

Features

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

Applications

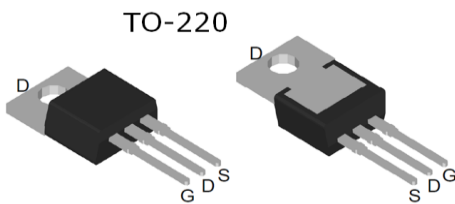
- Motor control and drive
- Battery management System
- UPS (Uninterruptible Power Supplies)

Product Summary

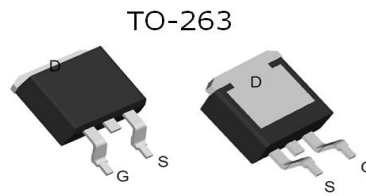
V_{DS}	100V
$R_{DS(on).typ}$	2mΩ
I_D	180A

100% DVDS Tested

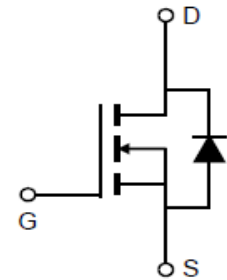
100% Avalanche Tested



CRST024N10N3Z



CRSS022N10N3Z



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRST024N10N3Z	CRST024N10N3Z	TO-220	Tube	N/A	N/A	50pcs
CRSS022N10N3Z	CRSS022N10N3Z	TO-263	Tape	N/A	N/A	1000pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	100	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Silicon limit) $T_C = 25^\circ\text{C}$ (Package limit) $T_C = 100^\circ\text{C}$ (Silicon limit)	I_D	275 180 174	A
Pulsed drain current ($T_C = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D\ pulse}$	720	A
Avalanche energy, single pulse ($I_D = 89\text{A}$, $R_g = 25\Omega$) ^[1]	E_{AS}	1973	mJ
Gate-Source voltage	V_{GS}	± 20	V
Power dissipation ($T_C = 25^\circ\text{C}$)	P_{tot}	310	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	$^\circ\text{C}$

※. Notes:

1.EAS is tested at starting $T_j = 25^\circ\text{C}$, $L = 0.5\text{mH}$, $I_{AS} = 89\text{A}$, $V_{GS} = 10\text{V}$.

Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	R_{thJC}	0.40	°C/W
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	62	

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

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

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	100	-	-	V	$V_{GS}=0V, I_D=250\mu A$
		100	-	-	V	$V_{GS}=0V, I_D=1mA$
Gate threshold voltage	$V_{GS(th)}$	2.3	3.3	4.3	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=100V, V_{GS}=0V$ $T_j=25\text{ °C}$ $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	0	-	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	2.0	2.4	mΩ	$V_{GS}=10V, I_D=90A$ TO-220
		-	1.8	2.2		TO-263
Transconductance	g_{fs}	93.1	186.1	372.3	S	$V_{DS}=5V, I_D=90A$

Dynamic Characteristic

Input Capacitance	C_{iss}	8577	12865	19298	pF	$V_{GS}=0V, V_{DS}=50V,$ $f=1MHz$
Output Capacitance	C_{oss}	1211	1817	2726		
Reverse Transfer Capacitance	C_{rss}	35	69	138		
Gate Total Charge	Q_G	159	238	357	nC	$V_{GS}=10V, V_{DS}=50V,$ $I_D=90A$
Gate-Source charge	Q_{gs}	53	80	120		
Gate-Drain charge	Q_{gd}	36	72	144		
Turn-on delay time	$t_{d(on)}$	16	32	63	ns	$V_{GS}=10V, V_{DD}=50V,$ $R_{G_ext}=2.7\Omega$
Rise time	t_r	77	115	173		
Turn-off delay time	$t_{d(off)}$	77	115	173		
Fall time	t_f	61	91	137		
Gate resistance	R_G	-	1.72	5.0	Ω	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	0.89	1.4	V	$V_{GS}=0V, I_{SD}=90A$
Body Diode Reverse Recovery Time	t_{rr}	47.5	95.0	189.9	ns	$I_F=90A,$ $dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	127.3	254.5	509.0	nC	

Typical Performance Characteristics

Fig 1: Output Characteristics

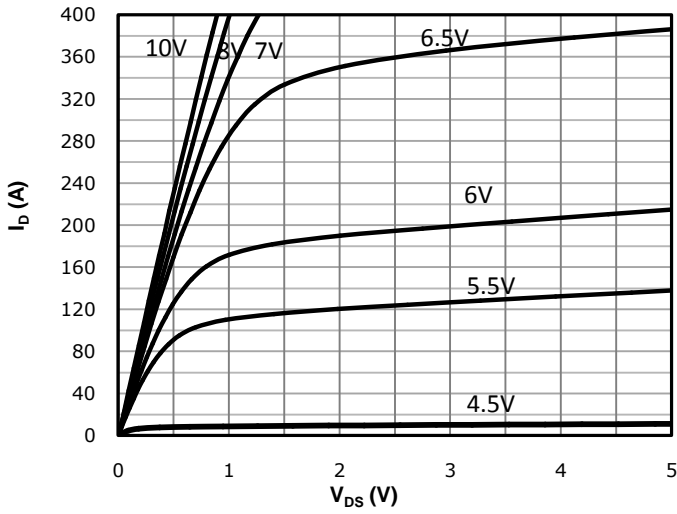


Fig 2: Transfer Characteristics

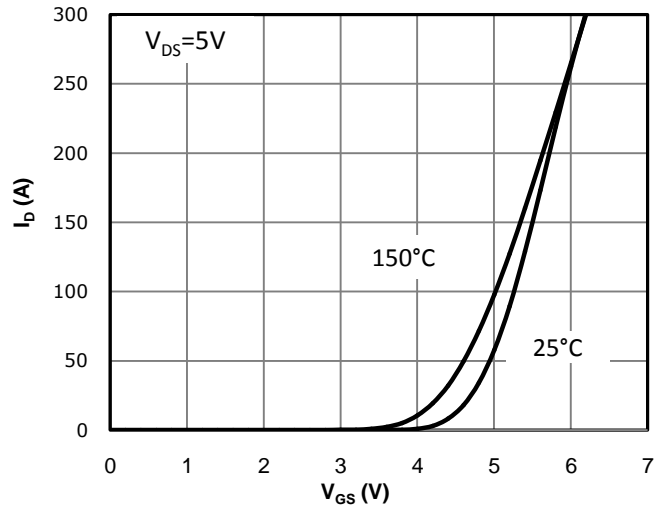


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

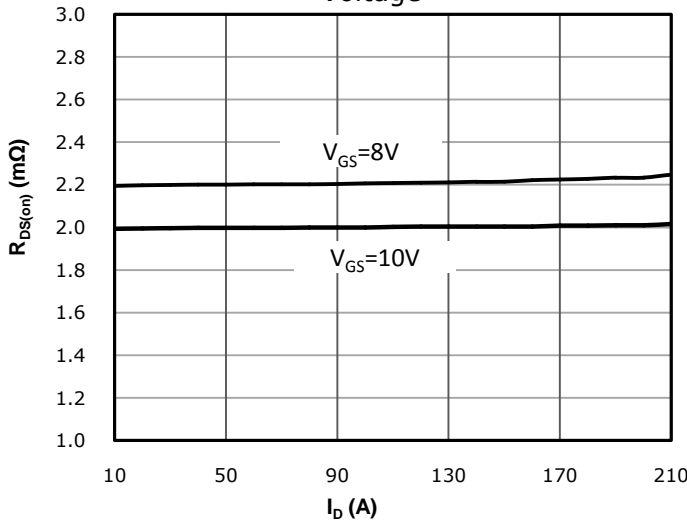


Fig 4: $R_{DS(on)}$ vs Gate Voltage

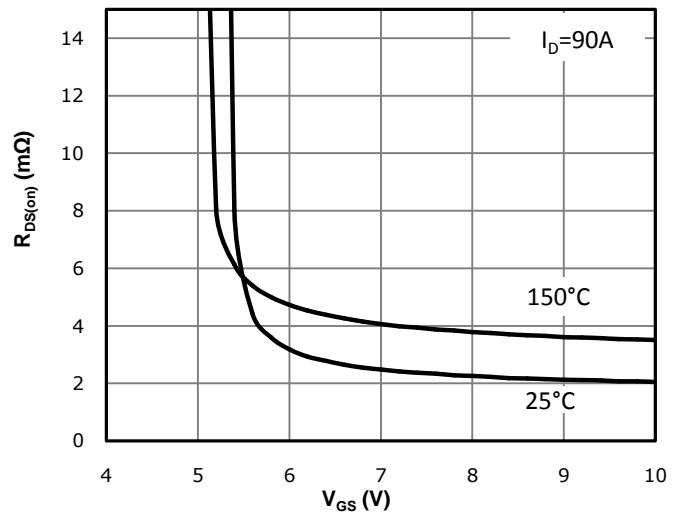


Fig 5: $R_{DS(on)}$ vs. Temperature

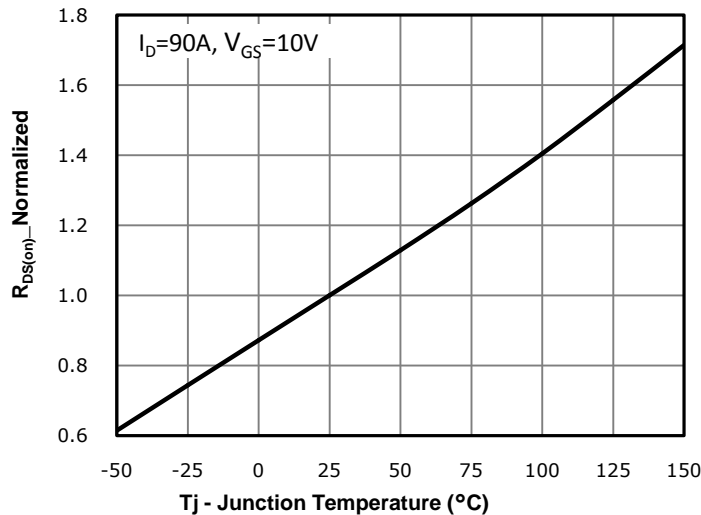


Fig 6: $V_{GS(th)}$ vs. Temperature

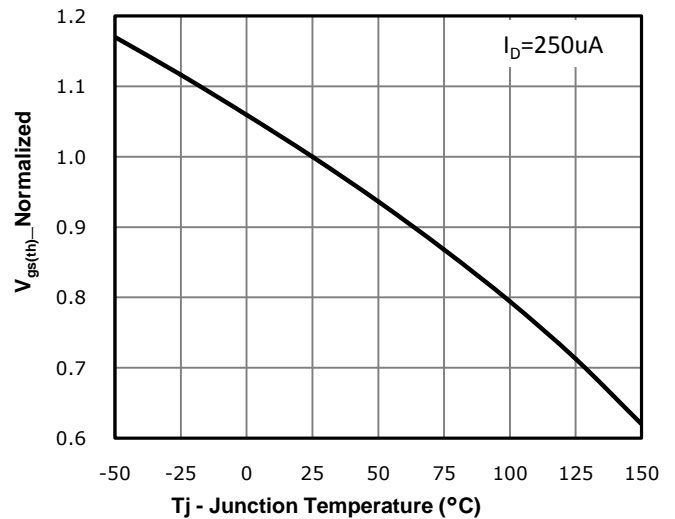


Fig 7: BVdss vs. Temperature

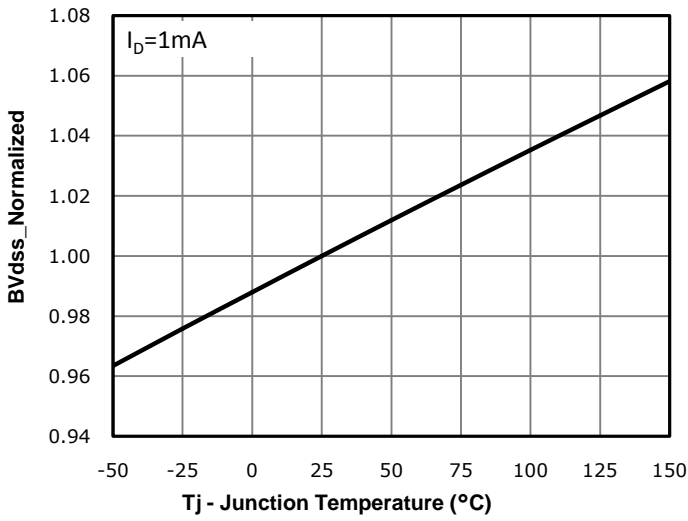


Fig 8: Capacitance Characteristics

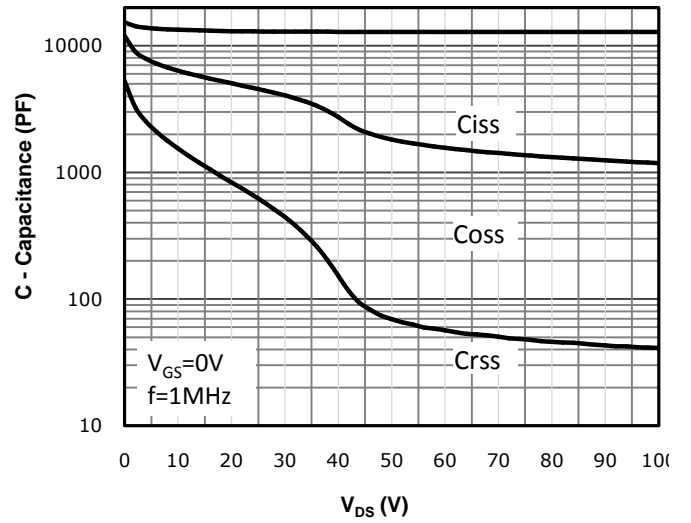


Fig 9: Gate Charge Characteristics

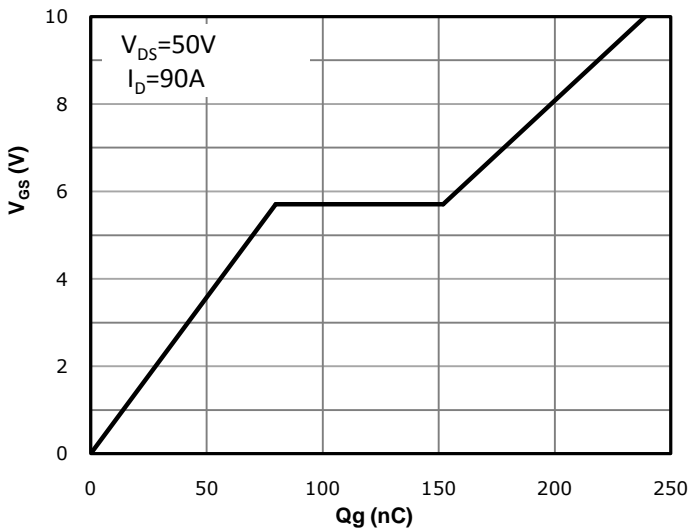


Fig 10: Body-diode Forward Characteristics

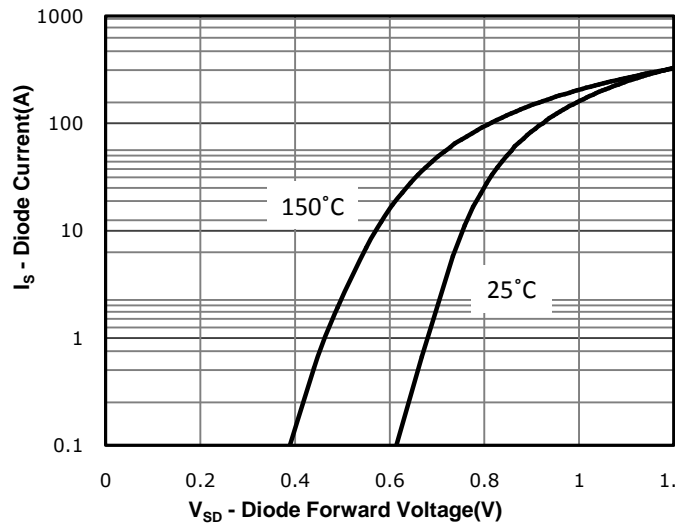


Fig 11: Power Dissipation

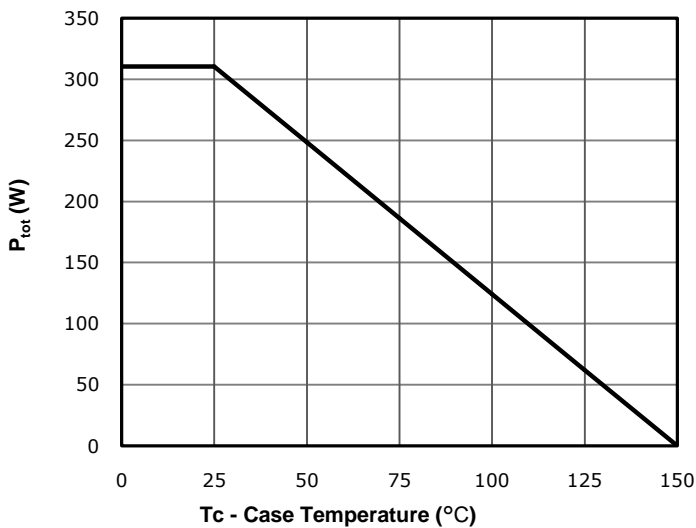


Fig 12: Drain Current Derating

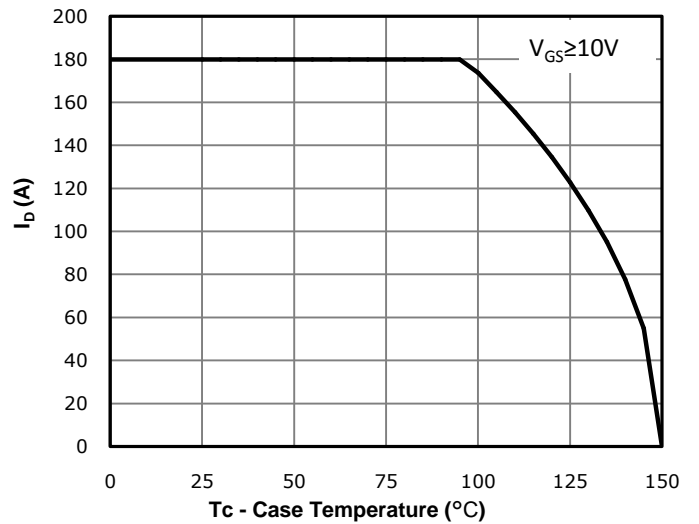


Fig 13: Safe Operating Area

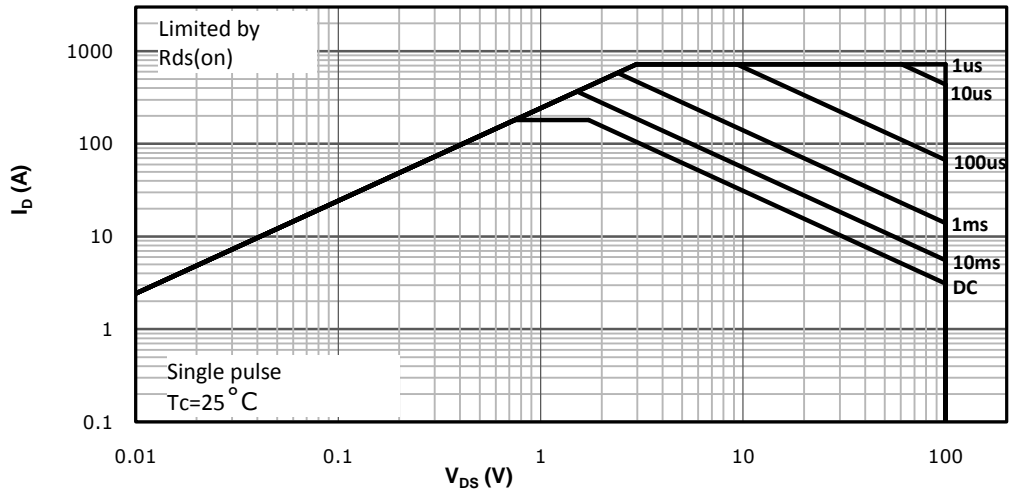
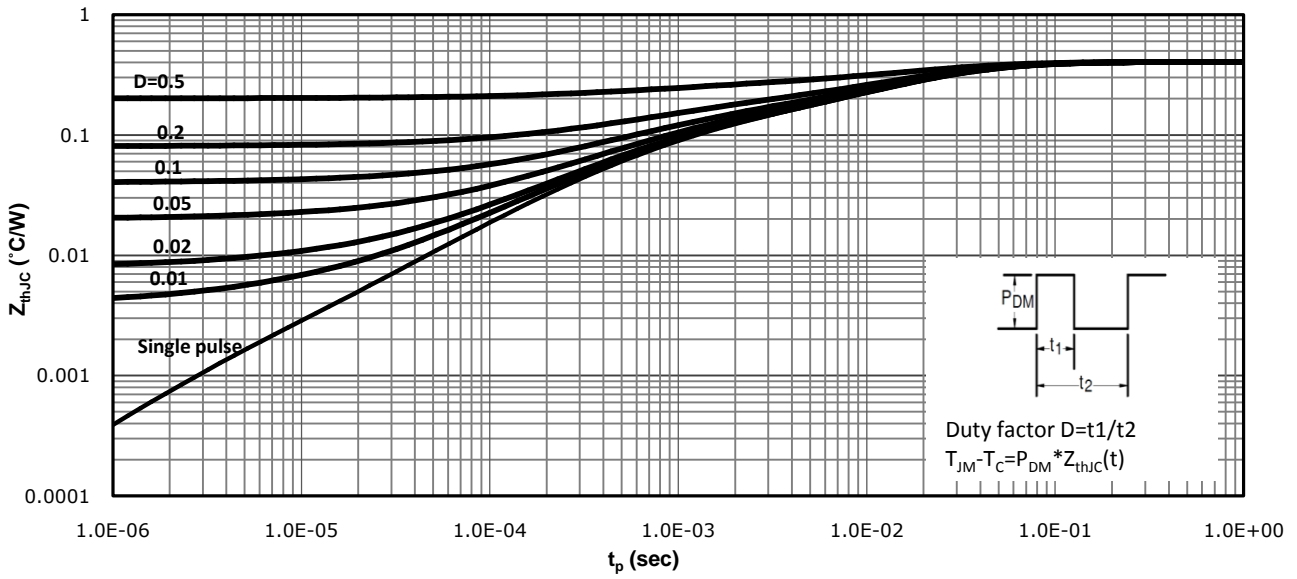
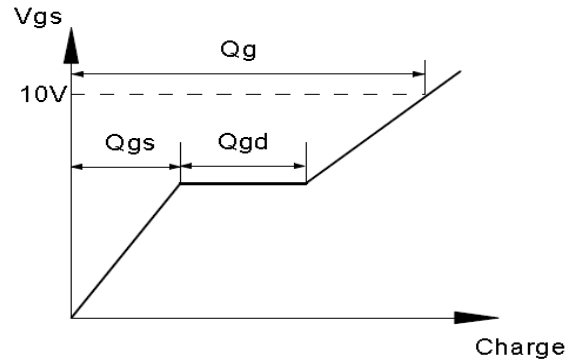
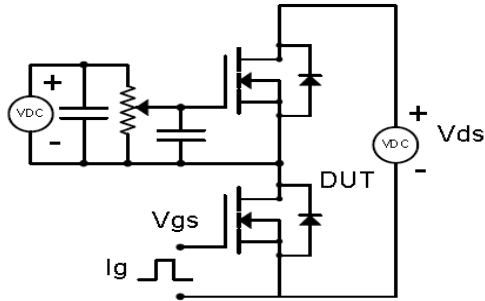


Fig 14: Max. Transient Thermal Impedance

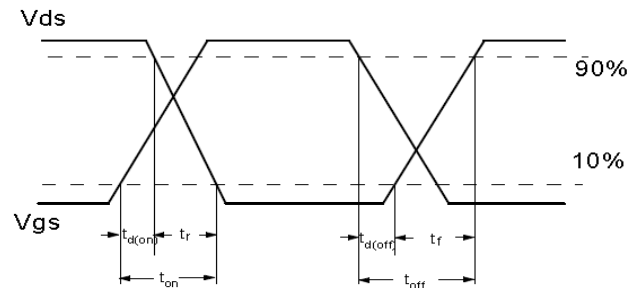
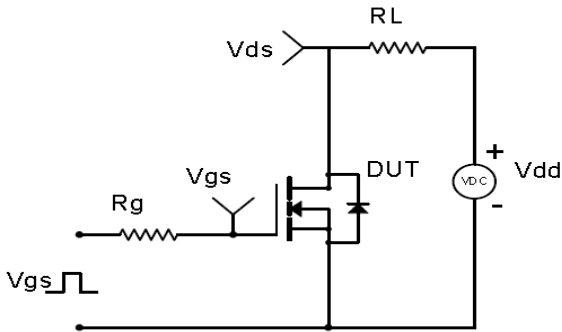


Test Circuit & Waveform

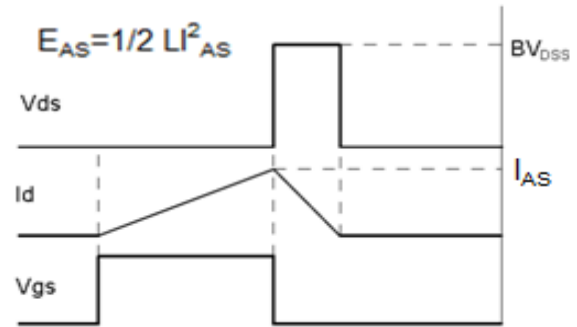
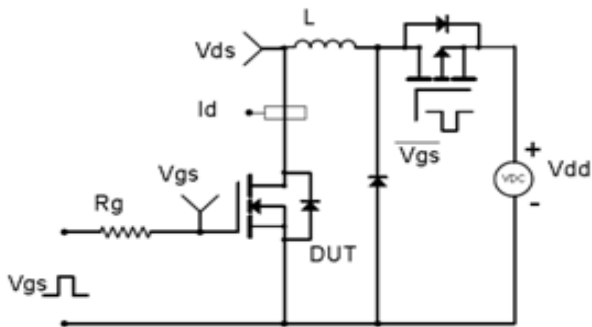
Gate Charge Test Circuit & Waveform



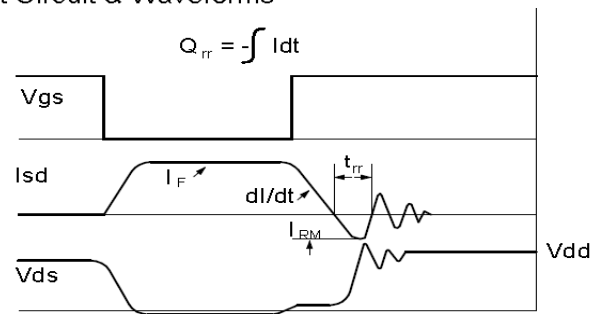
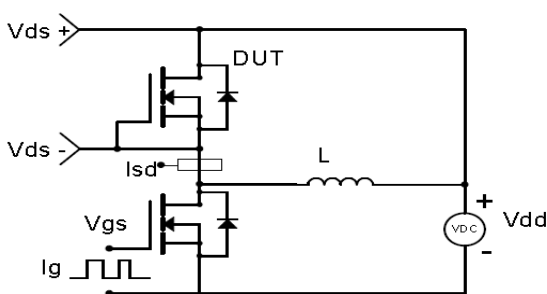
Resistive Switching Test Circuit & Waveforms



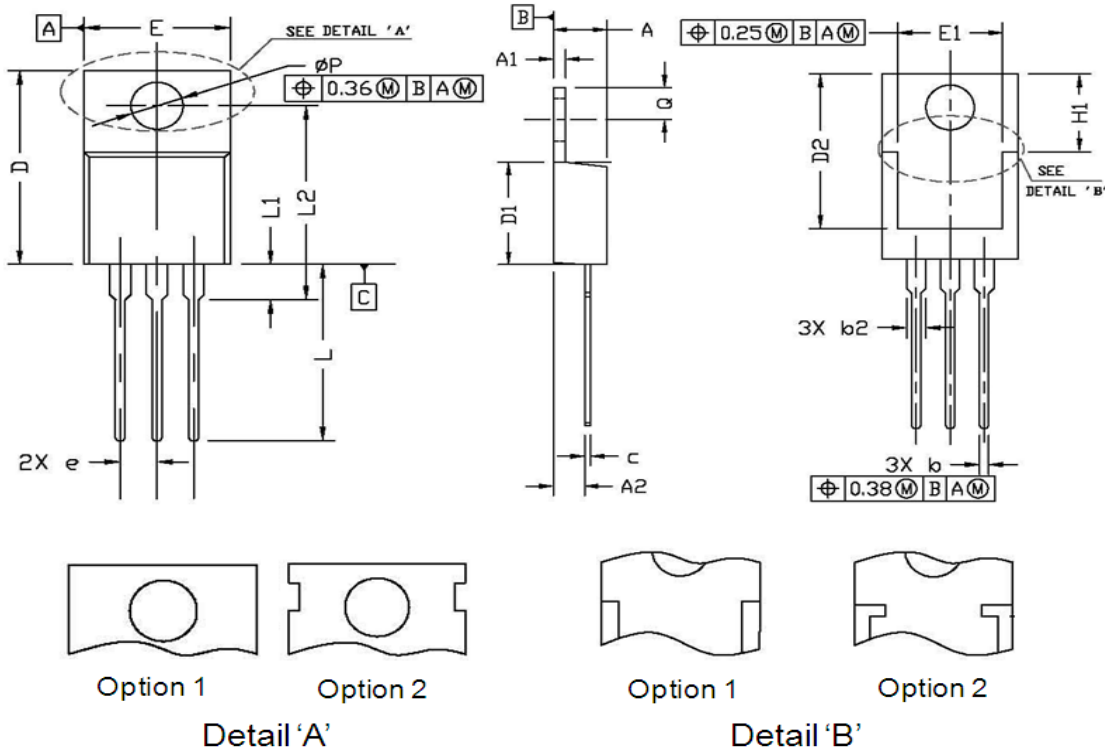
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



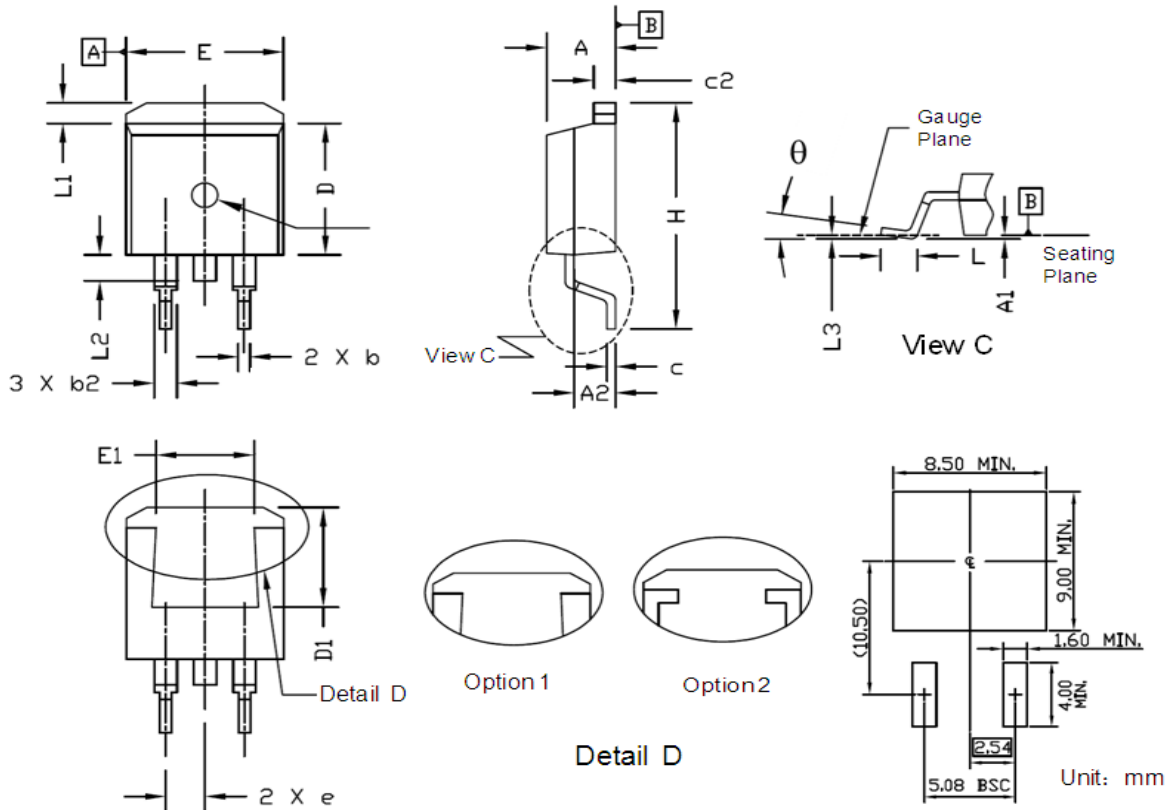
Diode Recovery Test Circuit & Waveforms



Package Outline: TO-220-3L

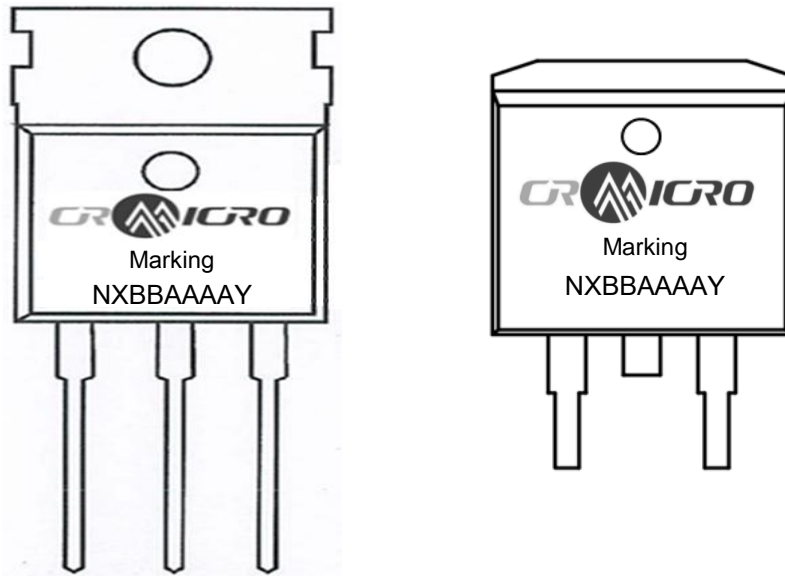


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.30	4.80	0.169	0.189
A1	1.20	1.45	0.047	0.057
A2	2.20	2.90	0.087	0.114
b	0.69	0.95	0.027	0.037
b2	1.00	1.60	0.039	0.063
c	0.33	0.65	0.013	0.026
D	14.70	16.20	0.579	0.638
D1	8.59	9.65	0.338	0.380
D2	11.75	13.60	0.463	0.535
e	2.54 BSC.		0.100 BSC.	
E	9.60	10.60	0.378	0.417
E1	7.00	8.89	0.276	0.350
H1	6.20	7.00	0.244	0.276
L	12.60	14.80	0.496	0.583
L1	2.70	3.80	0.106	0.150
L2	12.13	16.50	0.478	0.650
Q	2.40	3.10	0.094	0.122
P	3.50	3.95	0.138	0.156

Package Outline: TO-263


Symbol	Dimensions In Millimeters		Dimensions In Inches		
	Min.	Max.	Min.	Max.	
A	4.30	4.86	0.169	0.191	
A1	0.00	0.25	0.000	0.010	
A2	2.20	2.90	0.087	0.114	
b	0.68	0.94	0.027	0.037	
b2	1.14	1.78	0.045	0.070	
c	0.33	0.65	0.013	0.026	
c2	1.17	1.40	0.046	0.055	
D	8.38	9.45	0.330	0.372	
D1	6.90	8.17	0.272	0.322	
e	2.54 BSC.		0.100 BSC.		
E	9.78	10.50	0.385	0.413	
E1	6.50	8.60	0.256	0.339	
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	0.70	1.60	0.028	0.063	
L2	1.00	1.78	0.039	0.070	
L3	0.25 BSC.		0.010 BSC.		
θ	Option A	-8°	0°	-8°	0°
	Option B	0°	8°	0°	8°

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	2024/4/10	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.

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