

Features

- Uses CRM(CQ) advanced SkyMOS4 technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g \times R_{DS(on)}$ product(FOM)
- Qualified according to JEDEC criteria

Applications

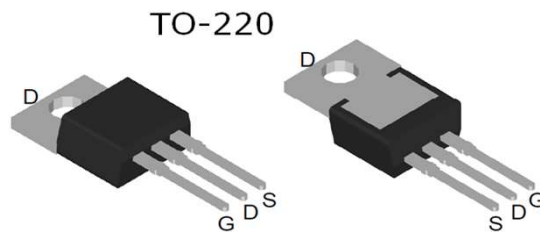
- Motor control and drive
- Battery management
- UPS (Uninterruptible Power Supplies)

Product Summary

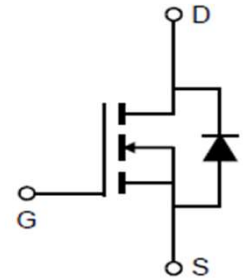
V_{DS}	100V
$R_{DS(on)}$	2.1mΩ
I_D	180A

100% DVDS Tested

100% Avalanche Tested



CRST024N10N4Z



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRST024N10N4Z	CRST024N10N4Z	TO-220	Tube	N/A	N/A	50pcs

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	253 180 160	A
Pulsed drain current ($T_C = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D \text{ pulse}}$	720	A
Avalanche energy, single pulse ($I_D = 45\text{A}$, $R_g = 25\Omega$)	E_{AS}	500	mJ
Gate-Source voltage	V_{GS}	± 20	V
Power dissipation ($T_C = 25^\circ\text{C}$)	P_{tot}	250	W
Operating junction and storage temperature	T_j, T_{stg}	$-55 \dots +150$	$^\circ\text{C}$
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	T_{sld}	260	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case.	R_{thJC}	-	0.30	0.50	°C/W	
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	-	-	62	°C/W	

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	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2.2	3	3.8	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1 100	μA	$V_{DS}=100V, V_{GS}=0V$ $T_j=25\text{ °C}$ $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	± 10	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	2.1	2.5	mΩ	$V_{GS}=10V, I_D=90A$ TO-220
Transconductance	g_{fs}	-	197.2	-	S	$V_{DS}=5V, I_D=90A$

Dynamic Characteristic

Input Capacitance	C_{iss}	7565	11347	17020.5	pF	$V_{GS}=0V, V_{DS}=50V,$ $f=1MHz$
Output Capacitance	C_{oss}	1167	1751	4376		
Reverse Transfer Capacitance	C_{rss}	25	37	259		
Gate Total Charge	Q_G	103	154	232	nC	$V_{GS}=10V, V_{DS}=50V,$ $I_D=90A, f=1MHz$
Gate-Source charge	Q_{gs}	44	66	98		
Gate-Drain charge	Q_{gd}	12	18	35		

Turn-on delay time	$t_{d(on)}$	19	29	43	ns	$V_{GS}=10V, V_{DD}=50V,$ $R_{G_ext}=3.0\Omega$
Rise time	t_r	76	114	170		
Turn-off delay time	$t_{d(off)}$	52	78	117		
Fall time	t_f	72	109	163		
Gate resistance	R_G	1	1.6	2.5	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}	-	0.9	1.4	V	$V_{GS}=0V, I_{SD}=90A$
Body Diode Continuous Forward Current	I_S	-	-	180	A	$T_C = 25^\circ C$
Body Diode Pulsed Current	$I_{S\ pulse}$	-	-	720	A	$T_C = 25^\circ C$
Body Diode Reverse Recovery Time	t_{rr}	49	99	197	ns	$I_F=90A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	109	218	436	nC	

Typical Performance Characteristics

Fig 1: Output Characteristics

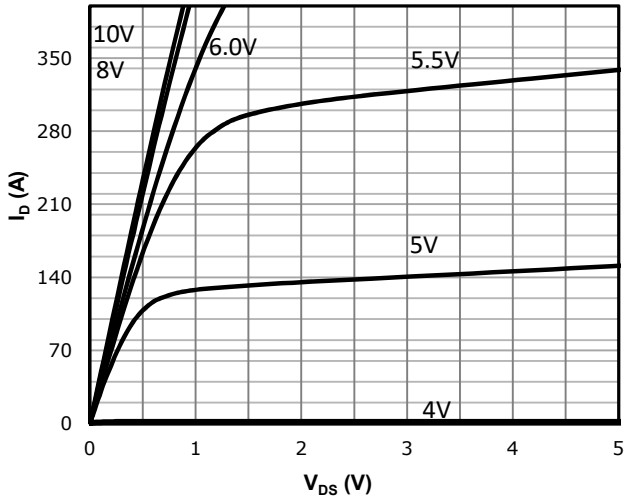
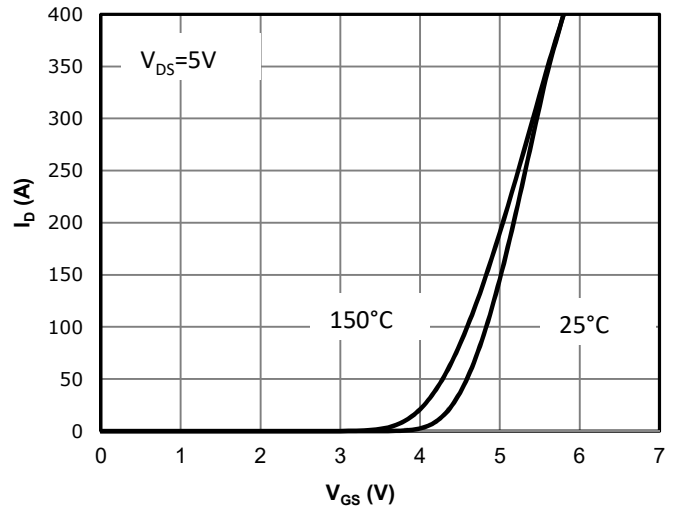


Fig 2: Transfer Characteristics



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

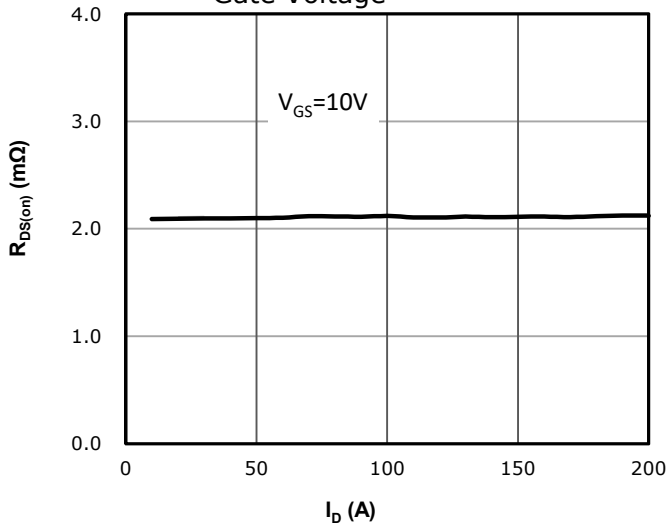


Fig 4: $R_{DS(on)}$ vs Gate Voltage

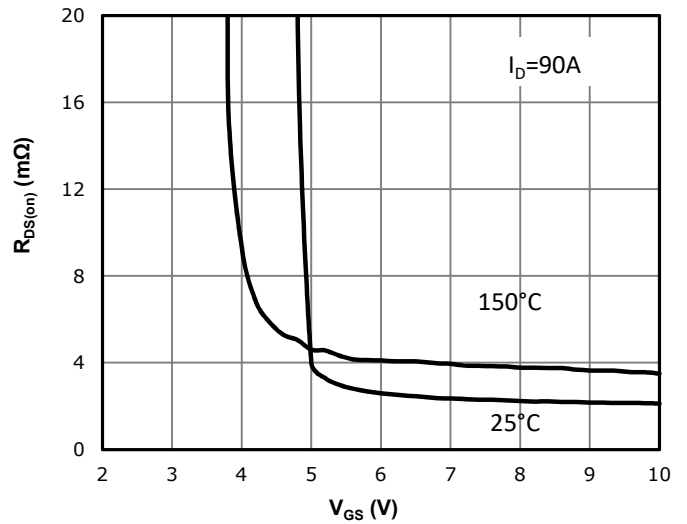


Fig 5: $R_{DS(on)}$ vs. Temperature

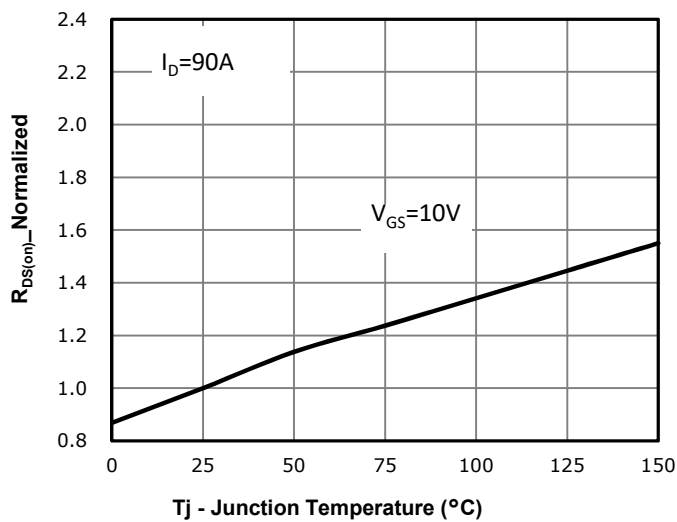


Fig 6: Capacitance Characteristics

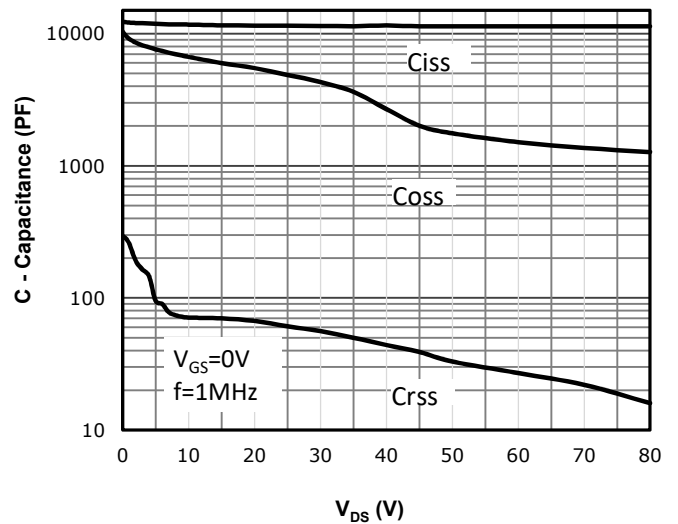


Fig 7: Gate Charge Characteristics

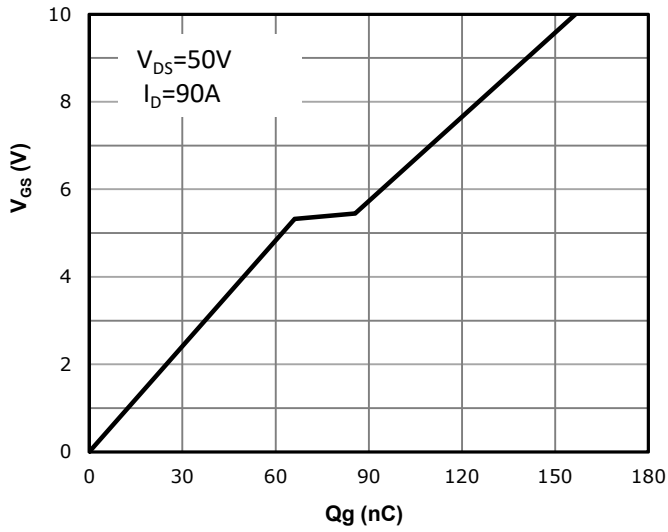


Fig 8: Body-diode Forward Characteristics

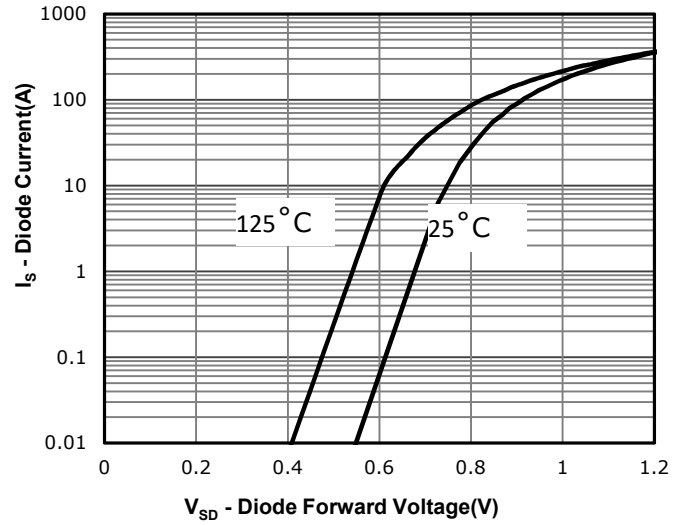


Fig 9: Power Dissipation

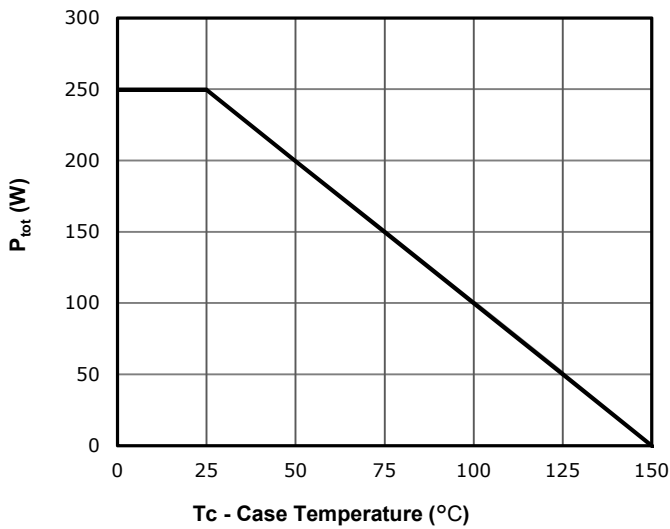


Fig 10: Drain Current Derating

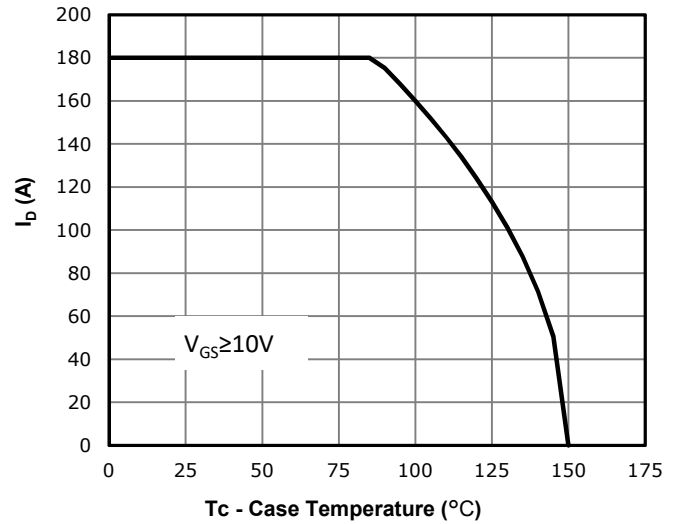


Fig 11: BVds vs. Temperature

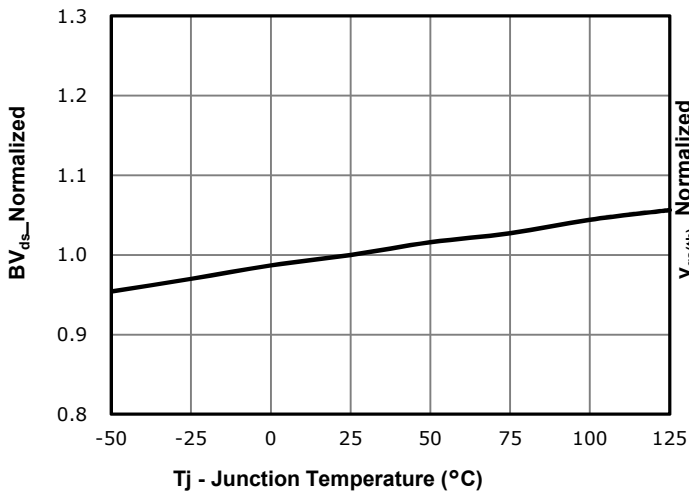


Fig 6: Vgs(th) vs. Temperature

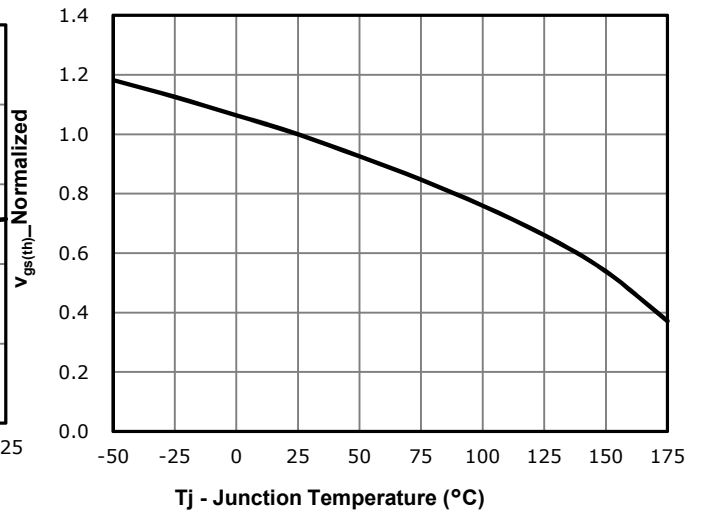


Fig 13: Safe Operating Area

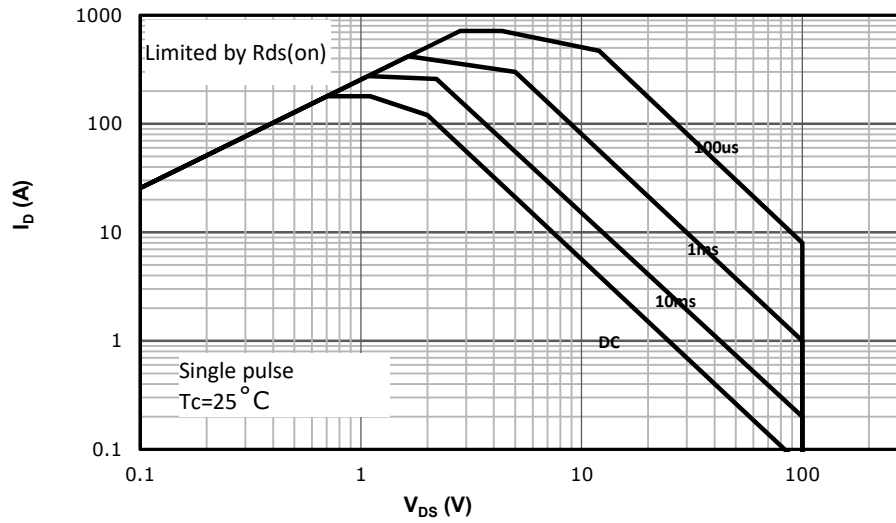
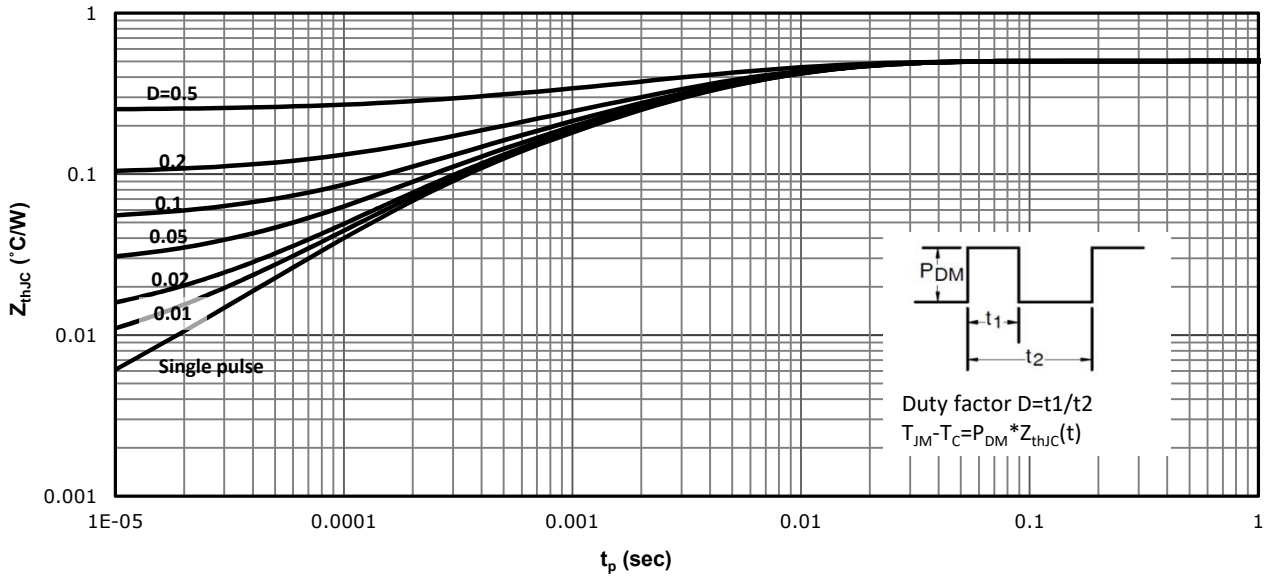
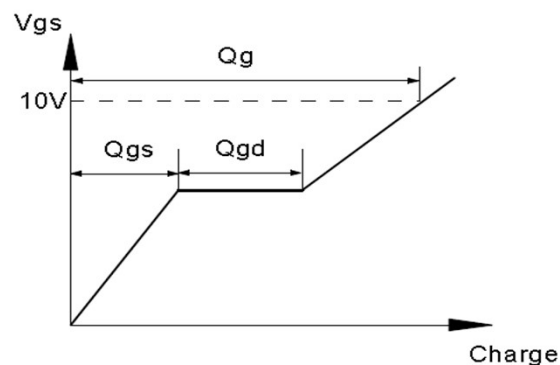
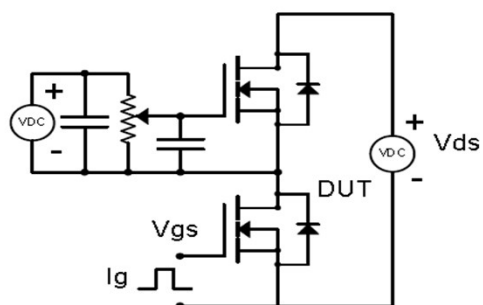


Fig 14: Max. Transient Thermal Impedance

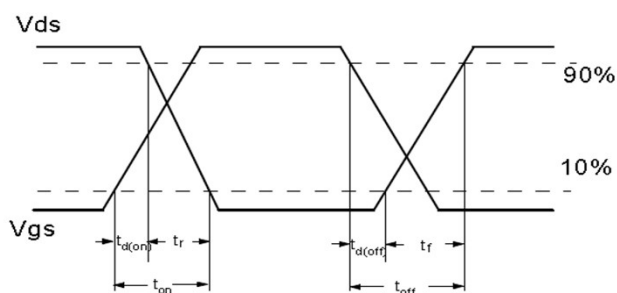
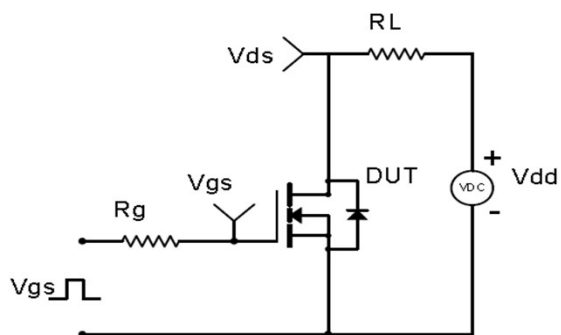


Test Circuit & Waveform

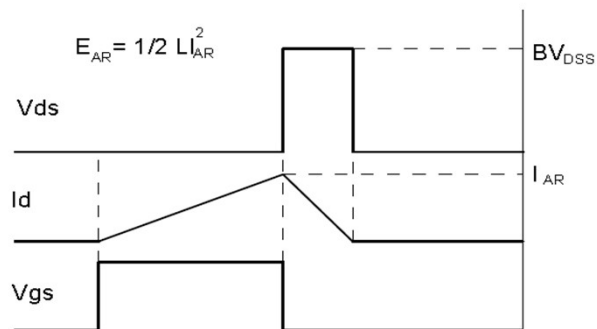
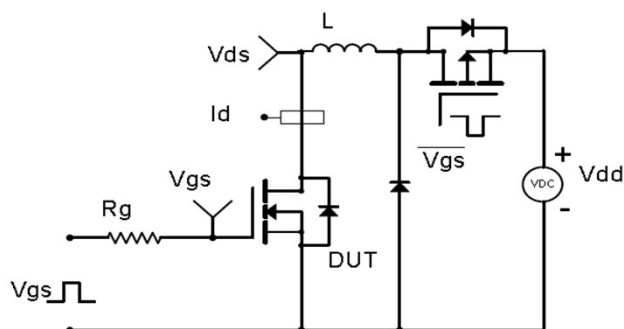
Gate Charge Test Circuit & Waveform



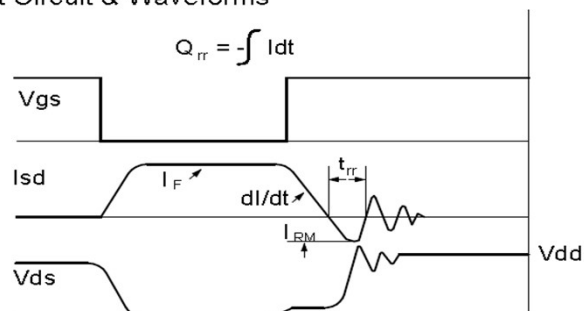
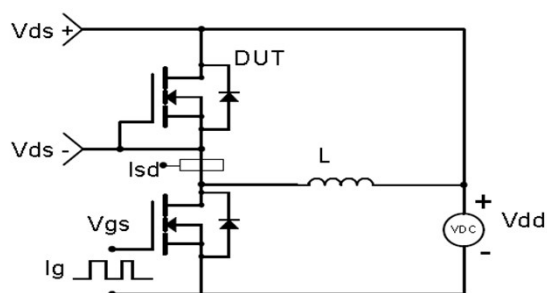
Resistive Switching Test Circuit & Waveforms



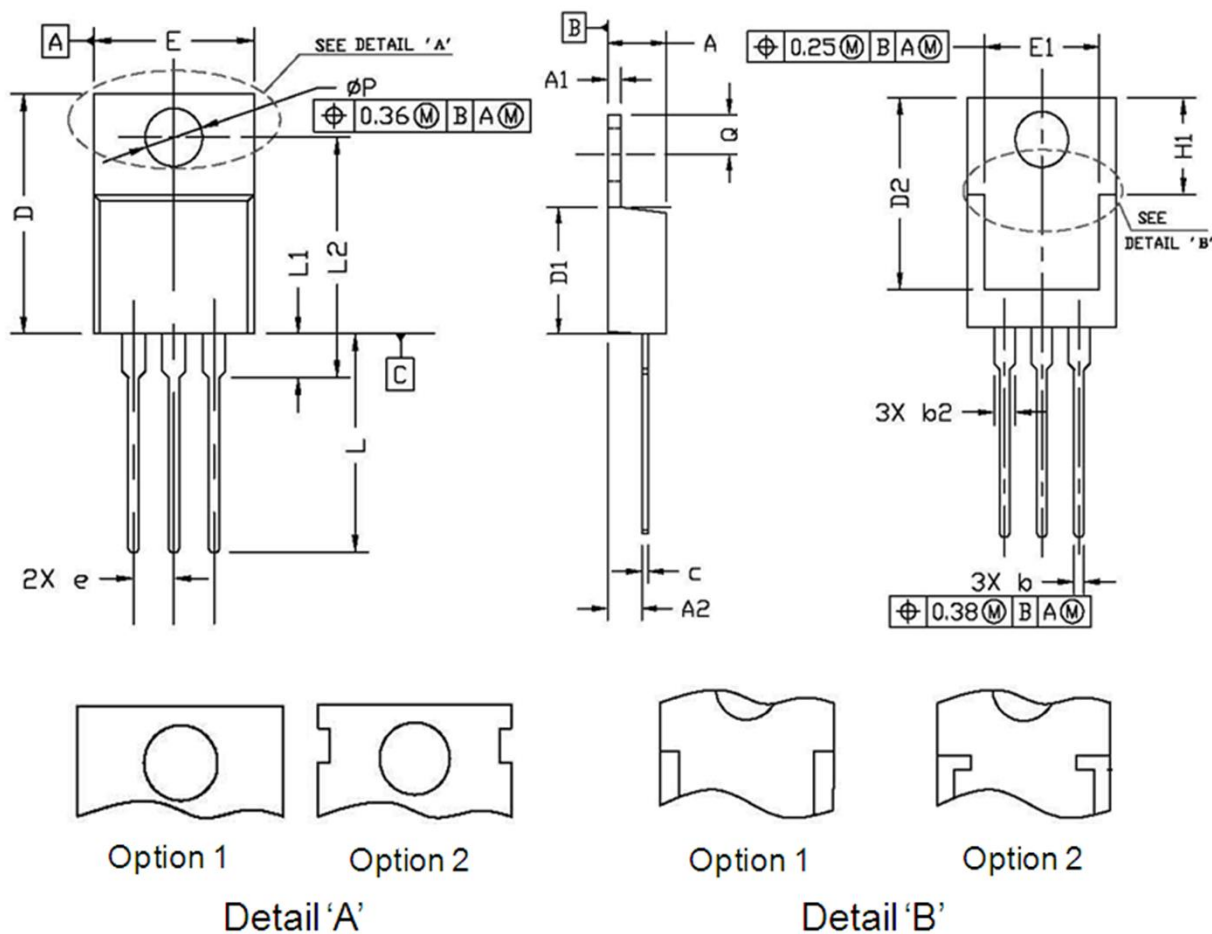
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: TO-220-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.42	4.72	0.174	0.186
A1	1.20	1.40	0.047	0.055
A2	2.35	2.90	0.093	0.114
b	0.71	0.91	0.028	0.036
b2	1.20	1.38	0.047	0.054
c	0.45	0.60	0.018	0.024
D	14.70	16.00	0.579	0.630
D1	8.80	9.50	0.347	0.374
D2	11.75	13.60	0.463	0.535
e	2.54 BSC.		0.100 BSC.	
E	9.70	10.40	0.382	0.409
E1	7.00	8.90	0.276	0.350
H1	6.10	6.50	0.240	0.256
L	12.80	14.80	0.504	0.583
L1	2.50	3.90	0.098	0.154
L2	12.13	16.50	0.478	0.650
Q	2.60	3.00	0.102	0.118
P	3.55	3.90	0.140	0.154

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	2022/8/31	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.