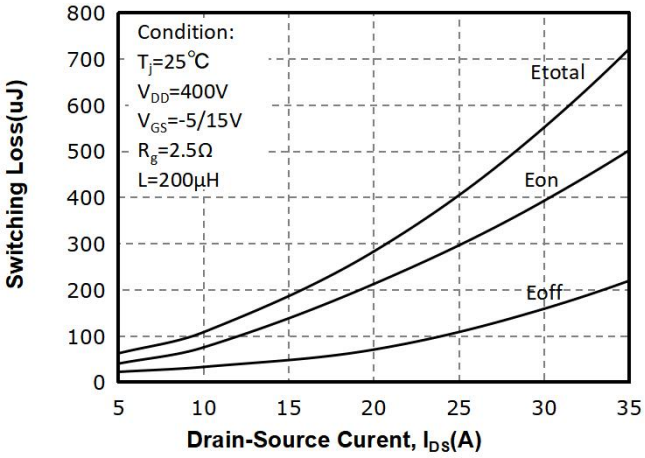
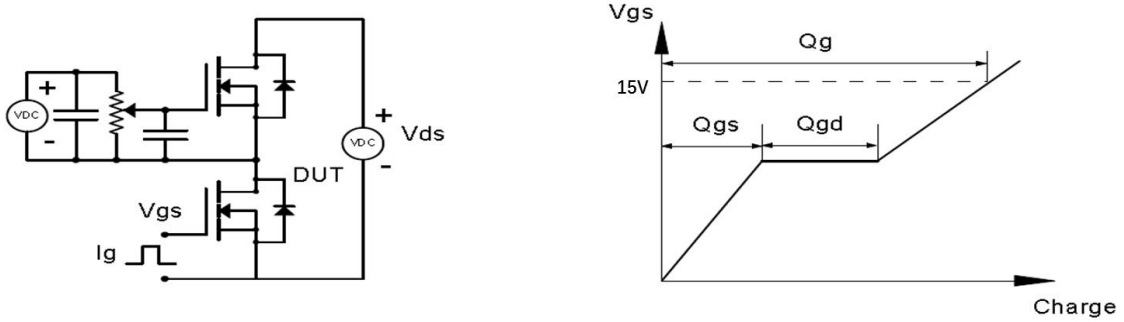


Fig 21: I_{DS}(A) vs. Switching Loss(uJ)

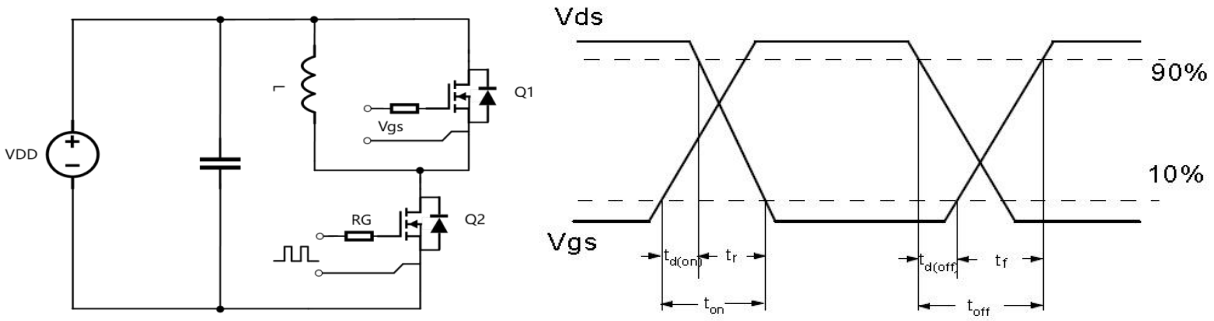


Test Circuit & Waveform

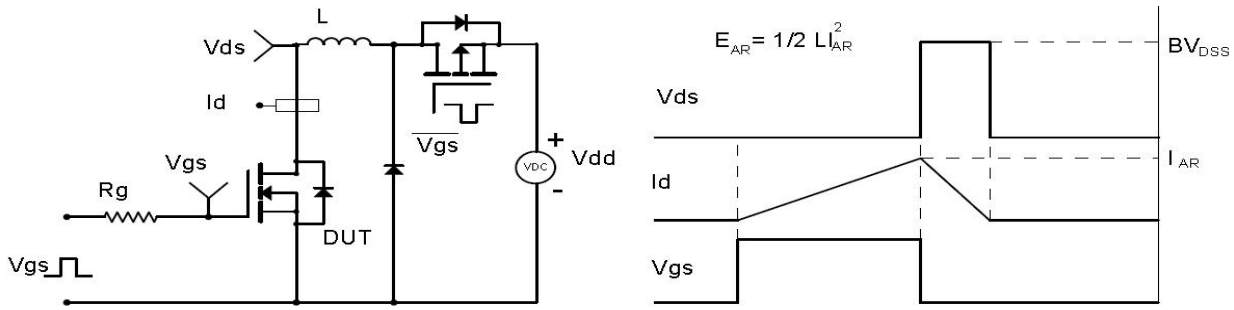
Gate Charge Test Circuit & Waveform



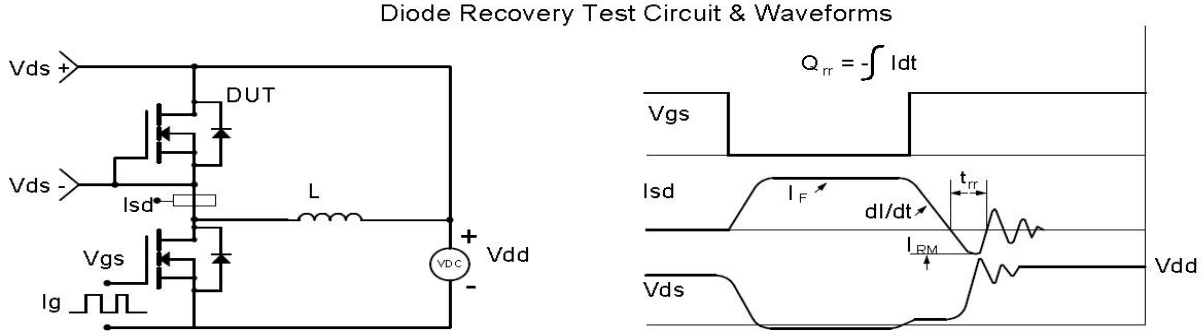
Resistive Switching Test Circuit & Waveforms



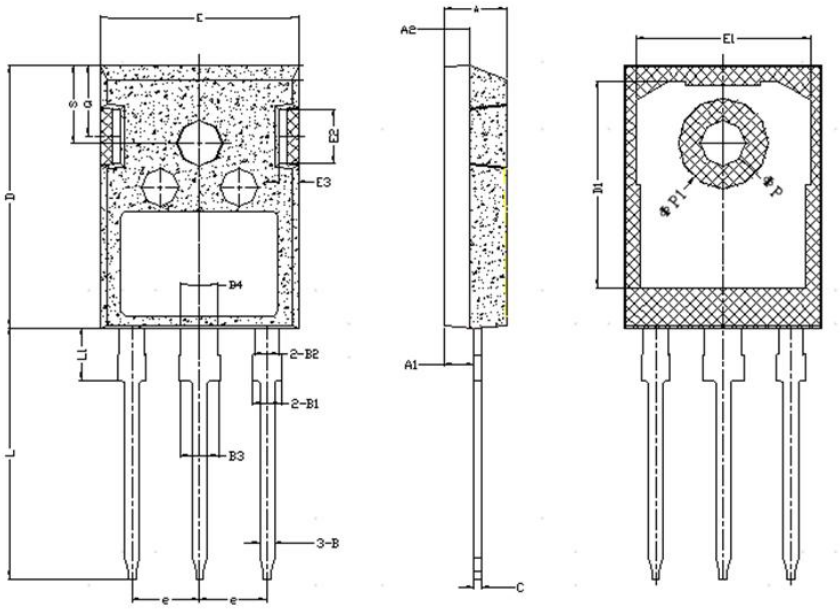
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: TO-247



Items	Values(mm)	
	MIN	MAX
A	4.6	5.2
A1	2.2	2.6
A2	1.85	2.17
B	0.9	1.4
B1	1.75	2.35
B2	1.75	2.15
B3	2.8	3.35
B4	2.8	3.15
C	0.5	0.7
D	20.6	21.3
D1	16	18
E	15.5	16.1
E1	13	14.7
E2	3.8	5.3
E3	0.8	2.6
e	5.2	5.7
L	19	20.5
L1	3.9	4.6
ΦP	3.3	3.7
ΦP1	7	7.4
Q	5.2	6
S	5.8	6.6

Revision History

Revison	Date	Major changes
1.0	2024/4/15	Release of formal version
2.0	2024/11/1	Updating the Switching data

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.