

**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

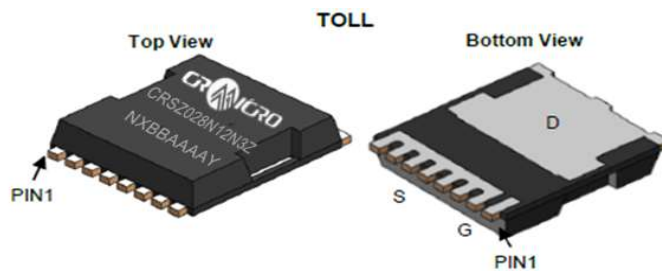
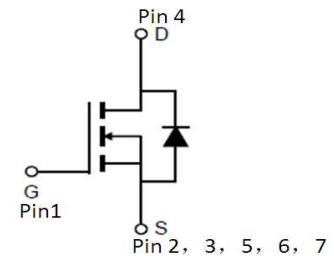
**Applications**

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

**Product Summary**

$V_{DS}$	120V
$R_{DS(on).typ}$	2.2mΩ
$I_D$	230A

**100% DVDS Tested**  
**100% Avalanche Tested**


**CRSZ028N12N3Z**

**Package Marking and Ordering Information**

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRSZ028N12N3Z	CRSZ028N12N3Z	TOLL	Tape&Reel	N/A	N/A	2000pcs

**Absolute Maximum Ratings**

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	120	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)	$I_D$	230 300 145	A
Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )	$I_{D\ pulse}$	920	A
Avalanche energy, single pulse ( $I_D = 77\text{A}$ , $R_g = 25\Omega$ ) <sup>[1]</sup>	$E_{AS}$	1468	mJ
Gate-Source voltage	$V_{GS}$	±20	V
Power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{tot}$	278	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)	$T_{sold}$	260	°C

※. Notes:

 1.EAS is tested at starting  $T_j = 25^\circ\text{C}$ ,  $L = 0.5\text{mH}$ ,  $I_{AS} = 77\text{A}$ ,  $V_{GS} = 10\text{V}$ .

**Thermal Resistance**

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	$R_{thJC}$	0.45	°C/W
Thermal resistance, junction – ambient(min. footprint)	$R_{thJA}$	50	

**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	$BV_{DSS}$	120	-	-	V	$V_{GS}=0V, I_D=250\mu A$
		120	-	-	V	$V_{GS}=0V, I_D=1mA$
Gate threshold voltage	$V_{GS(th)}$	2.0	3.0	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$	-	-	1	$\mu A$	$V_{DS}=120V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=125^\circ C$
		-	-	100		
Gate-source leakage current	$I_{GSS}$	0	-	$\pm 100$	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	2.2	2.8	mΩ	$V_{GS}=10V, I_D=90A$
Transconductance	$g_{fs}$	111.3	222.6	445.2	S	$V_{DS}=5V, I_D=90A$

**Dynamic Characteristic**

Input Capacitance	$C_{iss}$	8054	12081	18121.5	pF	$V_{GS}=0V, V_{DS}=60V,$ $f=1MHz$
Output Capacitance	$C_{oss}$	912	1368	2052		
Reverse Transfer Capacitance	$C_{rss}$	22	33	48.75		
Gate Total Charge	$Q_G$	99	148.9	223.3	nC	$V_{GS}=10V, V_{DS}=60V,$ $I_D=90A$
Gate-Source charge	$Q_{gs}$	41	61.0	91.5		
Gate-Drain charge	$Q_{gd}$	14	28.9	57.7		
Turn-on delay time	$t_{d(on)}$	-	45.3	-	ns	$V_{GS}=10V, V_{DD}=60V,$ $R_{G\_ext}=2.7\Omega$
Rise time	$t_r$	-	84.7	-		
Turn-off delay time	$t_{d(off)}$	-	96.8	-		
Fall time	$t_f$	-	47.4	-		
Gate resistance	$R_G$	-	2.6	-	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	$V_{SD}$	-	0.86	1.4	V	$V_{GS}=0V, I_{SD}=90A$
Body Diode Reverse Recovery Time	$t_{rr}$	-	90.2	-	ns	$I_F=90A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	276.0	-	nC	

## Typical Performance Characteristics

Fig 1: Output Characteristics

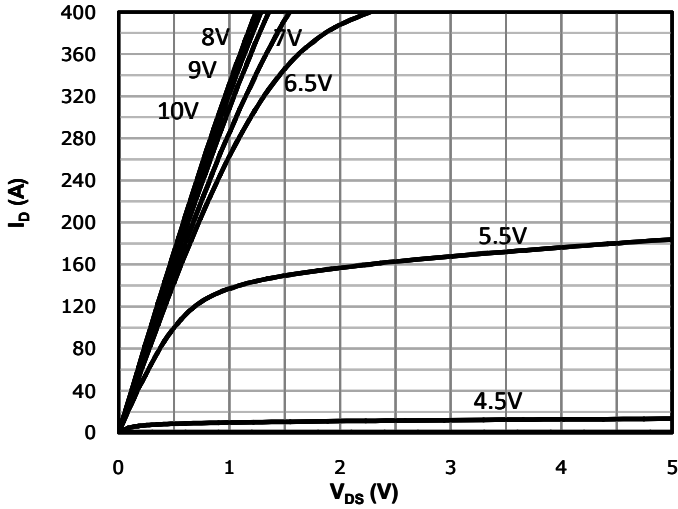


Fig 2: Transfer Characteristics

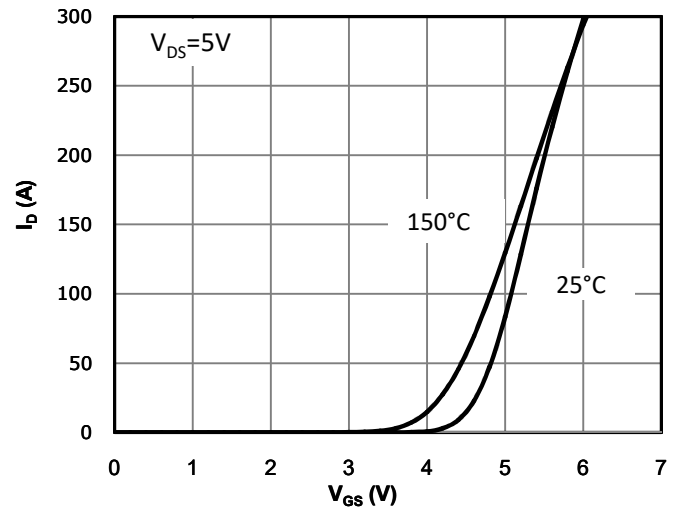


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

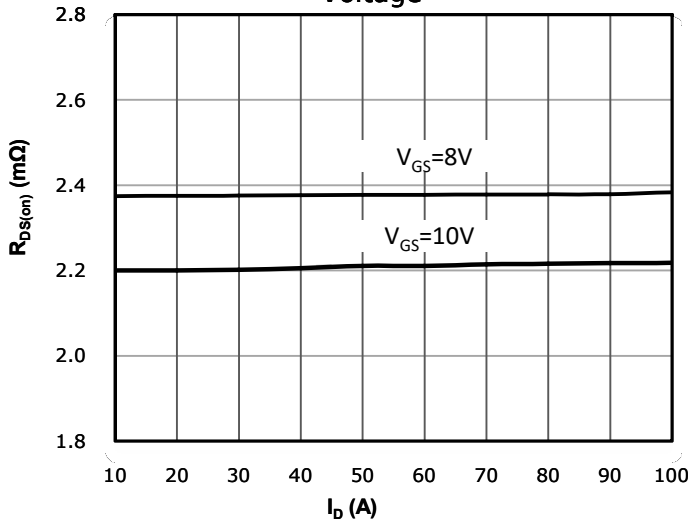


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

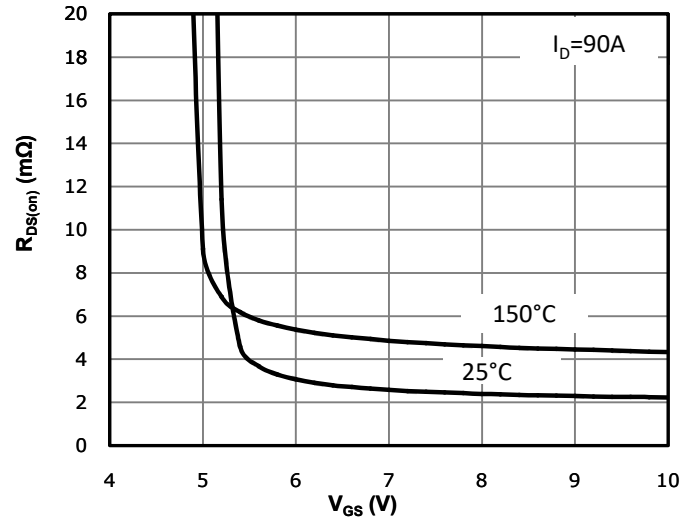


Fig 5:  $R_{DS(on)}$  vs. Temperature

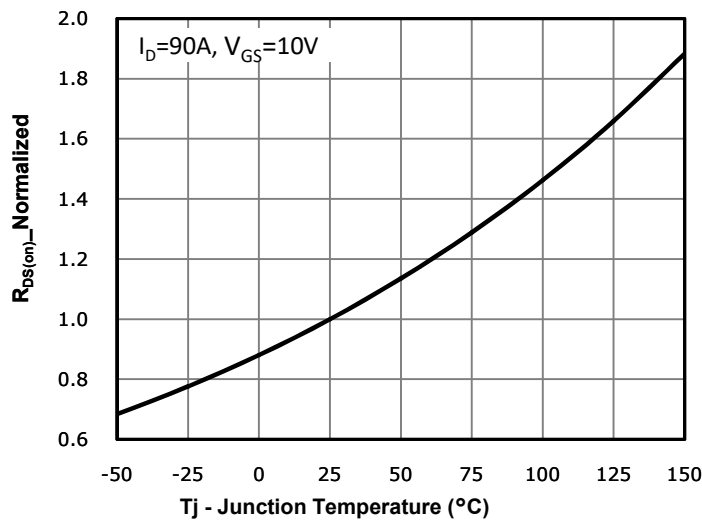


Fig 6:  $V_{GS(th)}$  vs. Temperature

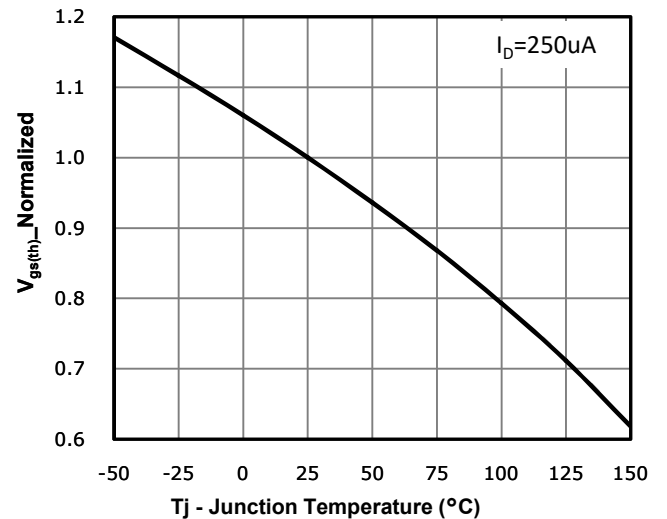


Fig 7: BVdss vs. Temperature

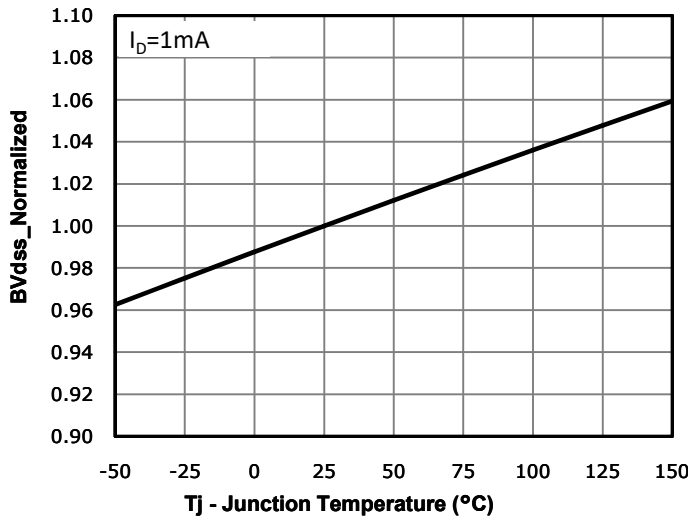


Fig 8: Capacitance Characteristics

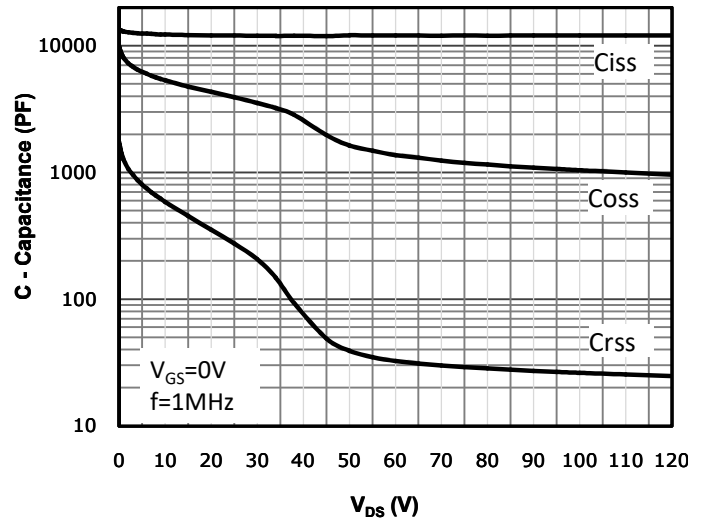


Fig 9: Gate Charge Characteristics

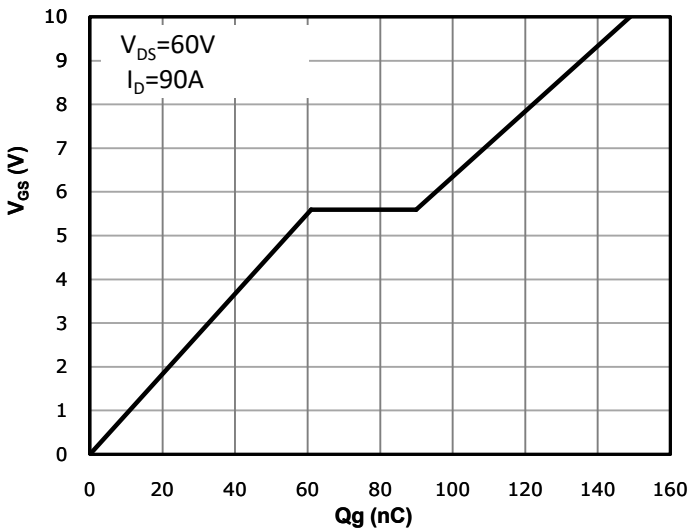


Fig 10: Body-diode Forward Characteristics

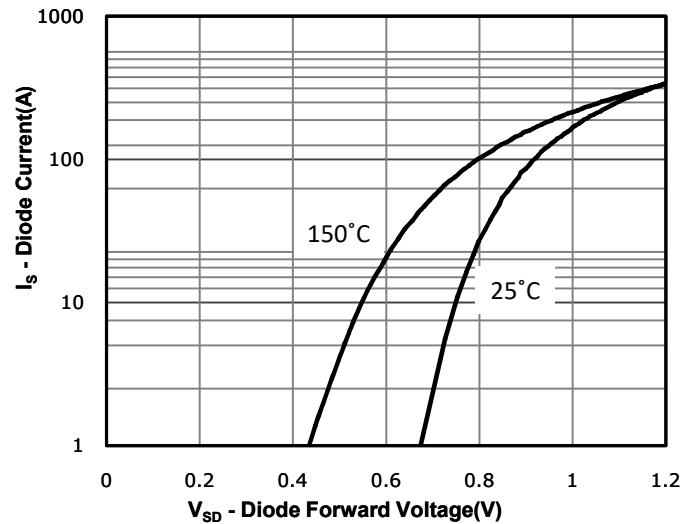


Fig 11: Power Dissipation

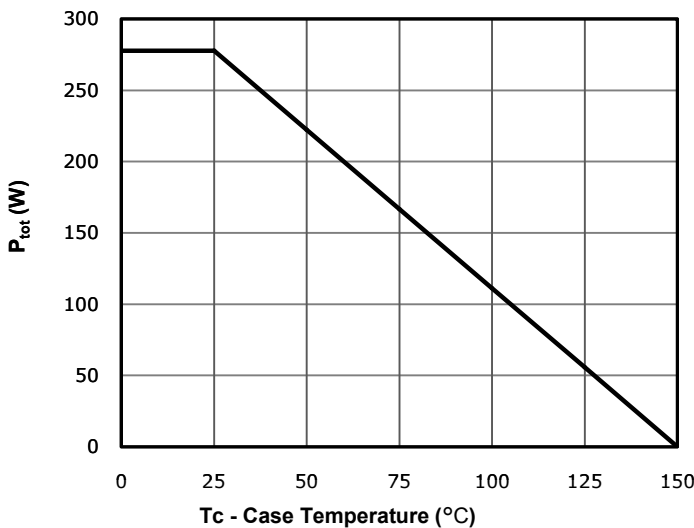


Fig 12: Drain Current Derating

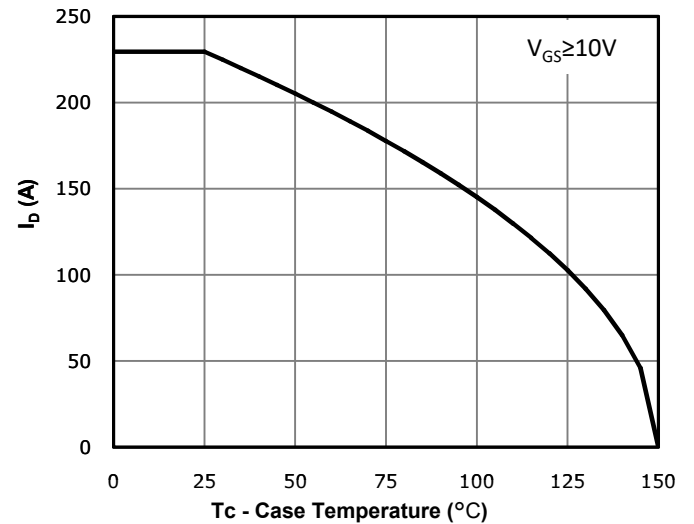


Fig 13: Safe Operating Area

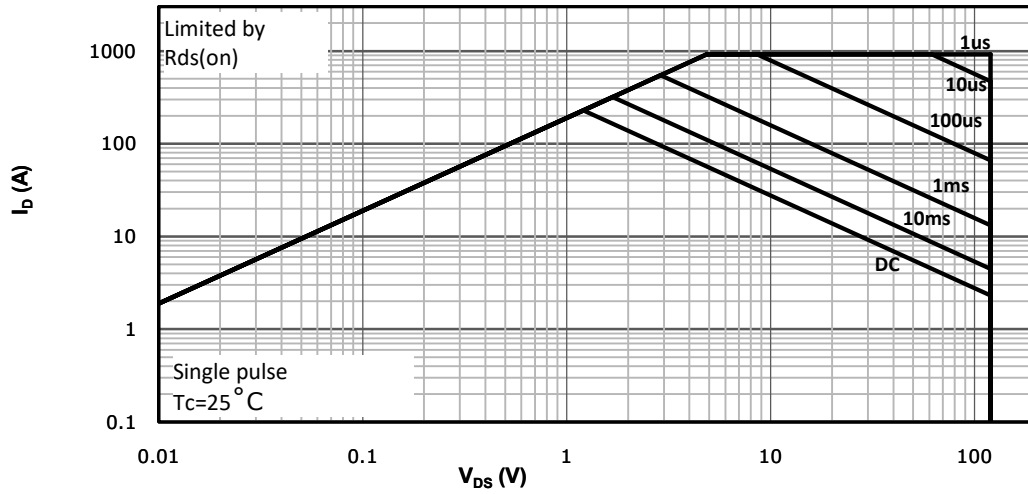
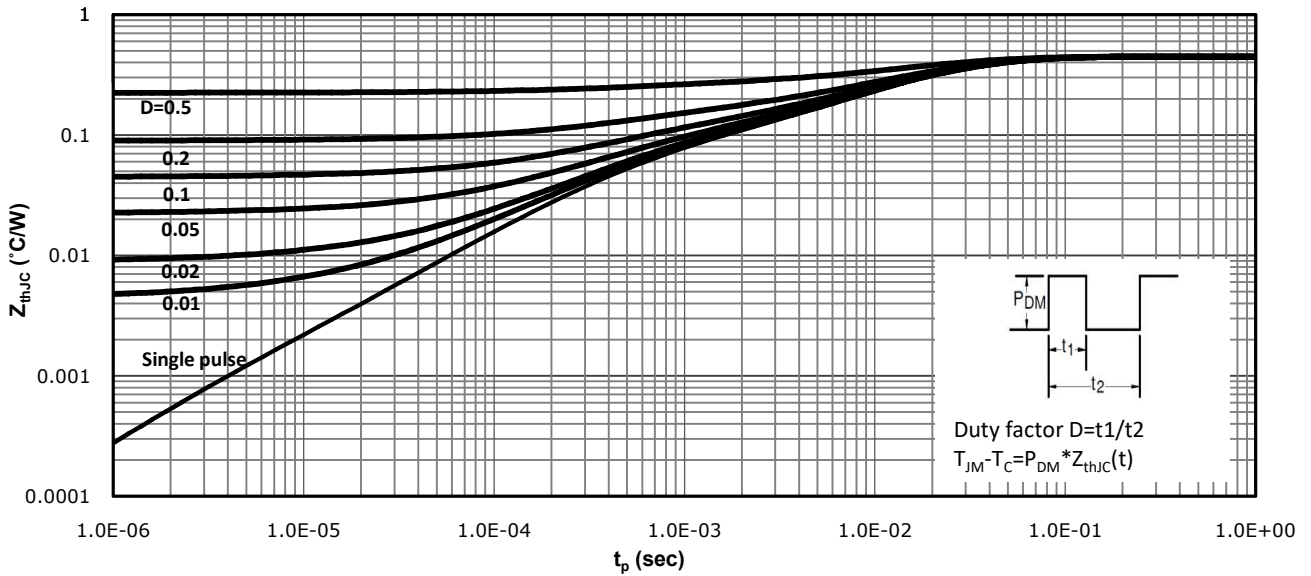
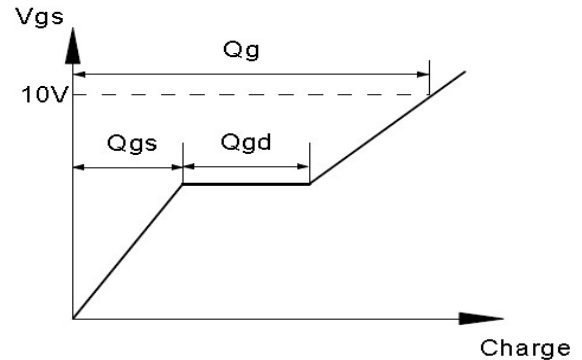
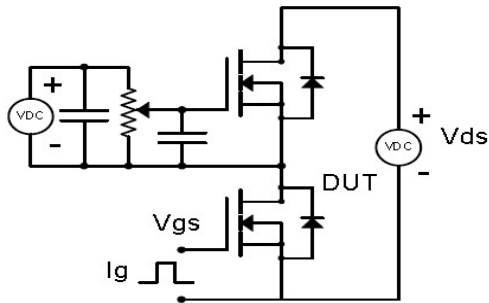


Fig 14: Max. Transient Thermal Impedance

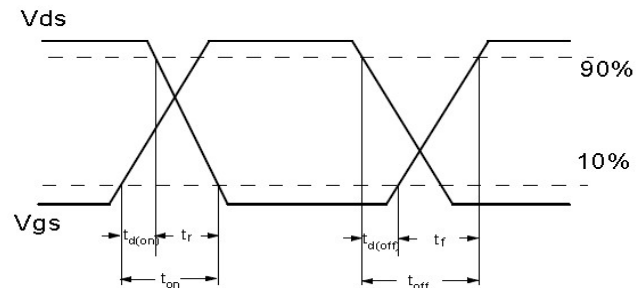
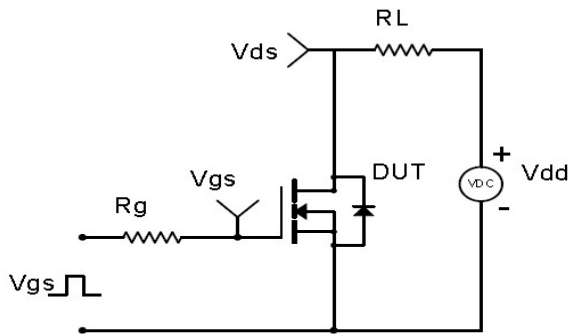


**Test Circuit & Waveform**

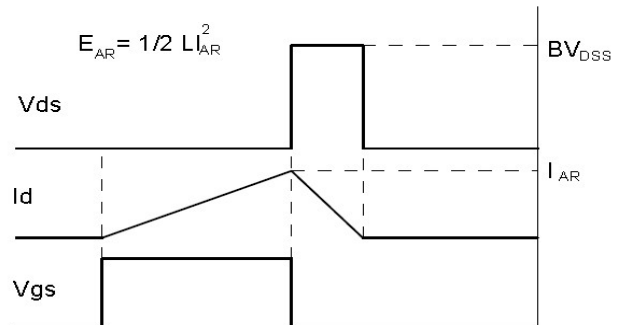
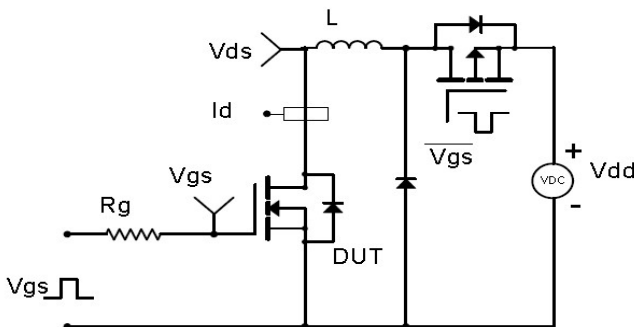
Gate Charge Test Circuit &amp; Waveform



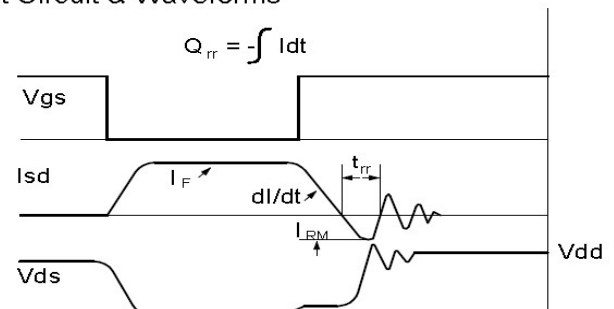
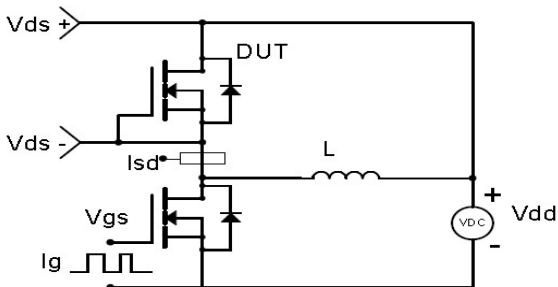
Resistive Switching Test Circuit &amp; Waveforms

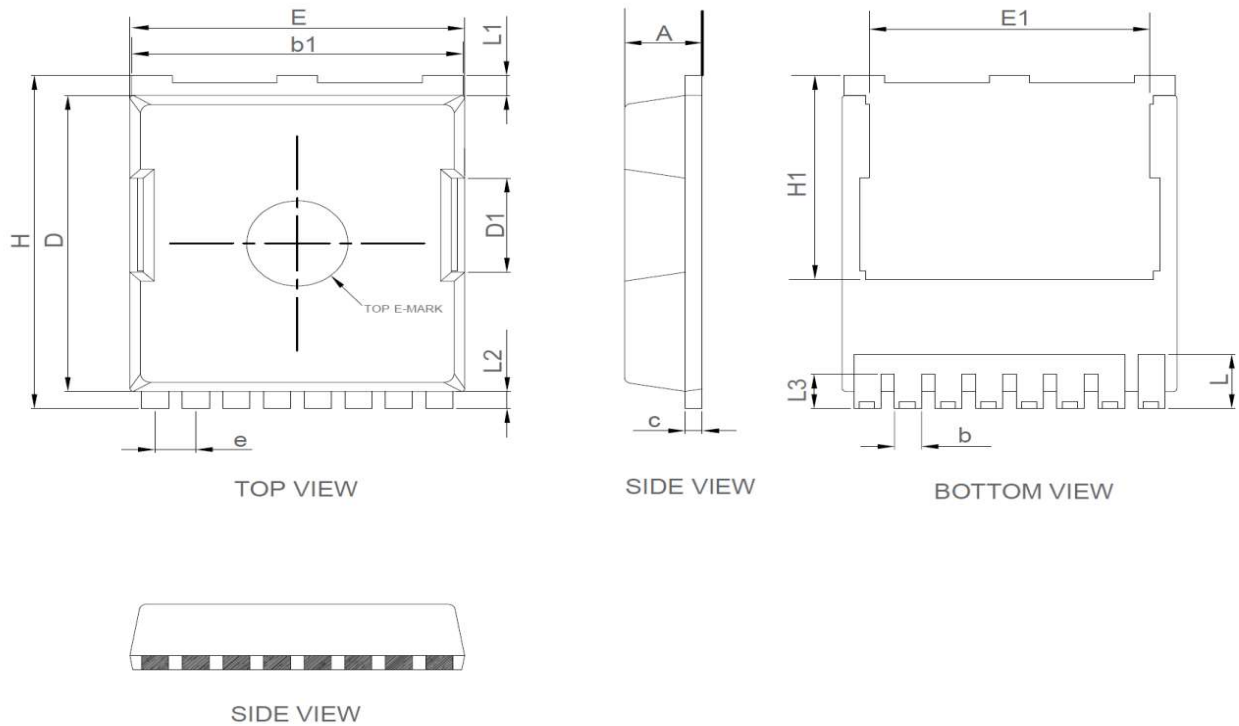


Unclamped Inductive Switching (UIS) Test Circuit &amp; Waveforms



Diode Recovery Test Circuit &amp; Waveforms



**Package Outline: TOLL**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.15	2.45	0.085	0.096
b	0.60	0.90	0.024	0.035
b1	9.65	9.95	0.380	0.392
c	0.35	0.65	0.014	0.026
D	10.18	10.70	0.401	0.421
D1	3.15	3.45	0.124	0.136
E	9.70	10.10	0.382	0.398
E1	7.35	8.45	0.289	0.333
e	1.10	1.30	0.043	0.051
H	11.45	11.95	0.451	0.470
H1	6.55	7.50	0.258	0.295
L	1.35	2.10	0.053	0.083
L1	0.50	0.90	0.020	0.035
L2	0.40	0.80	0.016	0.031
L3	0.95	1.35	0.037	0.053



## 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	2023/5/29	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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