华润微电子(重庆)有限公司

CRSG039N14N3

SkyMOS3 N-MOSFET 135V, 3.1mΩ, 230A

Features

- Uses CRM(CQ) advanced SkyMOS3 technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent Q_gx$R_{DS(on)}$ product(FOM)
- Qualified according to JEDEC criteria

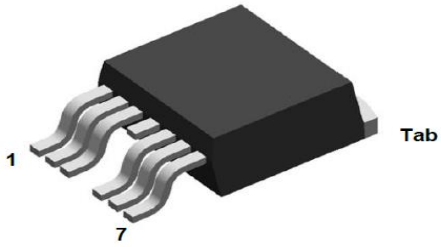
Applications

- Motor control and drive
- Battery management System
- UPS (Uninterrupible Power Supplies)

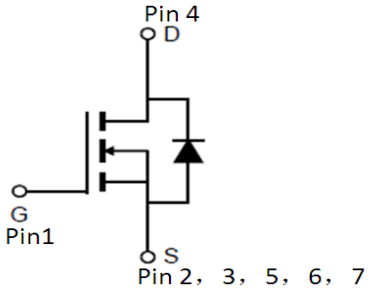
Product Summary

V_{DS}	135V
$R_{DS(on).typ}$	3.1mΩ
I_D	230A

100% DVDS Tested
100% Avalanche Tested



CRSG039N14N3



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRSG039N14N3	CRSG039N14N3	TO-263-7 pin	Tape	N/A	N/A	800pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	135	V
Continuous drain current T_C = 25°C (Silicon limit) T_C = 25°C (Package limit) T_C = 100°C (Silicon limit)	I_D	 230 240 146	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D\ pulse}$	920	A
Avalanche energy, single pulse (I_D = 76A, Rg=25Ω)[1]	E_{AS}	1434	mJ
Gate-Source voltage	V_{GS}	±20	V
Power dissipation (T_C = 25°C)	P_{tot}	370	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+150	°C
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	Tsold	245	°C

※. Notes:
1.EAS is tested at starting Tj = 25℃, L = 0.5mH, IAS =76A, VGS = 10V.

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Thermal Resistance

Parameter	Symbol	Value		Unit
		typ.	max.	
Thermal resistance, junction – case.	RthJC	0.26	0.34	°C/W
Thermal resistance, junction - ambient(min. footprint)	RthJA	-	40	°C/W

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

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	135	-	-	V	V_{GS}=0V, I_D=250uA
		135	-	-	V	V_{GS}=0V, I_D=1mA
Gate threshold voltage	$V_{GS(th)}$	2.0	3.0	4.0	V	V_{DS}=V_{GS},I_D=250uA
Zero gate voltage drain current	I_{DSS}	- -	- -	1 100	μA	V_{DS}=135V,V_{GS}=0V T_j=25°C T_j=125°C
Gate-source leakage current	I_{GSS}	-	-	±100	nA	V_{GS}=±20V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$		3.1	3.9	mΩ	VGS=10V, ID=80A
Transconductance	g_{fs}	-	214.7	-	S	V_{DS}=5V, I_D=80A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	10153	-	pF	V_{GS}=0V, V_{DS}=68V, f=1MHz
Output Capacitance	C_{oss}	-	869	-		
Reverse Transfer Capacitance	C_{rss}	-	34	-		
Gate Total Charge	Q_G	-	146.9	-	nC	V_{GS}=10V, V_{DS}=68V, I_D=80A
Gate-Source charge	Q_{gs}	-	60.5	-		
Gate-Drain charge	Q_{gd}	-	25.4	-		
Turn-on delay time	$t_{d(on)}$	-	32.0	-	ns	V_{GS}=10V, V_{DD}=68V, R_{G_ext}=2.7Ω
Rise time	t_r	-	79.1	-		
Turn-off delay time	$t_{d(off)}$	-	83.3	-		
Fall time	t_f	-	48.9	-		
Gate resistance	R_G	-	2.6	-	Ω	V_{GS}=0V, V_{DS}=0V, f=1MHz

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Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	0.813	1.4	V	V_{GS}=0V,I_{SD}=80A
Body Diode Reverse Recovery Time	t_{rr}	-	98.3	-	ns	I_F=80A,dI/dt=100A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	-	323.6	-	nC	

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Typical Performance Characteristics

Fig 1: Output Characteristics

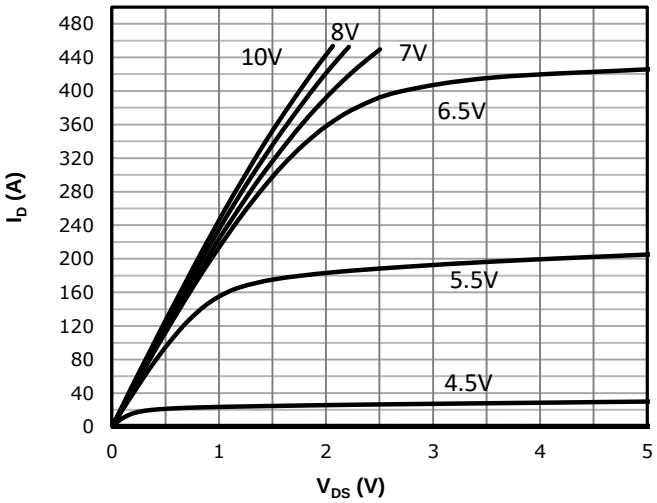


Fig 2: Transfer Characteristics

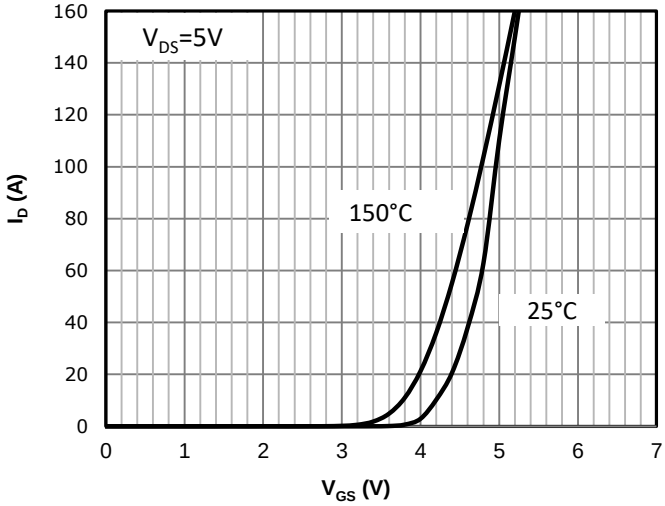


Fig 3: Rds(on) vs Drain Current and Gate Voltage

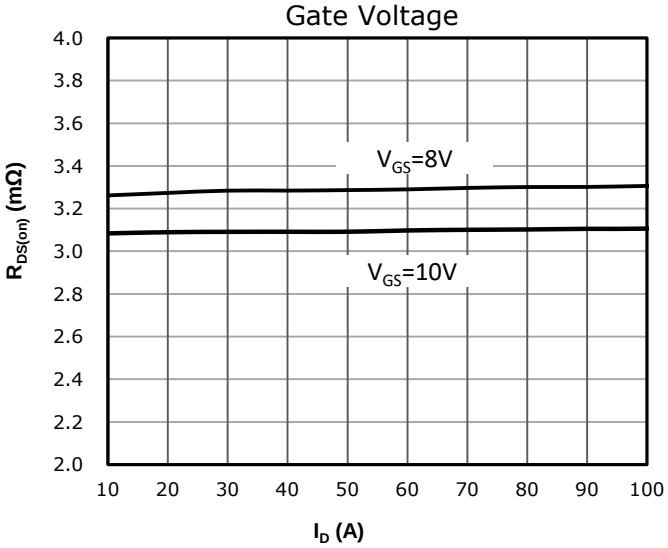


Fig 4: Rds(on) vs Gate Voltage

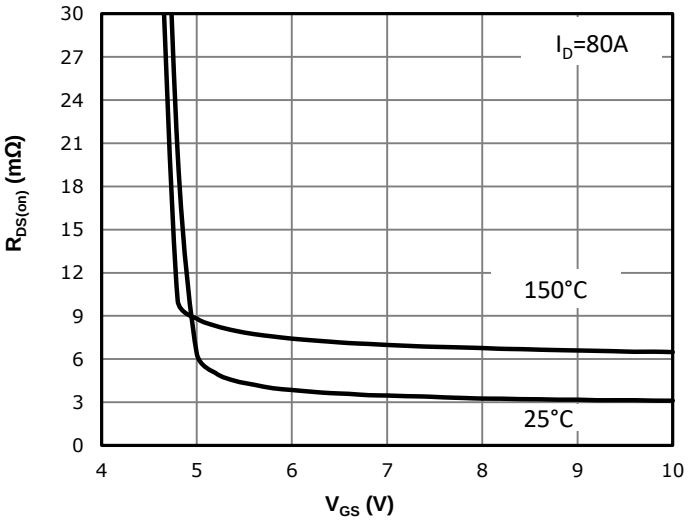


Fig 5: Rds(on) vs. Temperature

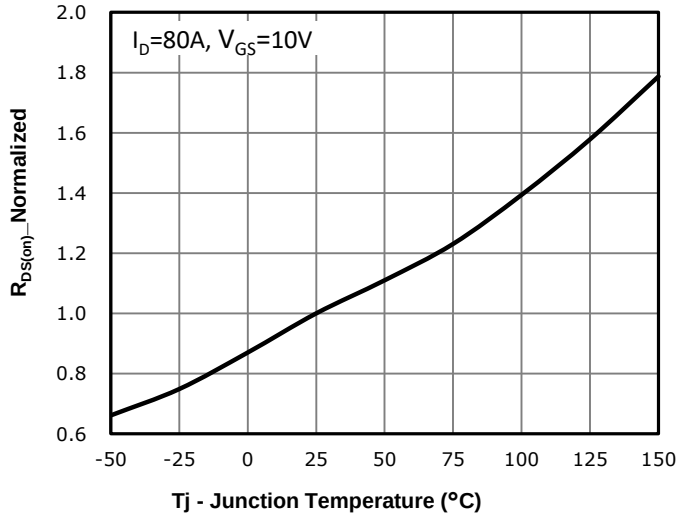
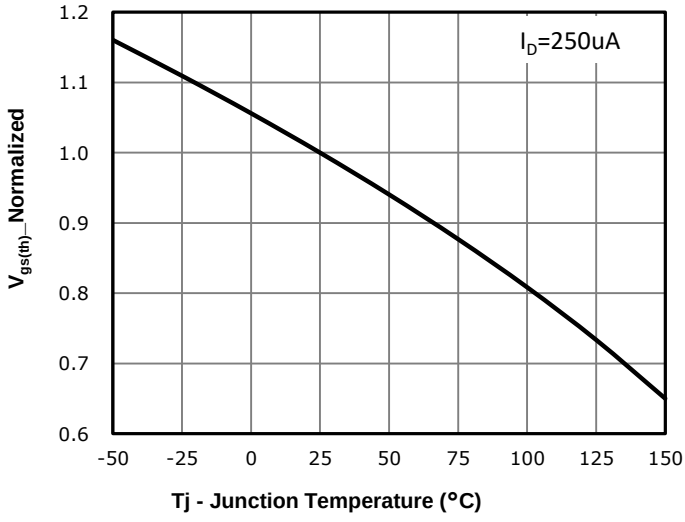


Fig 6: Vgs(th) vs. Temperature



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Fig 7: BVdss vs. Temperature

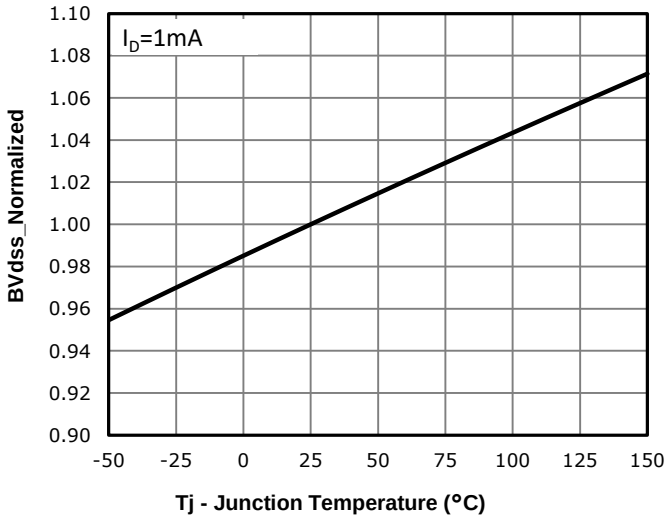


Fig 8: Capacitance Characteristics

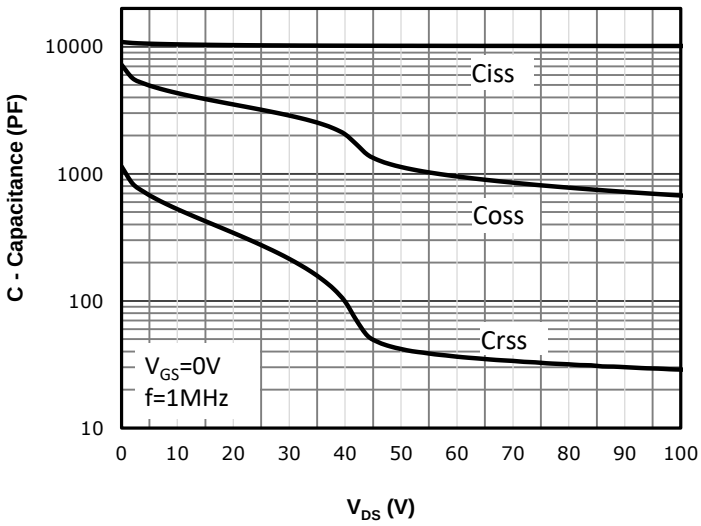


Fig 9:Gate Charge Characteristics

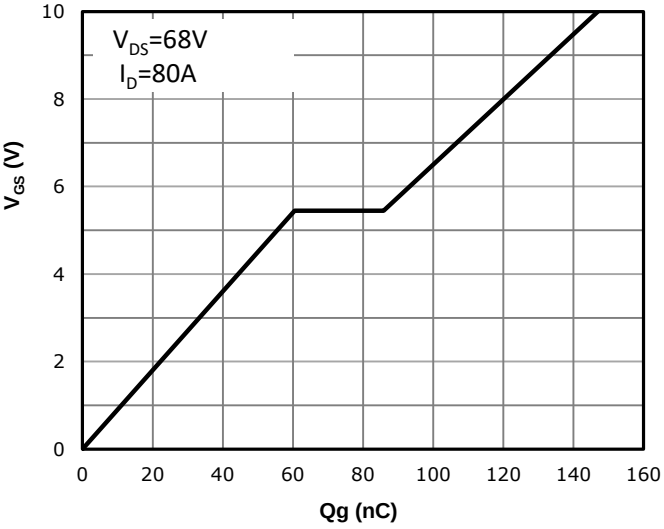


Fig 10: Body-diode Forward Characteristics

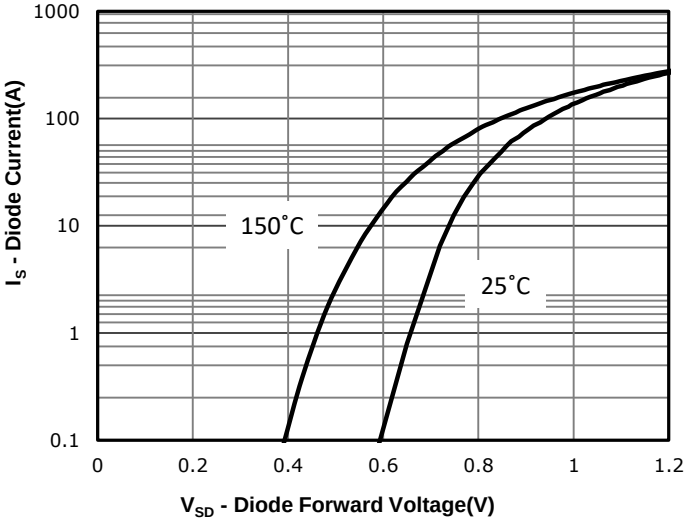


Fig 11: Power Dissipation

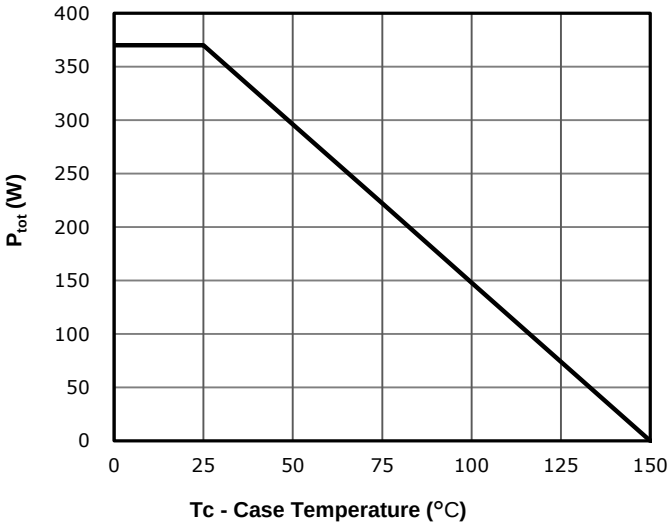
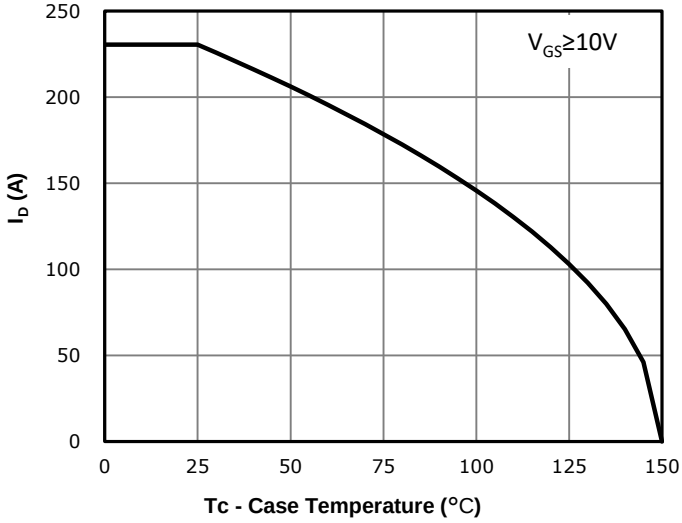


Fig 12: Drain Current Derating



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Fig 13: Safe Operating Area

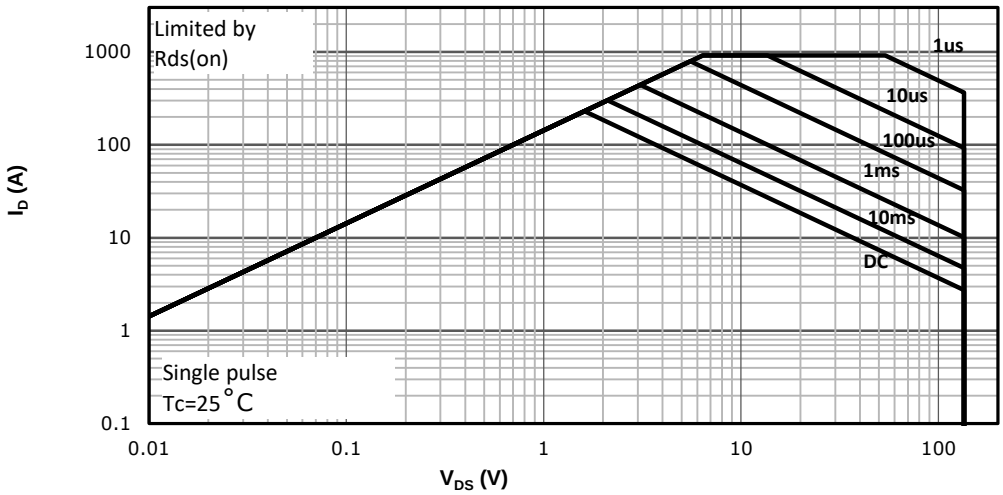
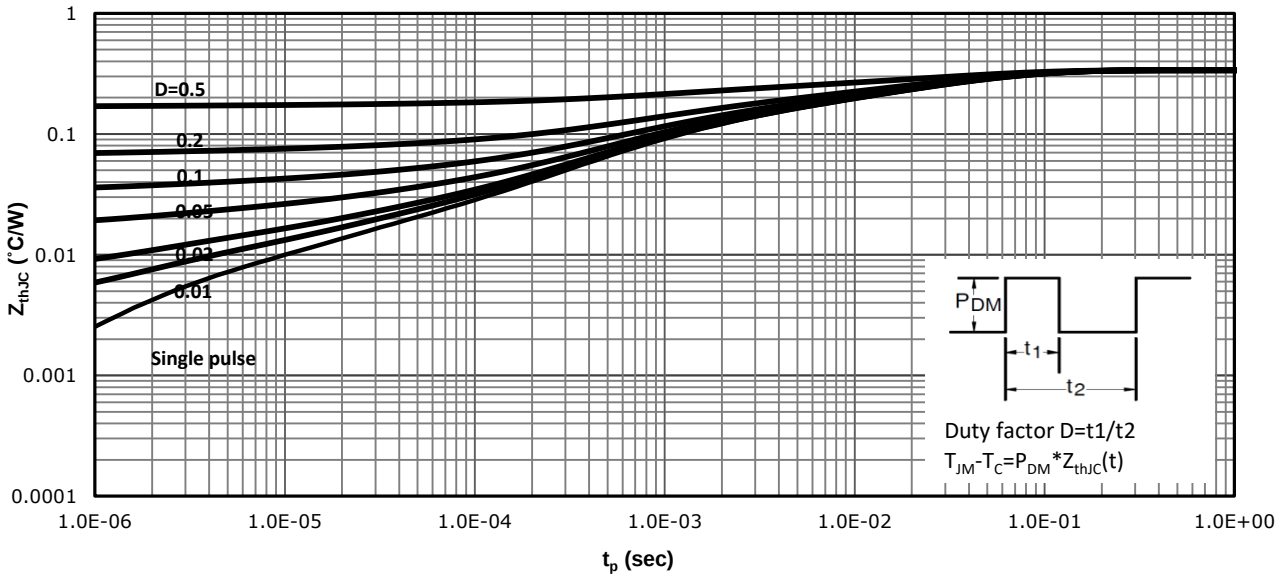


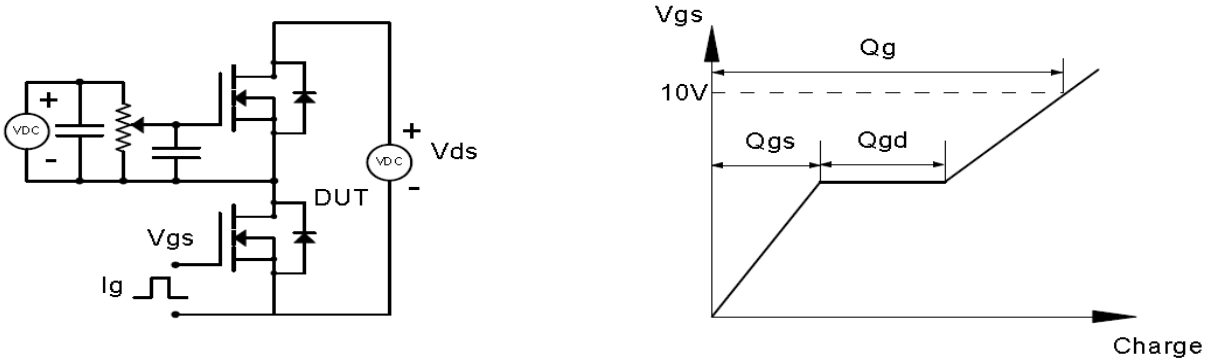
Fig 14: Max. Transient Thermal Impedance



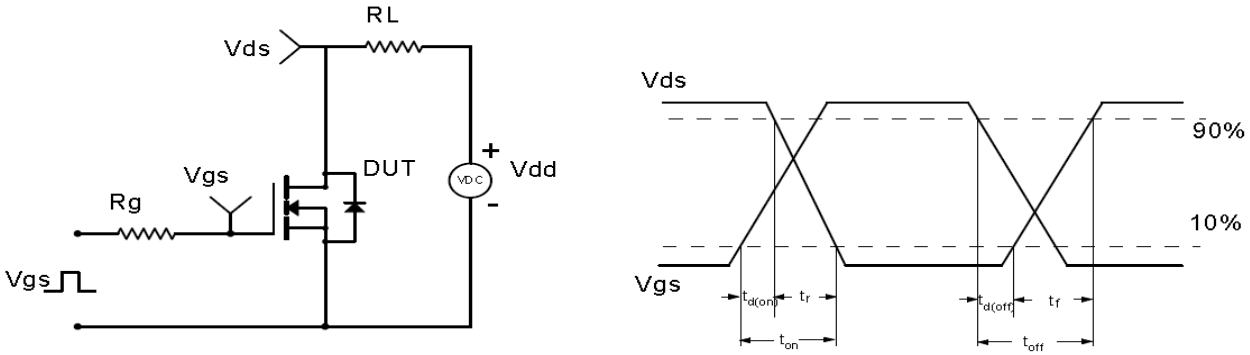
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Test Circuit & Waveform

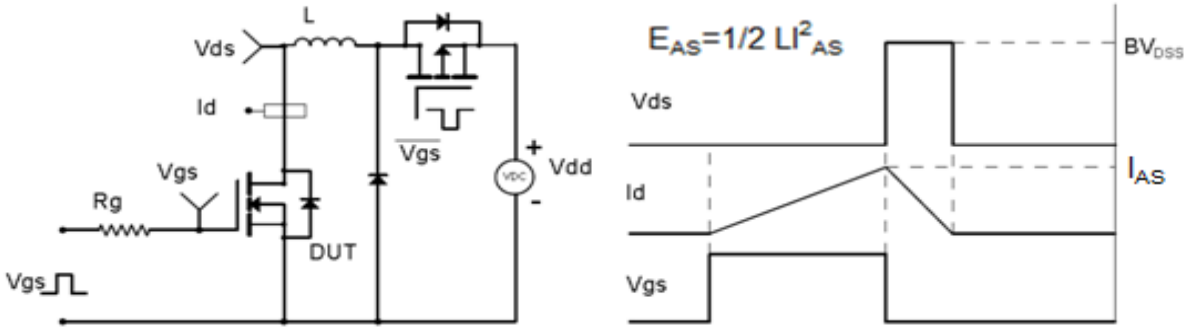
Gate Charge Test Circuit & Waveform



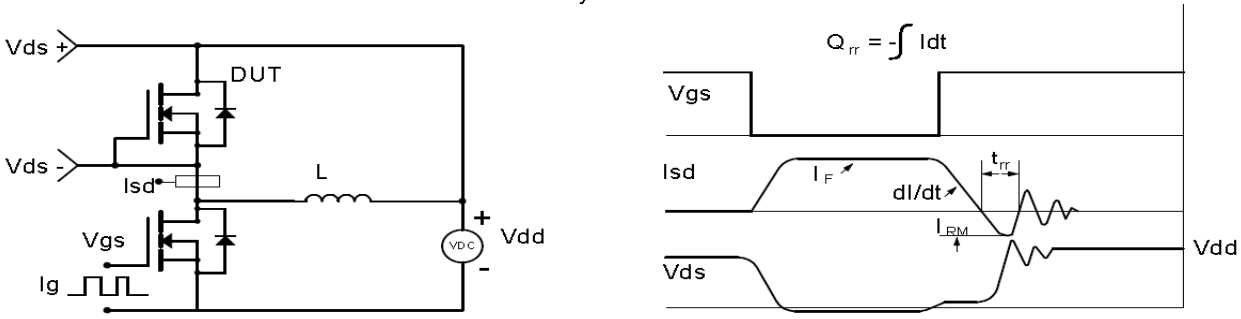
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

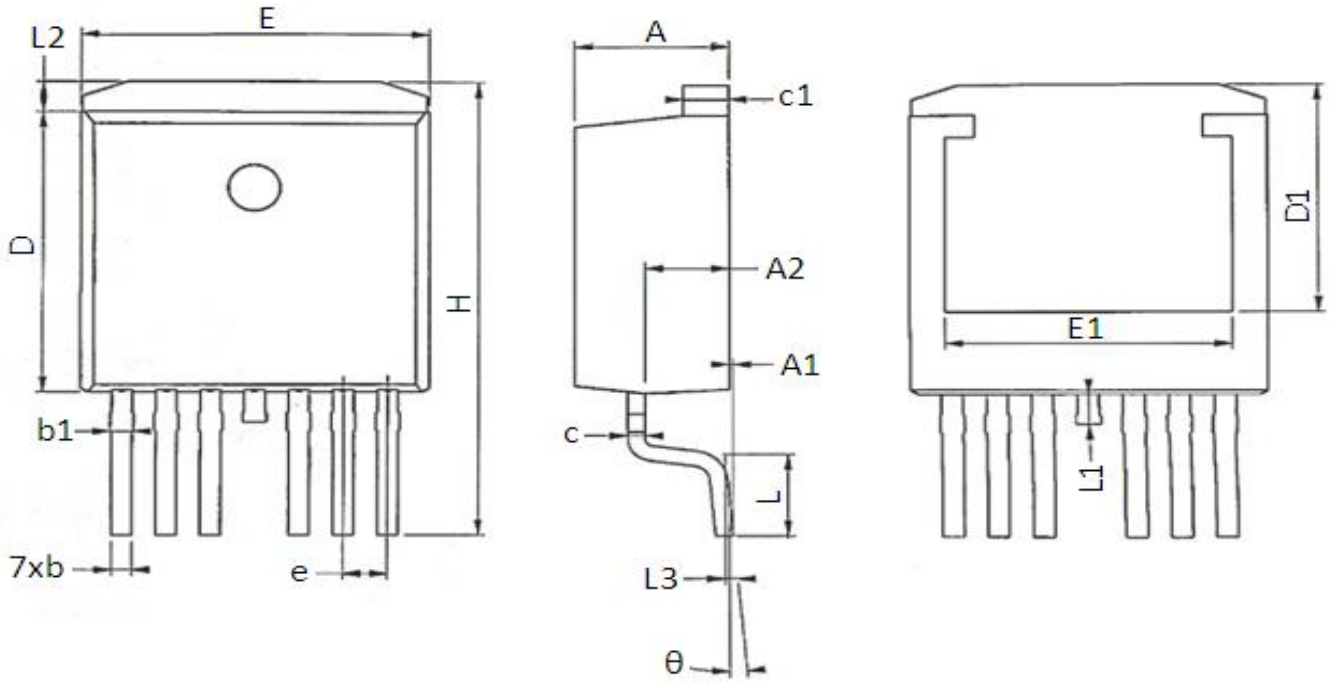


Diode Recovery Test Circuit & Waveforms



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Package Outline: TO-263-6L



Symbol		Dimensions In Millimeters		Dimensions In Inches	
		Min.	Max.	Min.	Max.
A		4.24	4.64	0.167	0.183
A1		0.00	0.25	0.000	0.010
A2		2.25	2.70	0.089	0.106
b		0.50	0.70	0.020	0.028
b1		0.50	0.90	0.020	0.035
c		0.40	0.60	0.016	0.024
c1		1.15	1.40	0.045	0.055
D		8.82	9.45	0.347	0.372
D1		6.80	--	0.268	--
e		1.27 BSC		0.050 BSC	
E		9.80	10.36	0.386	0.408
E1		7.25	--	0.285	--
H		14.61	15.88	0.575	0.625
L		1.78	3.00	0.070	0.118
L1		0.85	1.60	0.033	0.063
L2		0.80	1.60	0.031	0.063
L3		0.254 BSC		0.010 BSC	
θ	Option A	0°	8°	0°	8°
	Option B	0°	-8°	0°	-8°

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Marking



NOTE:
NXBBAAAAY

N	—Wire Bond code
X	—Assembly location code
BB	—Fab code
AAAA	—Lot code
Y	—Bin code

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Revision History

Revision	Date	Major changes
1.0	2023/11/1	Release of Preliminary version.
2.0	2024/3/18	Revise&Calibrate Rthjc&Add marking;

Disclaimer

Unless otherwise specified in the datasheet, the product is designed and qualified 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 semiconductor 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.

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