CRJQ50N65G4FZ

SJMOS N-MOSFET 650V, 41mΩ, 50A

Features

- CRM(CQ) Super_Junction technology
- Much lower Ron*A performance for On-state efficiency
- Better efficiency due to very low FOM
- Ultra-fast body diode
- Qualified for industrial grade applications according to JEDEC

Product Summary

V_{DS}	650V
$R_{DS(on),typ}$	41mΩ
I_D	50A

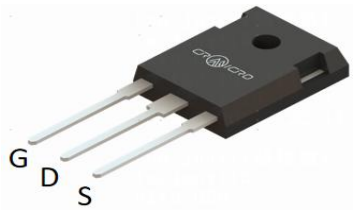
Applications

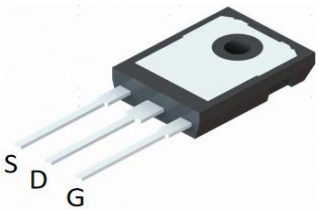
- PC Power
- EV Charger
- Solar/UPS
- Server/Telecom

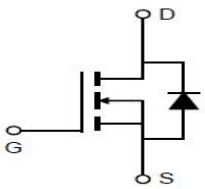
100% DVDS Tested
100% Avalanche Tested

RoHS HF

Top view Bottom view







Package Marking and Ordering Information

CRJQ50N65G4FZ	CRJQ50N65G4FZ	TO-247	Tube	N/A	N/A	25pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	650	V
Continuous drain current [1)] T_C = 25℃ T_C = 100℃	I_D	 50 31	A
Pulsed drain current [2)] (T_C = 25℃, t_p limited by $T_{j,max}$)	$I_{D,pulse}$	145	A
Avalanche energy, single pulse (L=30mH)	E_{AS}	375	mJ
MOSFET dv/dt ruggedness	dv/dt	120	V/ns
Gate-Source voltage	V_{GS}	±30	V
Power dissipation (T_C = 25℃)	P_{tot}	295	W
Continuous diode forward current(T_C = 25℃)	I_S	50	A
Diode pulse current [2)] (T_C = 25℃)	$I_{S,pulse}$	145	A
Recovery diode dv/dt [3)]	dv/dt	70	V/ns
Operating junction and storage temperature	T_j , T_{stg}	-55...+150	℃

1) Limited by $T_{j,max}$. Maximum Duty Cycle D = 0.50
2) Pulse width t_p limited by $T_{j,max}$
3) Identical low side and high side switch with identical R_g

Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case	R_{thJC}	-	0.30	0.42	℃/W	
Thermal resistance, junction – ambient	R_{thJA}	-	-	47	℃/W	

Electrical Characteristic (at T_j = 25℃, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	650	-	-	V	V_{GS}=0V,I_D=1mA
Gate threshold voltage	$V_{GS(th)}$	3	-	5	V	V_{DS}=V_{GS},I_D=2mA
Zero gate voltage drain current	I_{DSS}	-	-	10	μA	V_{DS}=650V,V_{GS}=0V
Gate-source leakage current	I_{GSS}	-	-	±100	nA	V_{GS}=±30V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	41 98	50 -	mΩ	V_{GS}=10V,I_D=25A, T_j=25℃ T_j=150℃
Transconductance	g_{fs}	-	40	-	S	V_{DS}=20V,I_D=25A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	4450	-	pF	V_{GS}=0V, V_{DS}=400V, f=250KHz
Output Capacitance	C_{oss}	-	75	-		
Reverse Transfer Capacitance	C_{rss}	-	5	-		
Gate Total Charge	Q_g	-	95	-	nC	V_{GS}=10V, V_{DS}=400V, I_D=25A
Gate-Source charge	Q_{gs}	-	38	-		
Gate-Drain charge	Q_{gd}	-	36	-		
Gate plateau voltage	$V_{plateau}$	-	7.5	-	V	
Turn-on delay time	$t_{d(on)}$	-	36	-	ns	V_{GS}=10V, I_D=25A, V_{DS}=400V, R_g=3.3Ω
Rise time	t_r	-	75	-		
Turn-off delay time	$t_{d(off)}$	-	65	-		
Fall time	t_f	-	40	-		
Gate resistance	$R_{g,int}$	-	2.0	-	Ω	f=1MHz

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	0.7	0.95	1.2	V	V_{GS}=0V,I_{SD}=25A
Body Diode Reverse Recovery Time	t_{rr}	-	110	-	ns	I_{SD}=25A di_F/dt=100A/μs V_{DS}=400V
Body Diode Reverse Recovery Charge	Q_{rr}	-	0.6	-	μC	
Body Diode Reverse Recovery Peak Current	I_{rrm}	-	11	-	A	

Typical Performance Characteristics

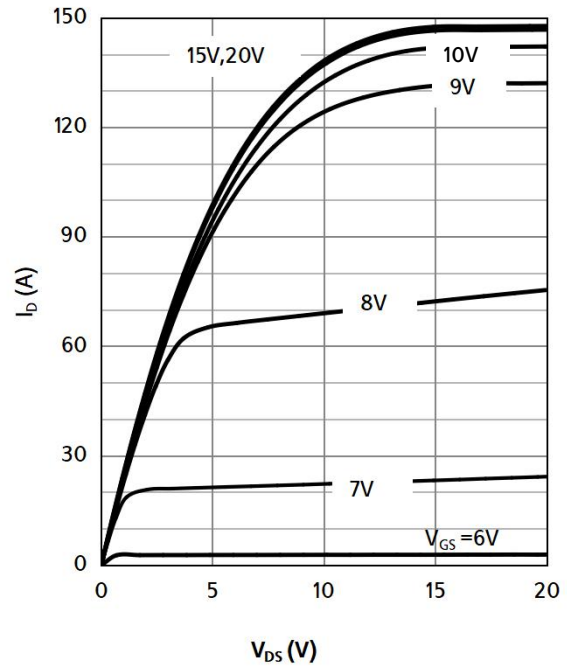
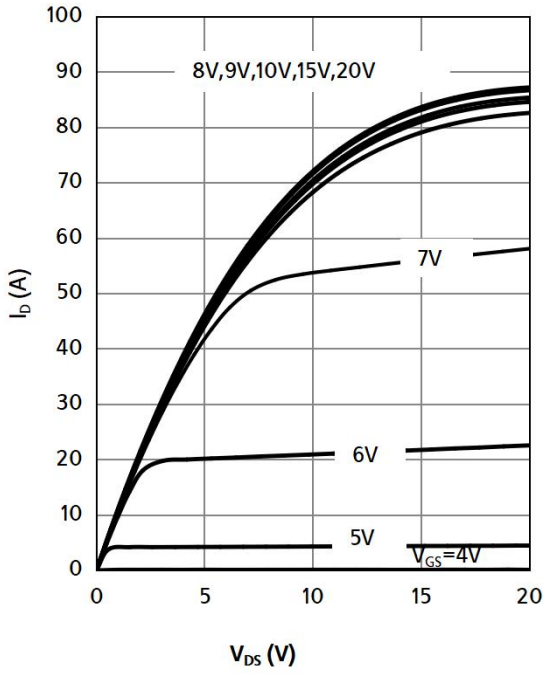
Fig 1. Output Characteristics (T_j=25℃)	Fig 2. Output Characteristics (T_j=150℃)
	
I_D=f(V_{DS});T_j=25℃;parameter: V_{GS}	I_D=f(V_{DS});T_j=150℃;parameter: V_{GS}

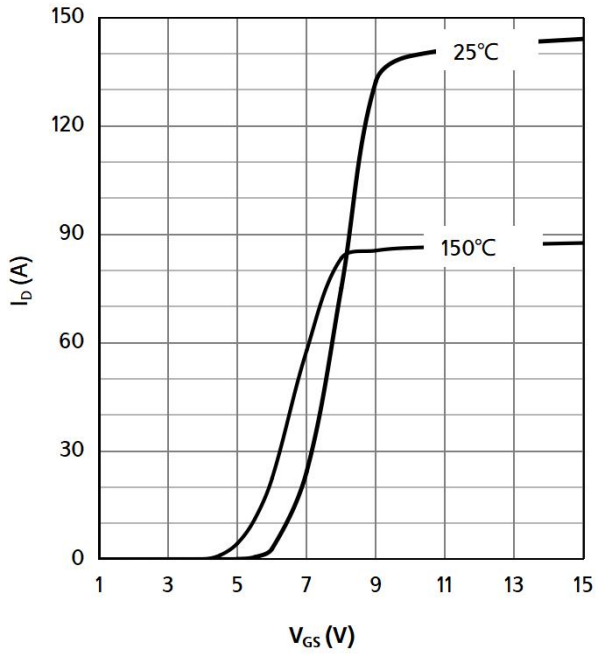
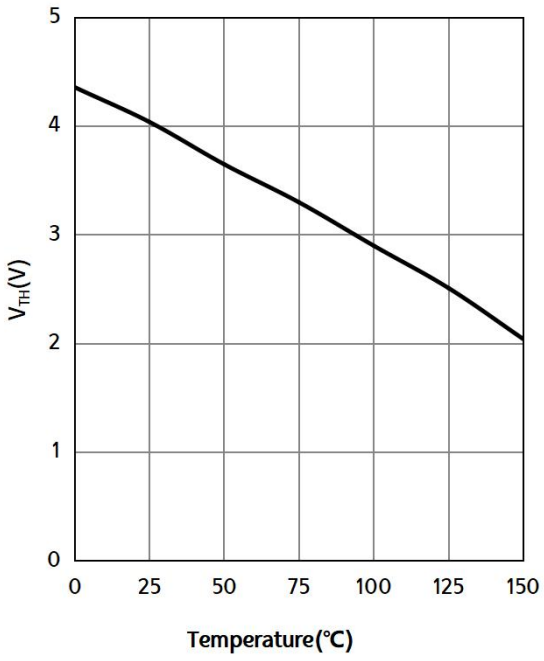
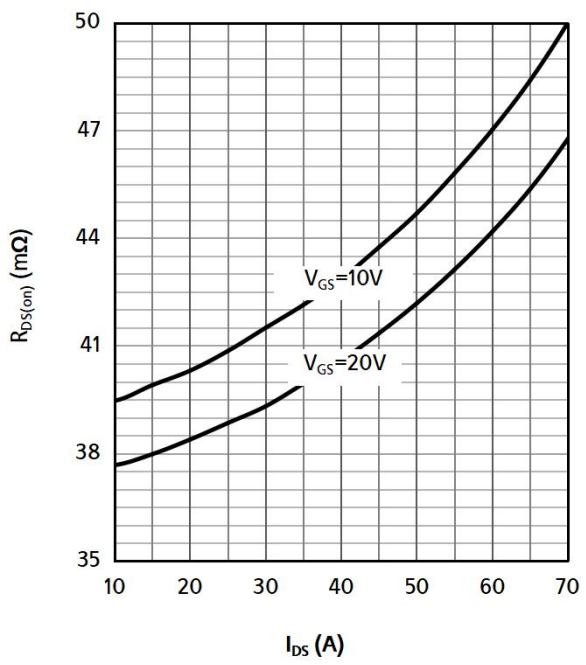
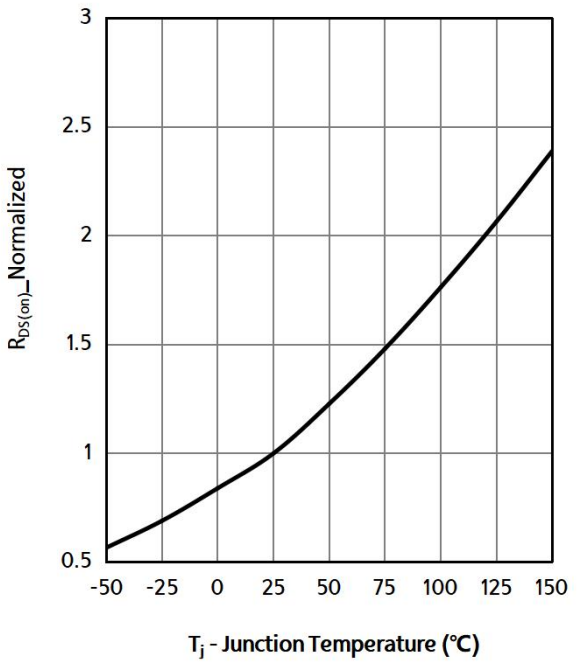
Fig 3: Transfer Characteristics	Fig 4: V_{TH} vs. T_j Temperature Characteristics
	
I_D=f(V_{GS});V_{DS}=20V;parameter: T_j	V_{TH}=f(T_j);I_D=2mA

Fig 5: $R_{DS(on)}$ vs. I_{DS} Characteristics(T_j=25℃)



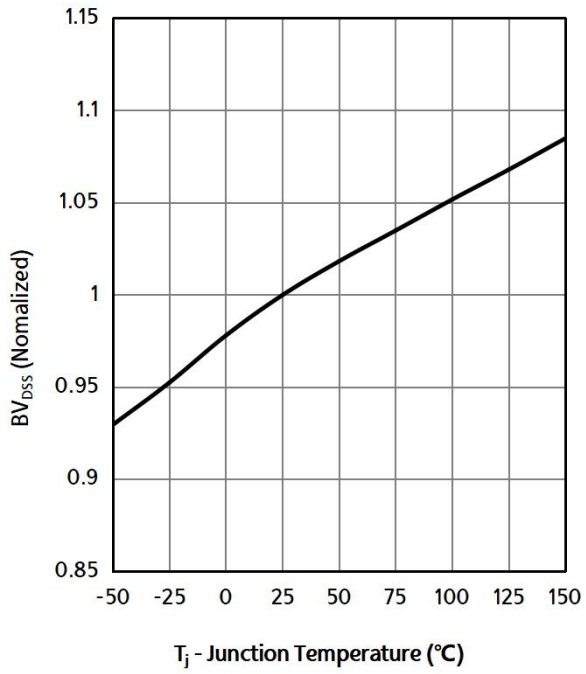
$R_{DS(on)}$=f(I_D);T_j=25℃;parameter: V_{GS}

Fig 6: $R_{DS(on)}$ vs. Temperature



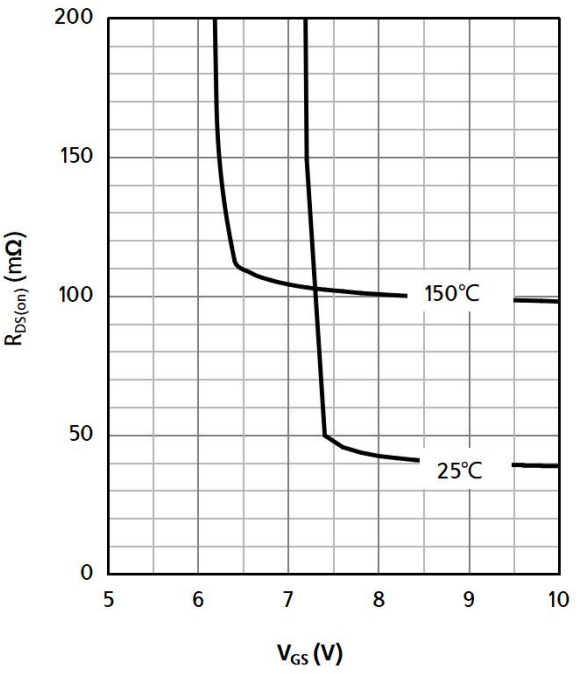
$R_{DS(on)}$=f(T_j);I_D=25A; V_{GS}=10V

Fig 7: BV_{DSS} vs. Temperature



BV_{DSS}=f(T_j)

Fig 8: $R_{DS(on)}$ vs. Gate Voltage



$R_{DS(on)}$=f(V_{GS});I_D=25A;parameter: T_j

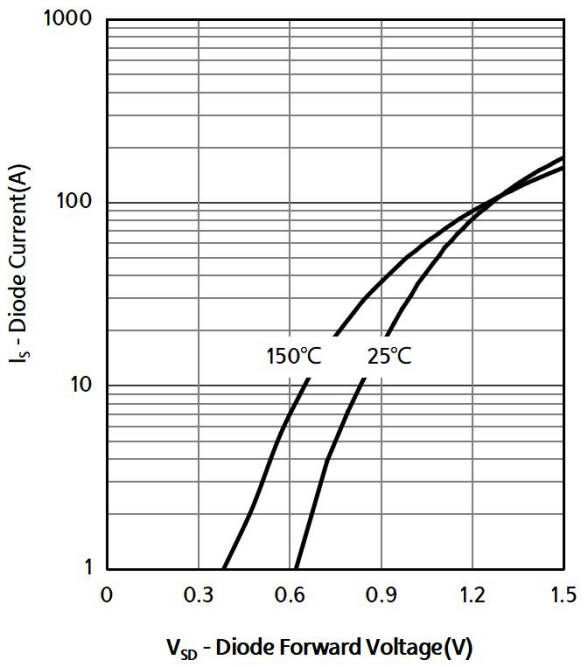
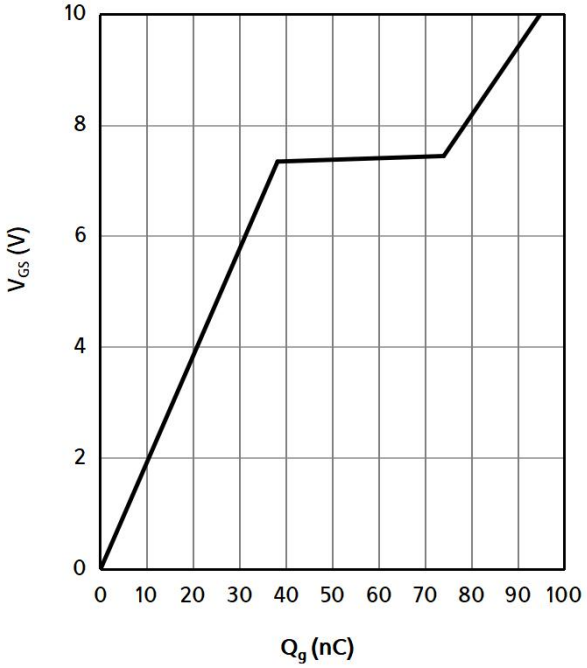
Fig 9: Body-diode Forward Characteristics	Fig 10: Gate Charge Characteristics
	
I_F=f(V_{SD});parameter: T_j	V_{GS}=f(Q_g); V_{DD}=400V; I_D=25A

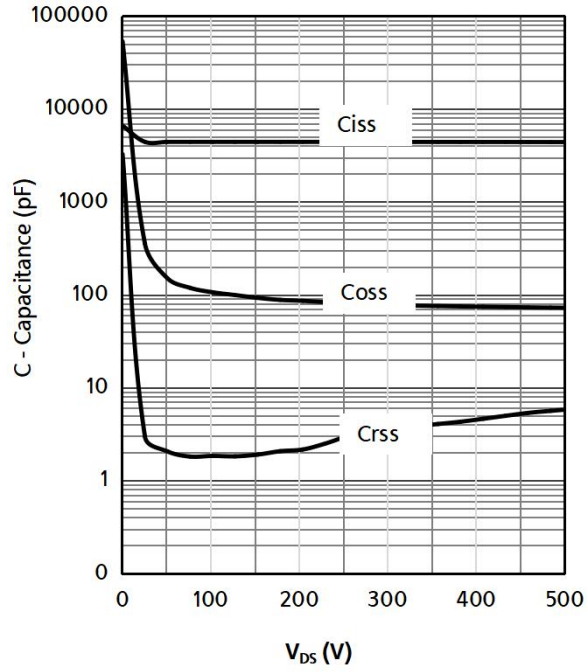
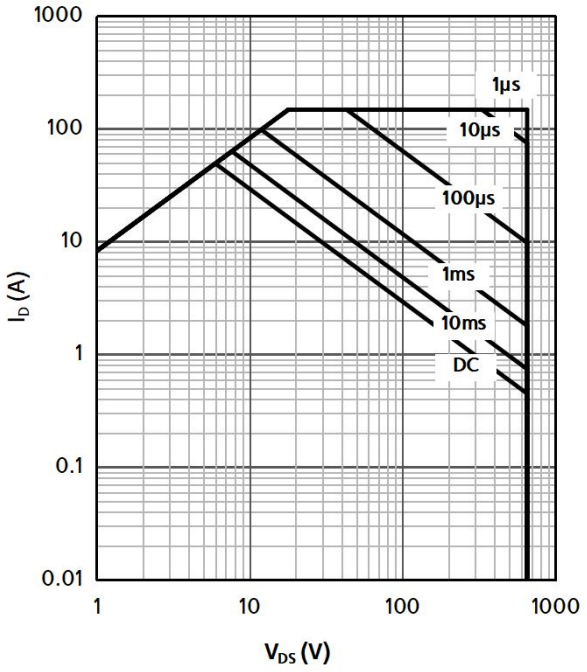
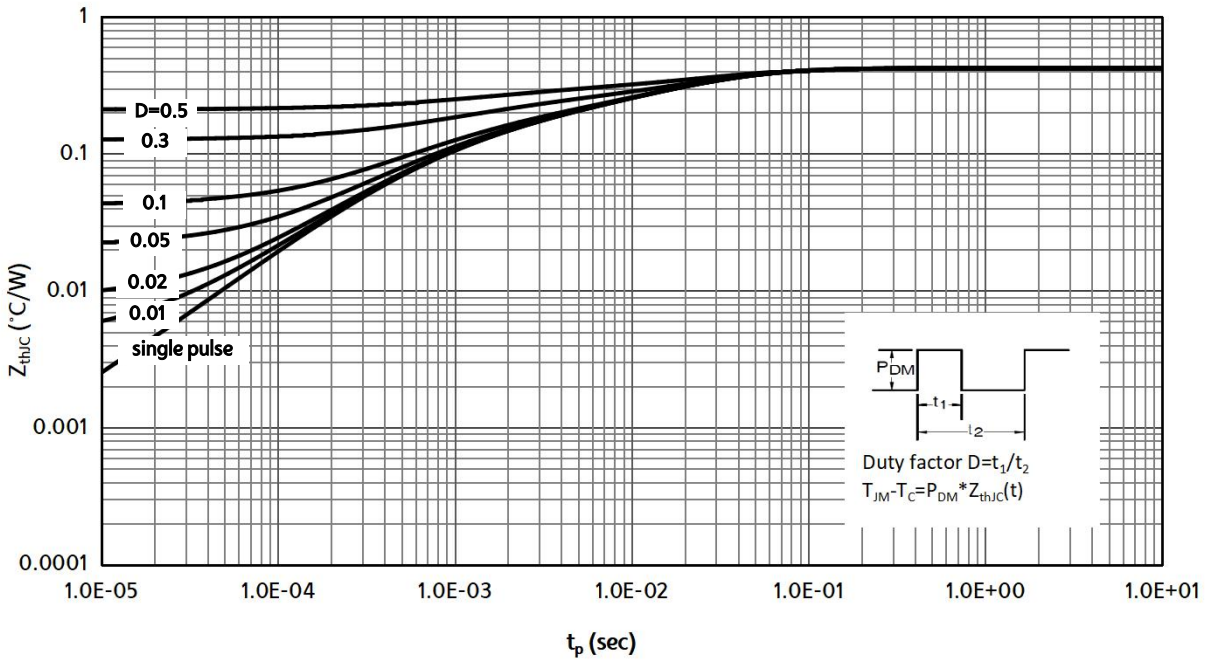
Fig 11: Capacitance Characteristics	Fig 12: Safe Operating Area
	
C=f(V_{DS}); V_{GS}=0V; f=250kHZ	I_D=f(V_{DS}); T_C=25°C;D=0;parameter: t_p

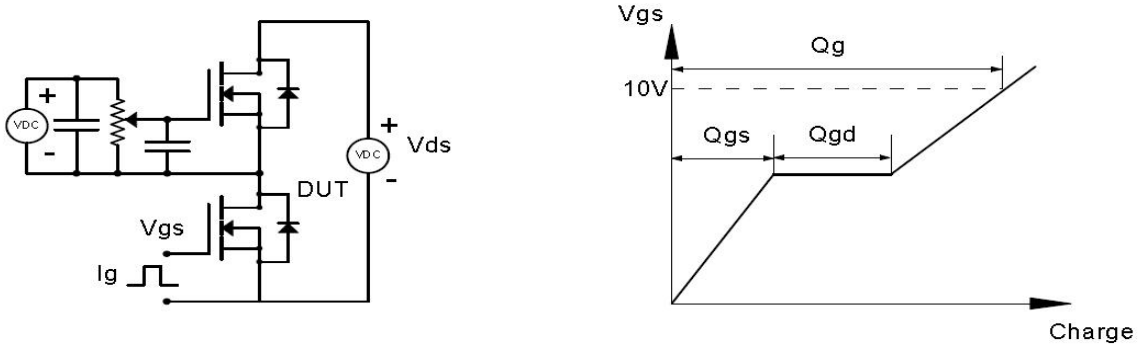
Fig 13: Max. Transient Thermal Impedance



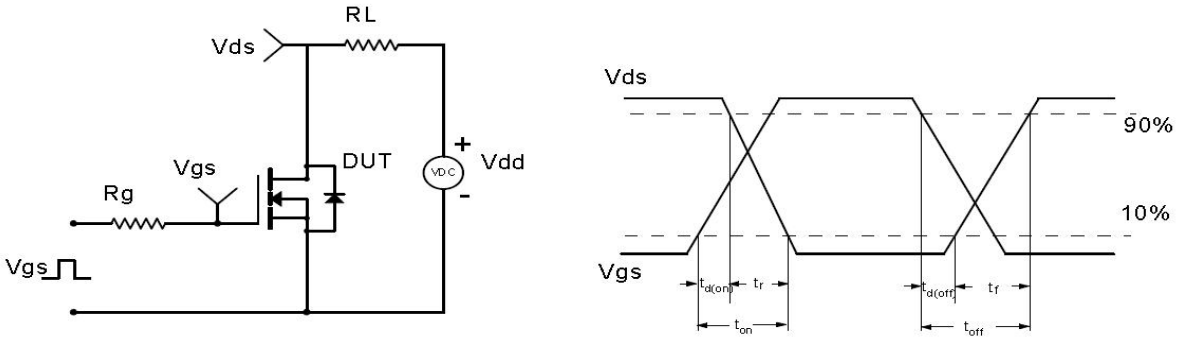
Z_{thJC}=f(t_p);parameter:D=t_1/t_2

Test Circuit & Waveform

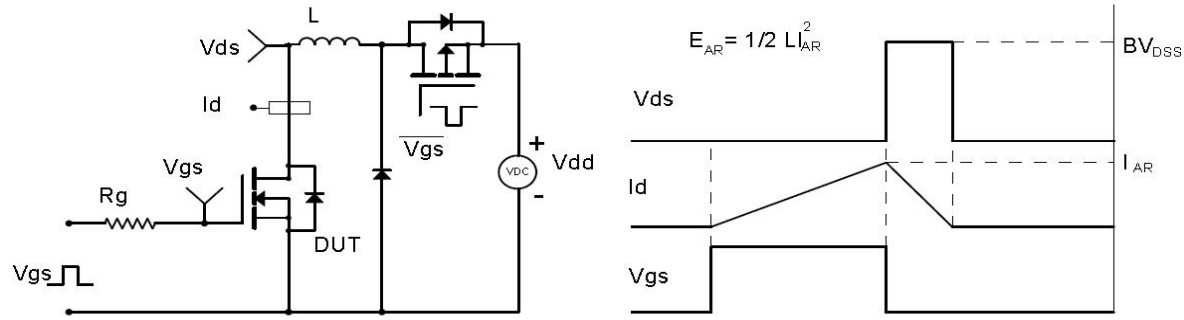
Gate Charge Test Circuit & Waveform



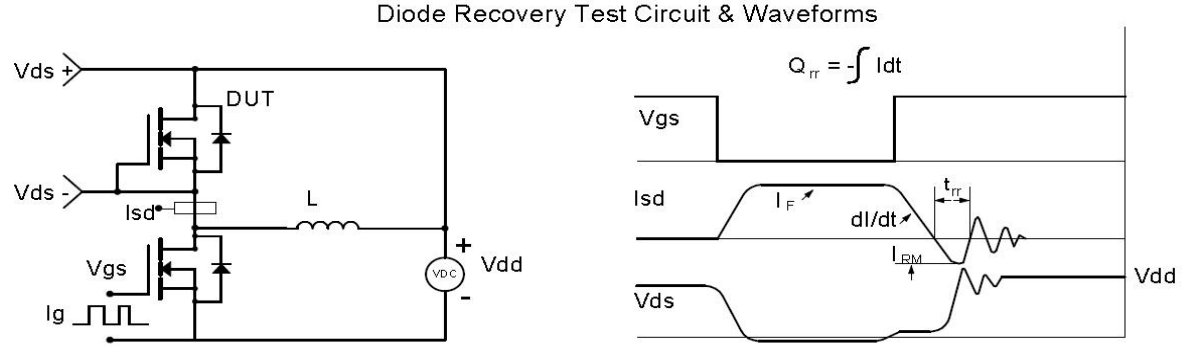
Resistive Switching Test Circuit & Waveforms



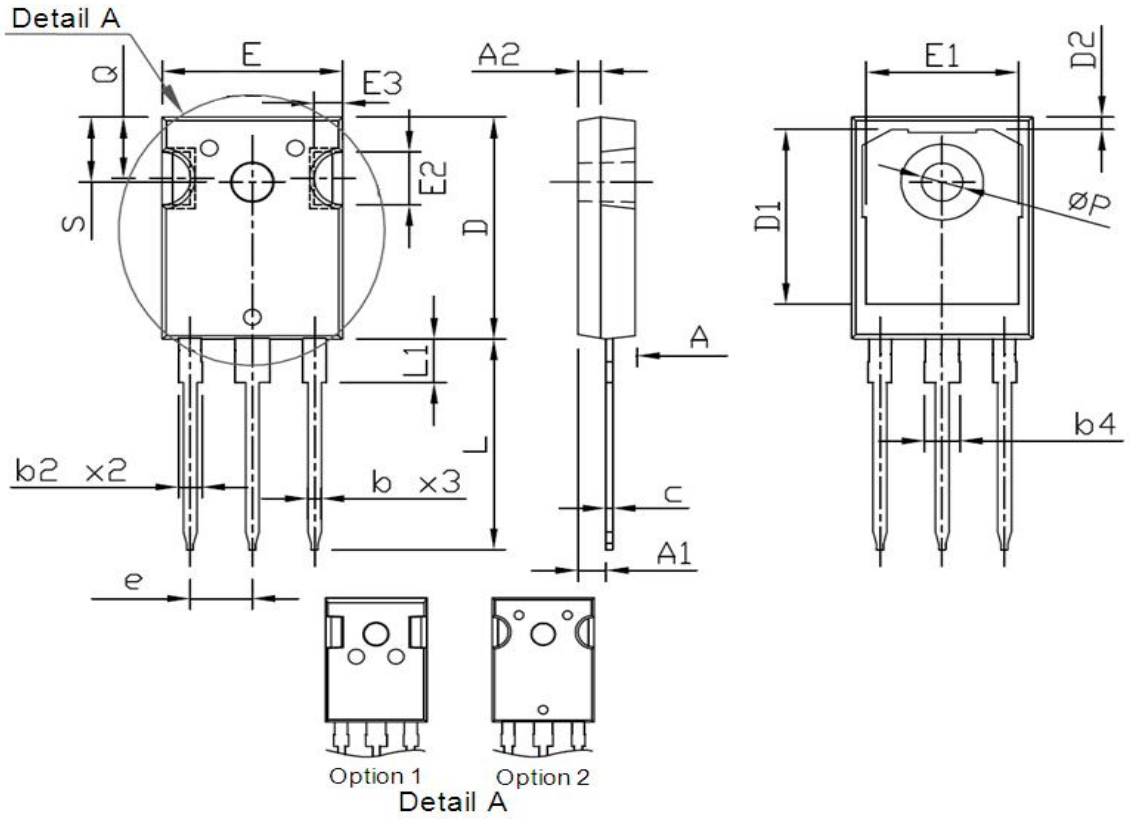
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: TO-247



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.70	5.30	0.185	0.209
A1	2.20	2.60	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	1.04	1.33	0.041	0.052
b2	1.90	2.41	0.075	0.095
b4	2.87	3.43	0.113	0.135
c	0.55	0.70	0.022	0.028
D	20.70	21.30	0.815	0.839
D1	16.25	17.65	0.640	0.695
D2	0.51	1.40	0.020	0.055
e	5.44 BSC.		0.214 BSC.	
E	15.50	16.30	0.610	0.642
E1	13.08	14.16	0.515	0.557
E2	3.80	5.49	0.150	0.216
E3	1.00	2.75	0.039	0.108
L	19.72	20.32	0.776	0.800
L1	3.85	4.50	0.152	0.177
Q	5.25	6.25	0.207	0.246
P	3.50	3.70	0.138	0.146
S	6.04	6.30	0.238	0.248

Marking



NOTE:
NXBBAAAAY

N	—WB code (Usually omitted)
X	—Assembly location code
BB	—Fab code
AAAA	—Lot code
Y	—Bin code (Usually omitted)

Revision History

Revison	Major changes
1.0	First version
2.0	Final 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(CQ) reserves the right to improve product design, function and reliability without notice.