

Features

- Uses CRM(CQ) advanced SkyMOS2 technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g \times R_{DS(on)}$ product(FOM)
- Qualified according to JEDEC criteria

Applications

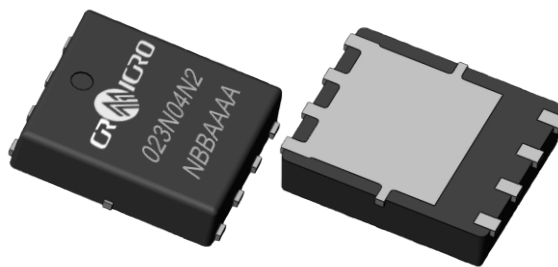
- Motor control and drive
- Battery management
- UPS (Uninterruptible Power Supplies)

Product Summary

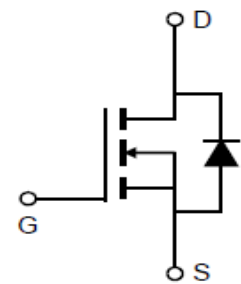
V_{DS}	40V
$R_{DS(on)}$	1.45mΩ
I_D	80A

100% DVDS Tested

100% Avalanche Tested



CRSM023N04N2



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRSM023N04N2	023N04N2	PDFN5X6	Tape	N/A	N/A	4000pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	40	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Silicon limit) $T_C = 100^\circ\text{C}$ (Silicon limit) $T_C = 25^\circ\text{C}$ (Package limit)	I_D	126 79 80	A
Pulsed drain current ($T_C = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D \text{ pulse}}$	500	A
Avalanche energy, single pulse ($L=0.5\text{mH}$, $R_g=25\Omega$)	E_{AS}	250	mJ
Gate-Source voltage	V_{GS}	± 20	V
Power dissipation ($T_C = 25^\circ\text{C}$)	P_{tot}	56	W
Operating junction and storage temperature	T_j, T_{stg}	$-55...+150$	$^\circ\text{C}$
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	T_{sold}	260	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	R_{thJC}	-	1.73	2.25	°C/W	
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	-	36.35	47.26	°C/W	

Electrical Characteristic (at $T_j = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

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

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	40	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2.5	3.0	3.5	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	0 0	0.05 -	1 100	μA	$V_{DS}=40V, V_{GS}=0V$ $T_j=25^{\circ}\text{C}$ $T_j=125^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	0	± 10	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	1.20 1.30	1.45 1.50	2.30 2.30	mΩ	$V_{GS}=10V, I_D=40A$ $V_{GS}=8V, I_D=40A$
Transconductance	g_{fs}	50	177	300	S	$V_{DS}=5V, I_D=40A$

Dynamic Characteristic

Input Capacitance	C_{iss}	4447	6671	10006.5	pF	$V_{GS}=0V, V_{DS}=20V,$ $f=1\text{MHz}$
Output Capacitance	C_{oss}	1288	1932	2898		
Reverse Transfer Capacitance	C_{rss}	21	32	48		
Gate Total Charge	Q_G	62	93	140	nC	$V_{GS}=10V, V_{DS}=20V,$ $I_D=40A, f=1\text{MHz}$
Gate-Source charge	Q_{gs}	23	35	53		
Gate-Drain charge	Q_{gd}	8	12	24		
Turn-on delay time	$t_{d(on)}$	13	20	30	ns	$V_{GS}=10V, V_{DD}=20V,$ $R_{G_ext}=3.0\Omega$
Rise time	t_r	58	87	174		
Turn-off delay time	$t_{d(off)}$	43	65	98		
Fall time	t_f	49	73	146		
Gate resistance	R_G	1.9	2.9	4.4	Ω	$V_{GS}=0V, V_{DS}=0V,$ $f=1\text{MHz}$

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	0.5	0.82	1.4	V	$V_{GS}=0V, I_{SD}=40A$
Body Diode Continuous Forward Current	I_S	-	-	125	A	$T_C = 25^{\circ}C$
Body Diode Pulsed Current	$I_{S\ pulse}$	-	-	500	A	$T_C = 25^{\circ}C$
Body Diode Reverse Recovery Time	t_{rr}	28	55	110	ns	$I_F=40A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	29	57	114	nC	

Typical Performance Characteristics

Fig 1: Output Characteristics

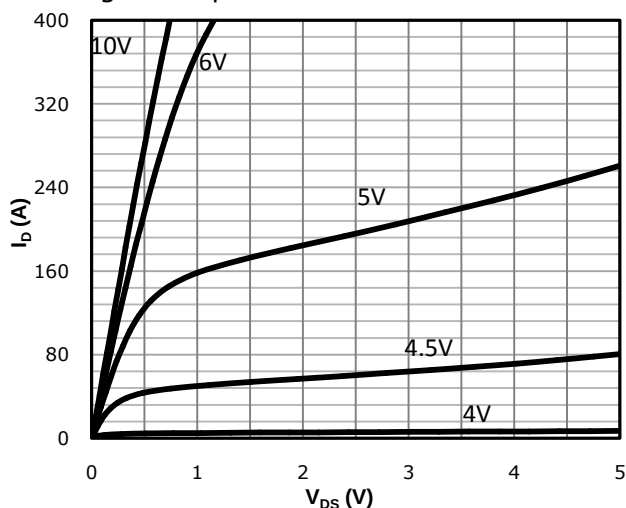
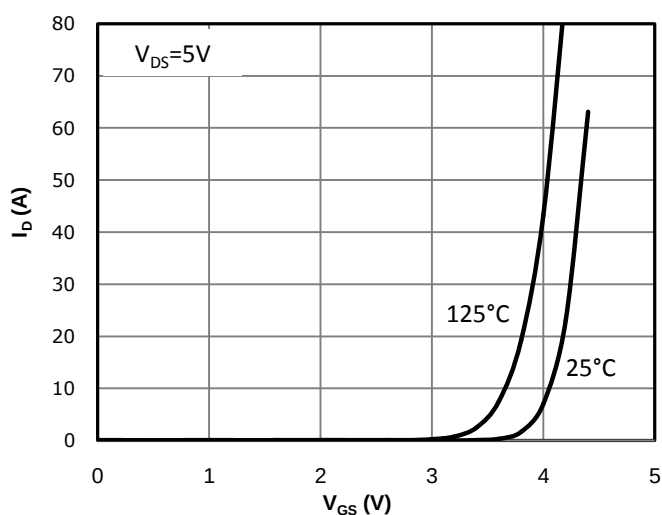


Fig 2: Transfer Characteristics



3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

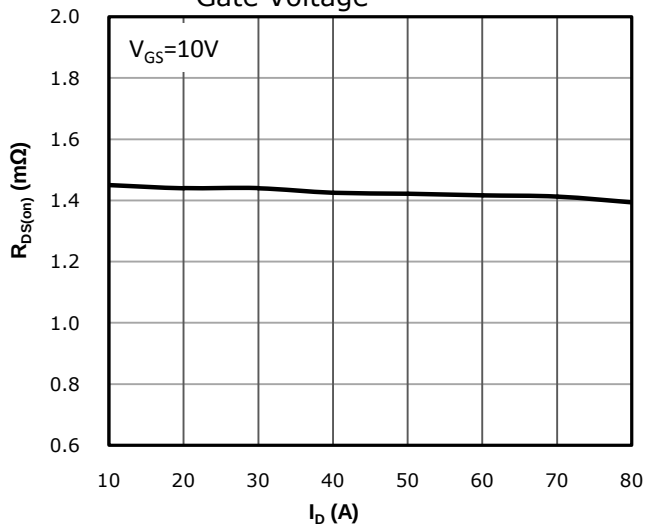


Fig 4: $R_{DS(on)}$ vs Gate Voltage

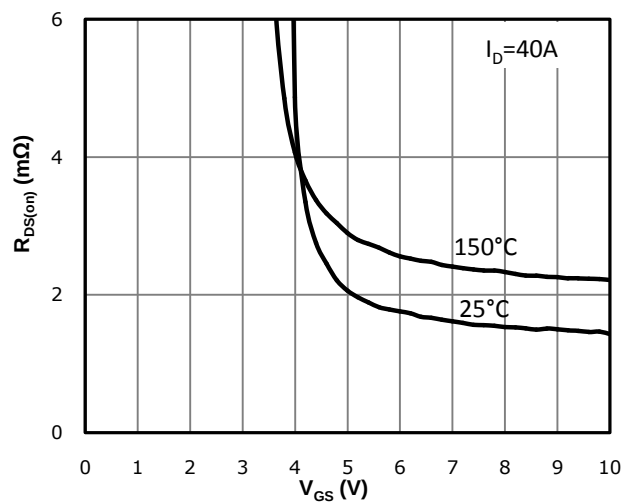


Fig 5: $R_{DS(on)}$ vs. Temperature

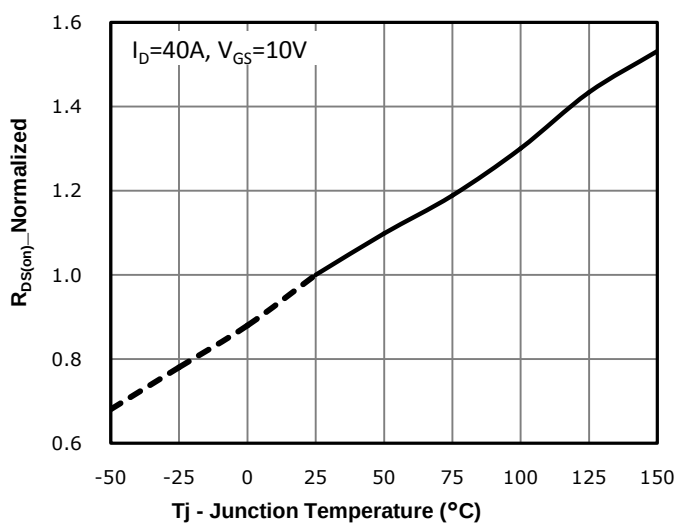


Fig 6: Capacitance Characteristics

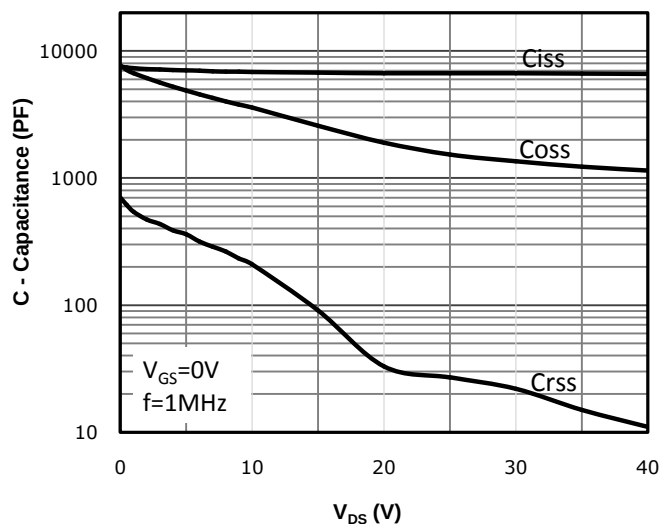


Fig 7: $V_{gs(th)}$ vs. Temperature

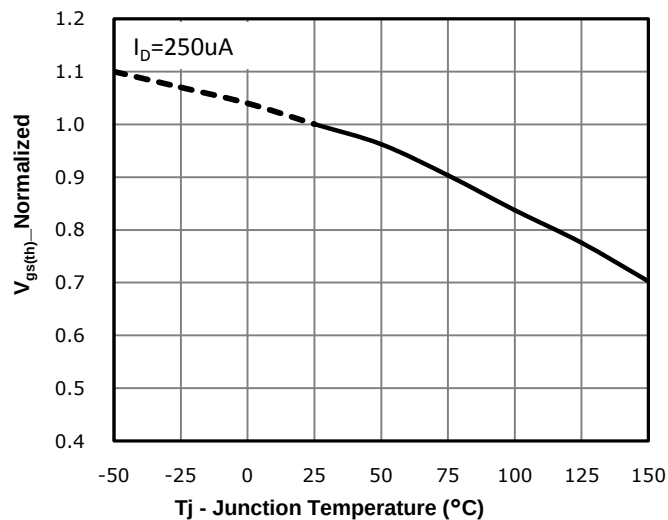


Fig 8: BV_{dss} vs. Temperature

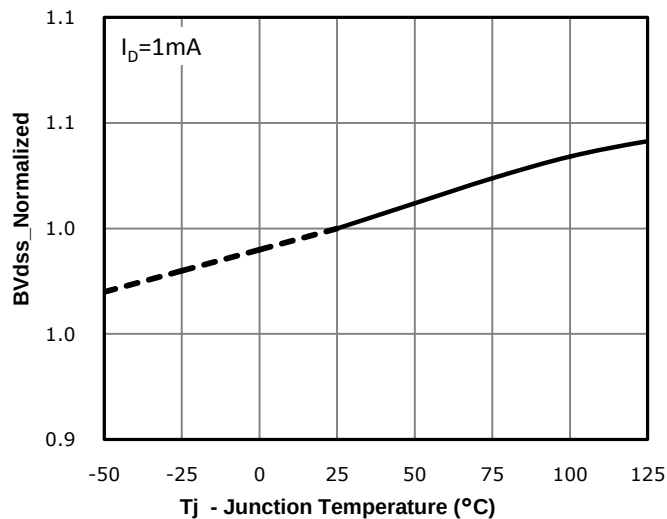


Fig 9: Gate Charge Characteristics

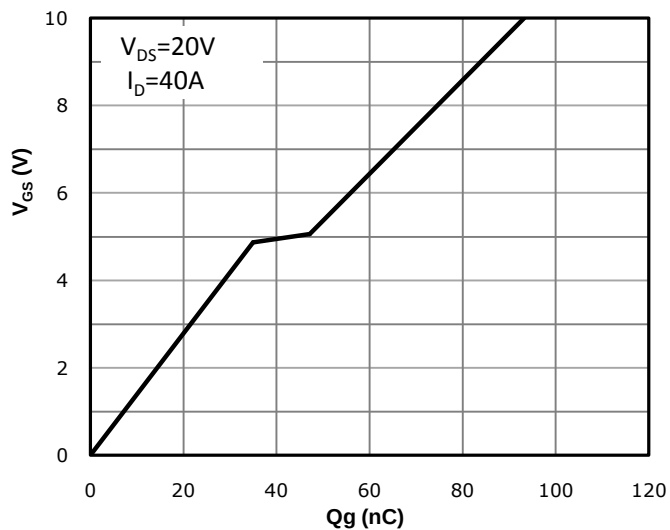


Fig 10: Body-diode Forward Characteristics

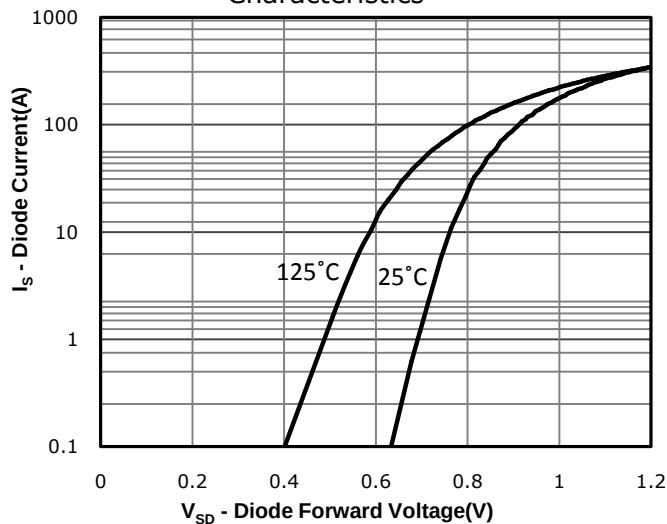


Fig 11: Power Dissipation

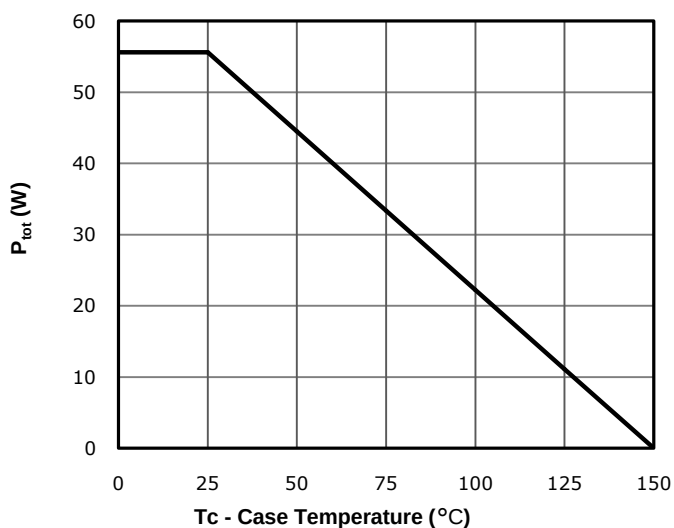


Fig 12: Drain Current Derating

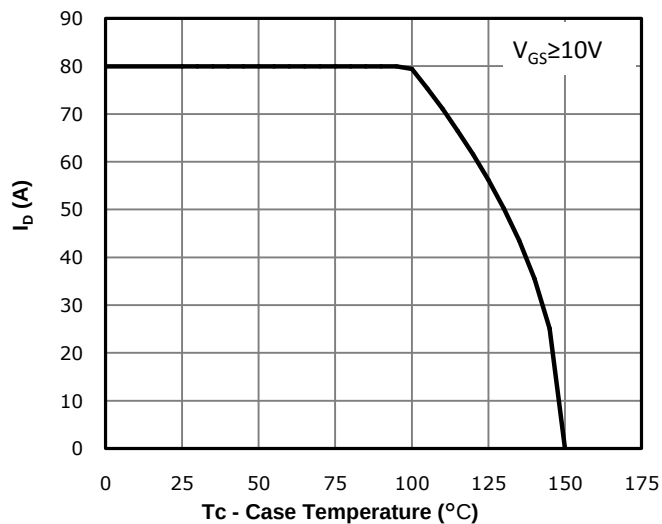


Fig 13: Safe Operating Area

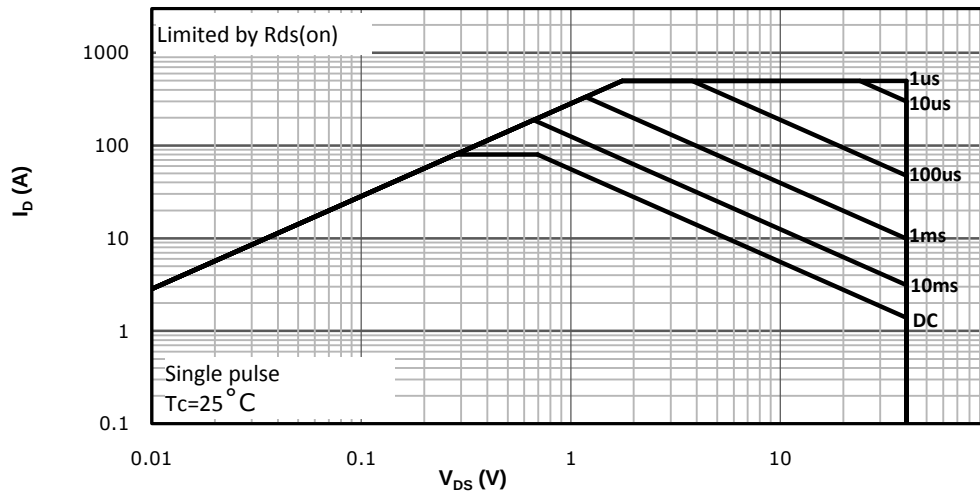
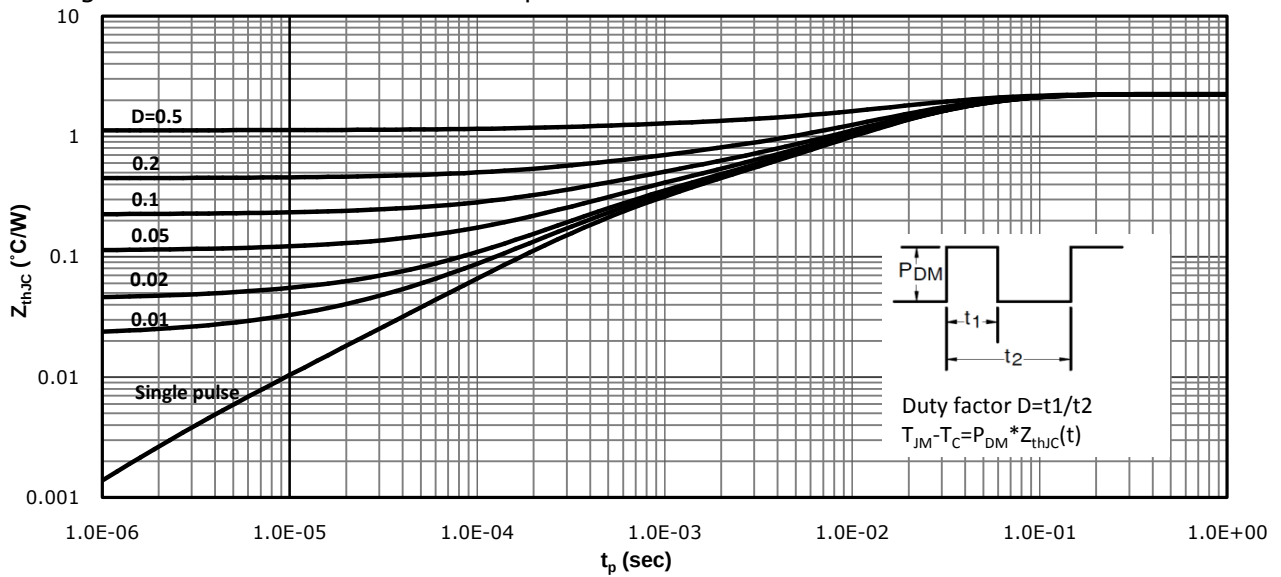
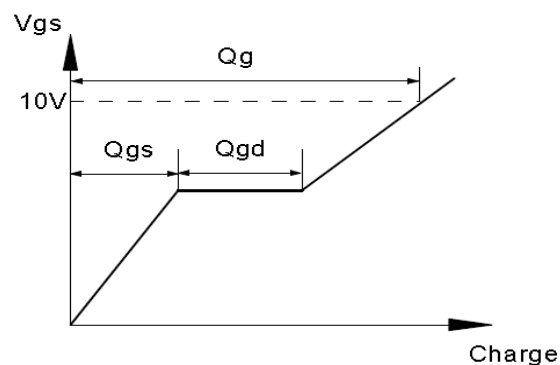
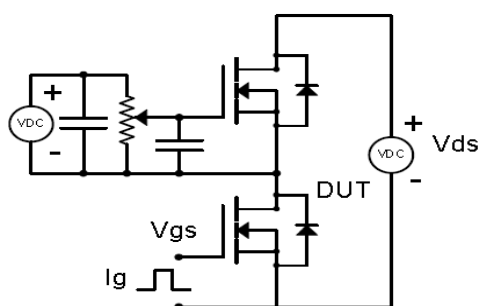


Fig 12: Max. Transient Thermal Impedance

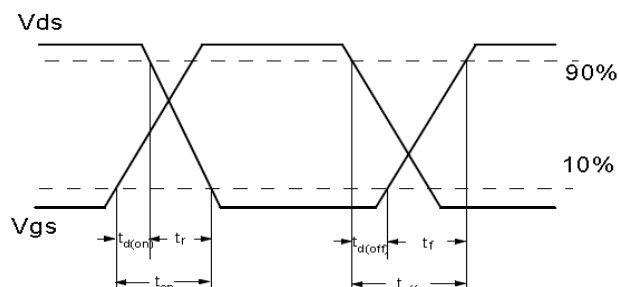
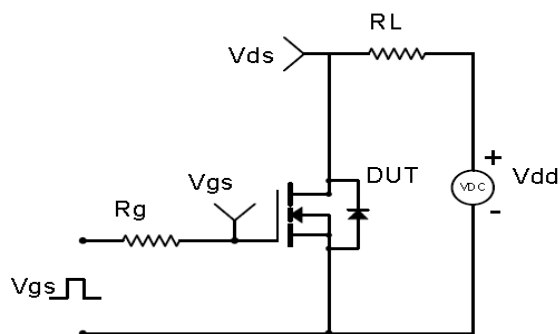


Test Circuit & Waveform

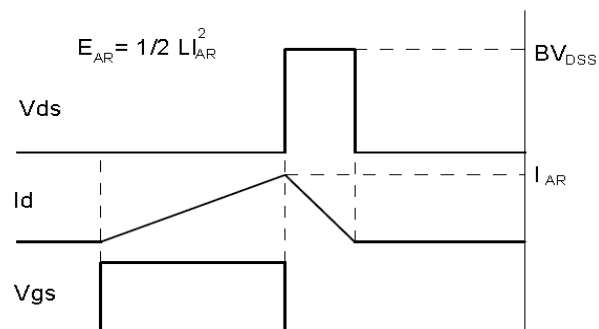
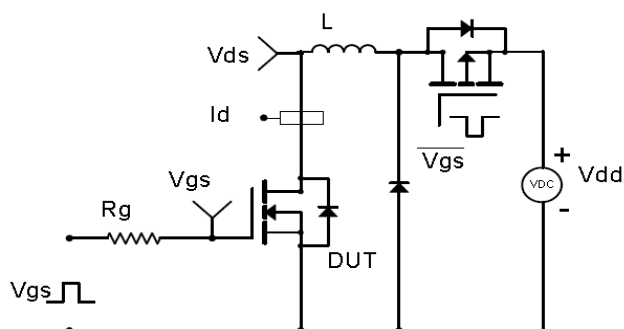
Gate Charge Test Circuit & Waveform



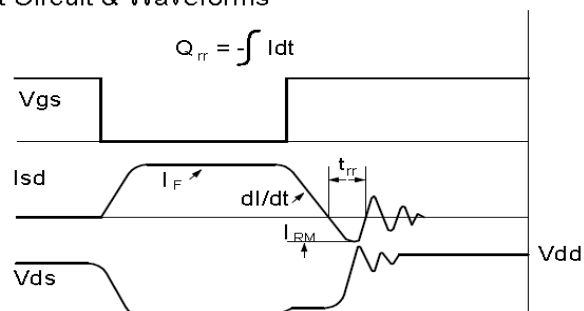
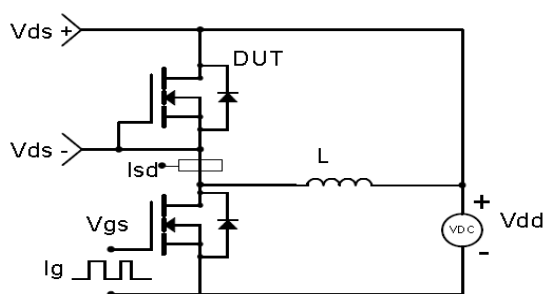
Resistive Switching Test Circuit & Waveforms



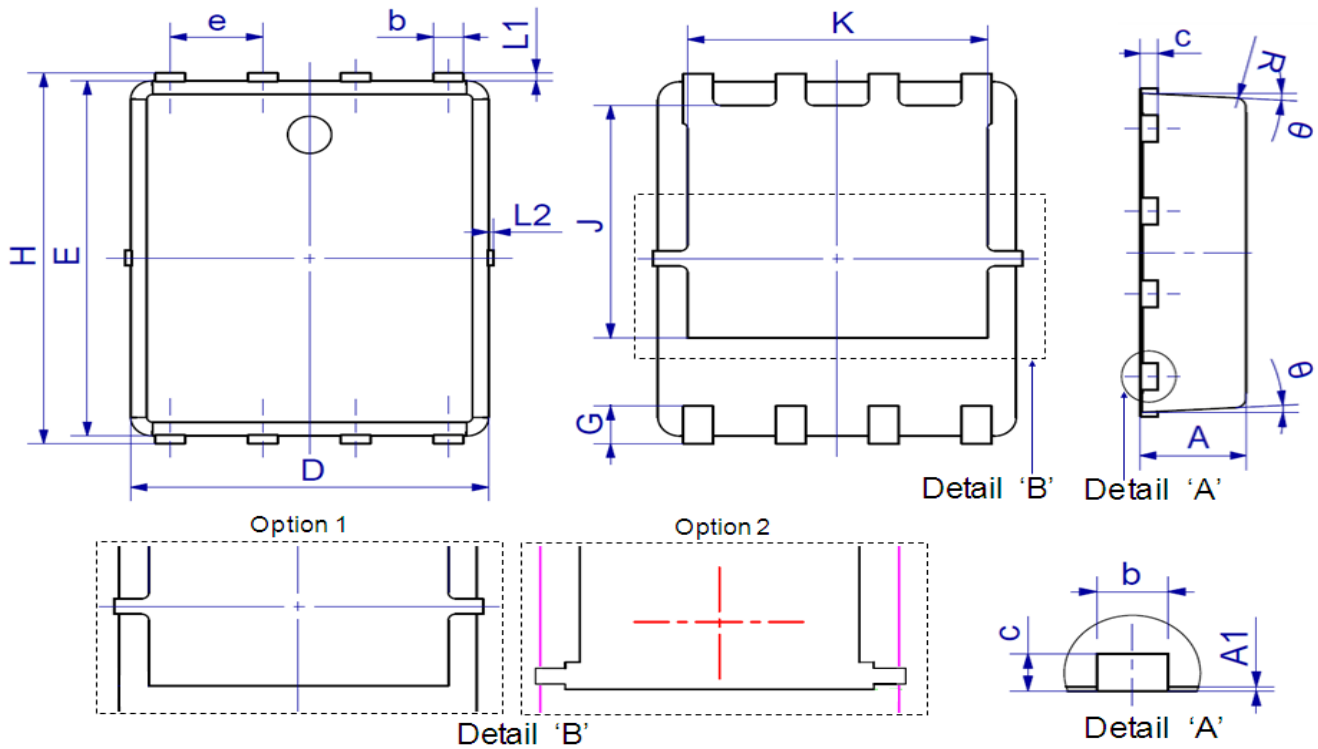
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: PDFN5X6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.80	1.20	0.031	0.047
A1	0.00	0.05	0.000	0.002
b	0.30	0.51	0.012	0.020
c	0.15	0.35	0.006	0.014
D	4.80	5.40	0.189	0.213
e	1.27 BSC		0.050 BSC	
E	5.66	6.06	0.223	0.239
G	0.30	0.71	0.012	0.028
H	5.90	6.35	0.232	0.250
J	3.32	3.92	0.131	0.154
K	3.61	4.25	0.142	0.167
L1	0.05	0.25	0.002	0.010
L2	0.00	0.15	0.000	0.006
R	0.25 REF		0.010 REF	
θ	0°	12°	0°	12°

Marking



NOTE:

NXBBAAAAY

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

Revision History

Revision	Date	Major changes
1.0	2022/9/21	Release of Preliminary version.

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.