CRST045N10N, CRSS042N10N

SkyMOS1 N-MOSFET 100V, 3.6mΩ, 120A

Features

- Uses CRM(CQ) advanced SkyMOS1 technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g \times R_{DS(on)}$ product(FOM)
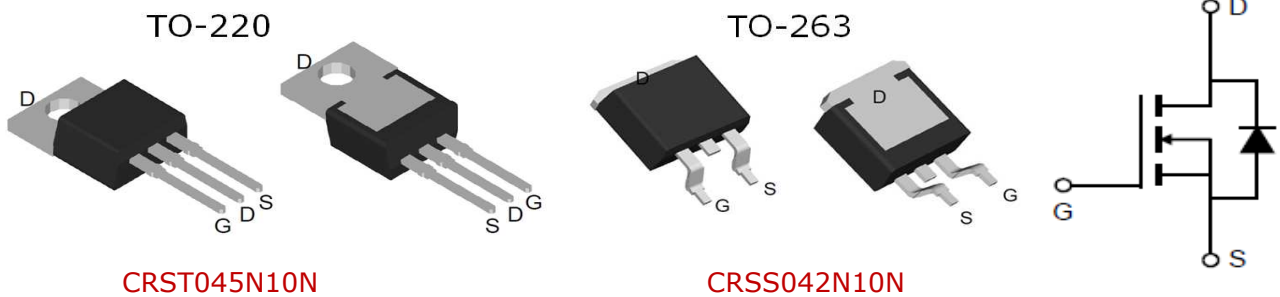- Qualified according to JEDEC criteria

Applications

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

Product Summary

V_{DS}	100V
$R_{DS(on)}$	3.6mΩ
I_D	120A

100% Avalanche Tested

TO-220   TO-263

CRST045N10N   CRSS042N10N

Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRST045N10N	-	TO-220	Tube	N/A	N/A	50pcs
CRSS042N10N	-	TO-263	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°C (Silicon limit) 　T_C = 25°C (Package limit) 　T_C = 100°C (Silicon limit)	I_D	172 120 109	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D\,pulse}$	480	A
Avalanche energy, single pulse (L=0.5mH, Rg=25Ω)	E_{AS}	256	mJ
Gate-Source voltage	V_{GS}	±20	V
Power dissipation (T_C = 25°C)	P_{tot}	227	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+150	°C

Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	R_{thJC}	0.55	°C/W
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	62	

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

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

Static Characteristic

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Drain-source breakdown voltage	BV_{DSS}	100	115	-	V	$V_{GS}=0V$, $I_D=250uA$
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	$V_{DS}=V_{GS}$, $I_D=250uA$
Zero gate voltage drain current	I_{DSS}	-	0.05	1	µA	$V_{DS}=100V$, $V_{GS}=0V$ $T_j=25°C$
		-	-	10		$T_j=125°C$
Gate-source leakage current	I_{GSS}	-	±10	±100	nA	$V_{GS}=±20V$, $V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	3.6	4.5	mΩ	$V_{GS}=10V$, $I_D=50A$ TO-220
		-	3.4	4.2		TO-263
Transconductance	g_{fs}	-	50	-	S	$V_{DS}=5V$, $I_D=50A$

Dynamic Characteristic

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Input Capacitance	C_{iss}	-	6772	-	pF	$V_{GS}=0V$, $V_{DS}=50V$, f=1MHz
Output Capacitance	C_{oss}	-	952	-		
Reverse Transfer Capacitance	C_{rss}	-	33	-		
Gate Total Charge	Q_G	-	90	-	nC	$V_{GS}=10V$, $V_{DS}=50V$, $I_D=20A$, f=1MHz
Gate-Source charge	Q_{gs}	-	28	-		
Gate-Drain charge	Q_{gd}	-	19	-		
Turn-on delay time	$t_{d(on)}$	-	28	-	ns	$V_{GS}=10V$, $V_{DD}=50V$, $R_{G\_ext}=3.0Ω$
Rise time	t_r	-	32	-		
Turn-off delay time	$t_{d(off)}$	-	48	-		
Fall time	t_f	-	27	-		
Gate resistance	R_G	-	2	-	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	1.3	V	V_{GS}=0V,I_{SD}=50A
Body Diode Reverse Recovery Time	t_{rr}	-	80	-	ns	I_F=50A, dI/dt=100A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	-	190	-	nC	

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Typical Performance Characteristics

Fig 1: Output Characteristics
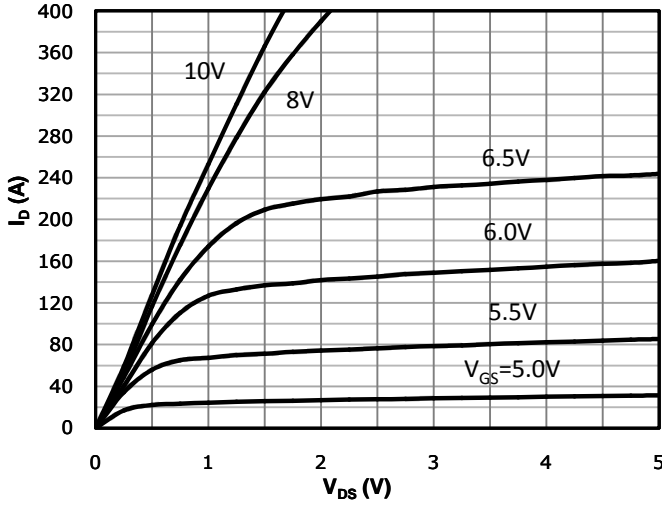
Fig 2: Transfer Characteristics
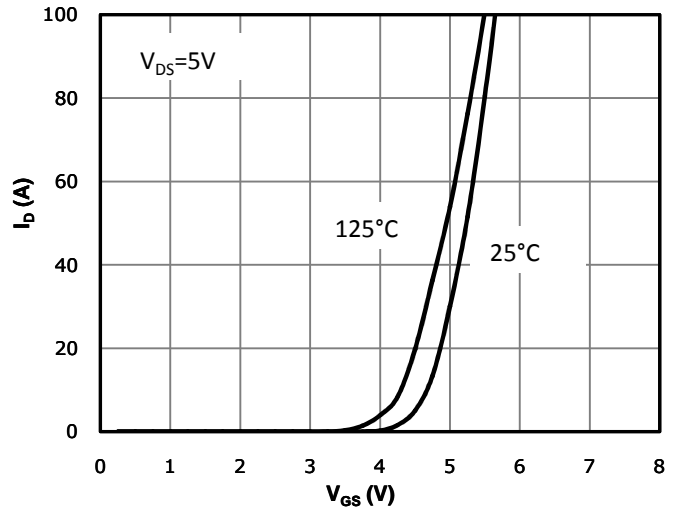
Fig 3: Rds(on) vs Drain Current and Gate Voltage
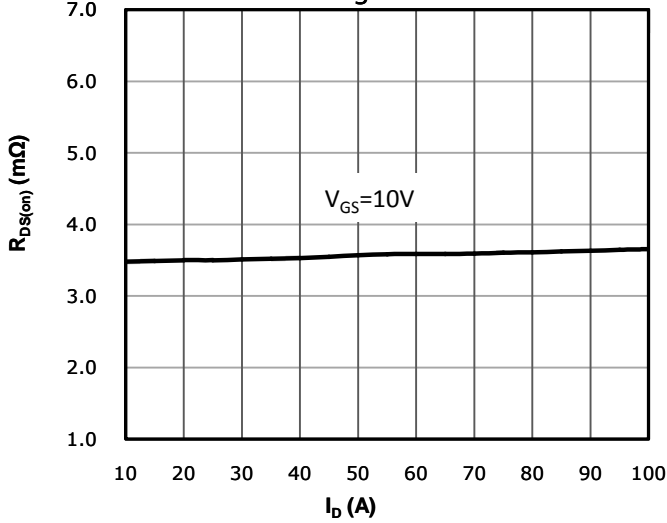
Fig 4: Rds(on) vs Gate Voltage
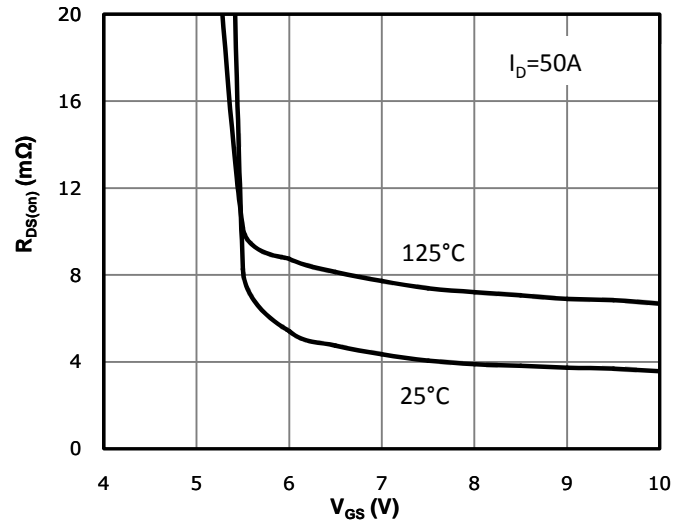
Fig 5: Rds(on) vs. Temperature
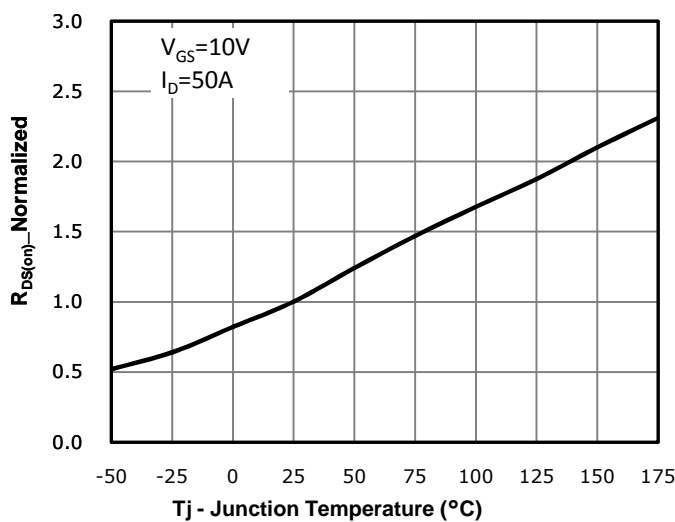
Fig 6: Capacitance Characteristics

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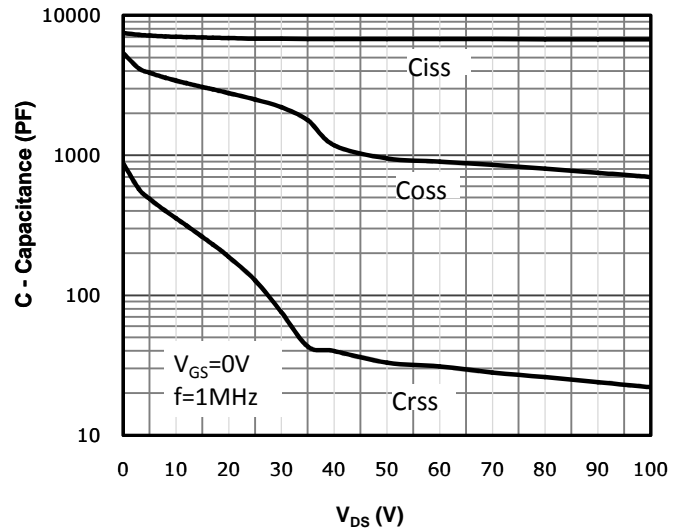
Fig 7: Gate Charge Characteristics

$V_{DS}=50V$
$I_D=20A$

X-axis: Qg (nC)
Y-axis: V_{GS} (V)
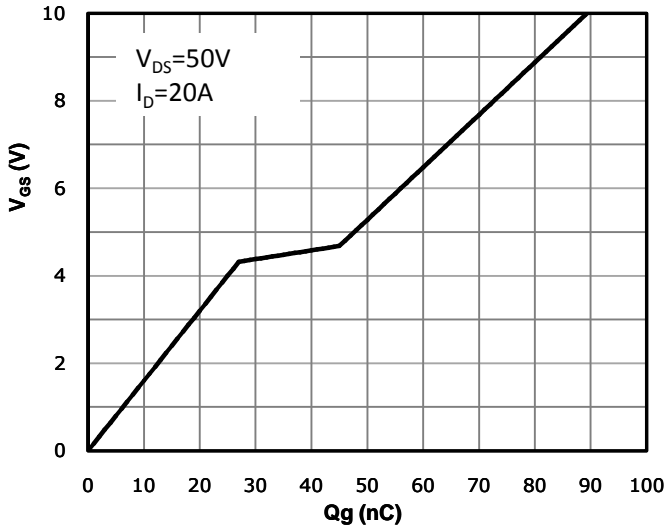
Fig 8: Body-diode Forward Characteristics

125°C, 25°C

X-axis: V_{SD} - Diode Forward Voltage(V)
Y-axis: I_S - Diode Current(A)

Fig 9: Power Dissipation

X-axis: Tc - Case Temperature (°C)
Y-axis: P_{tot} (W)
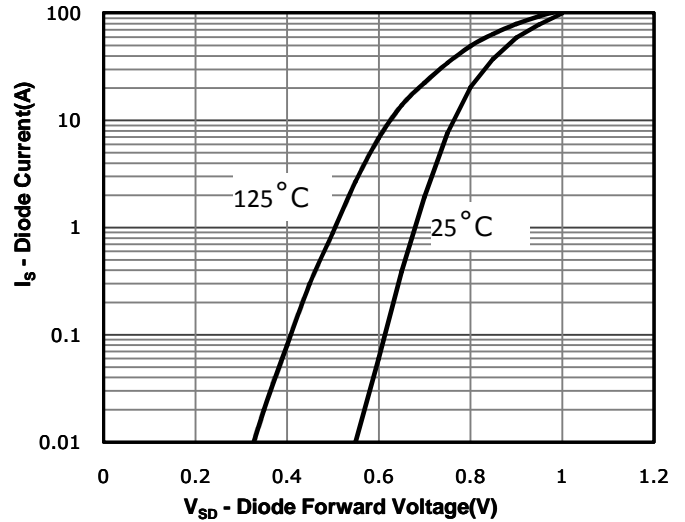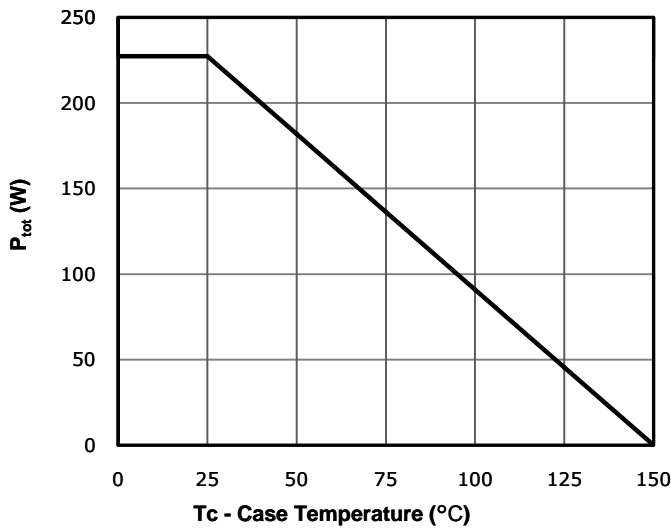
Fig 10: Drain Current Derating

$V_{GS} \geq 10V$

X-axis: Tc - Case Temperature (°C)
Y-axis: I_D (A)
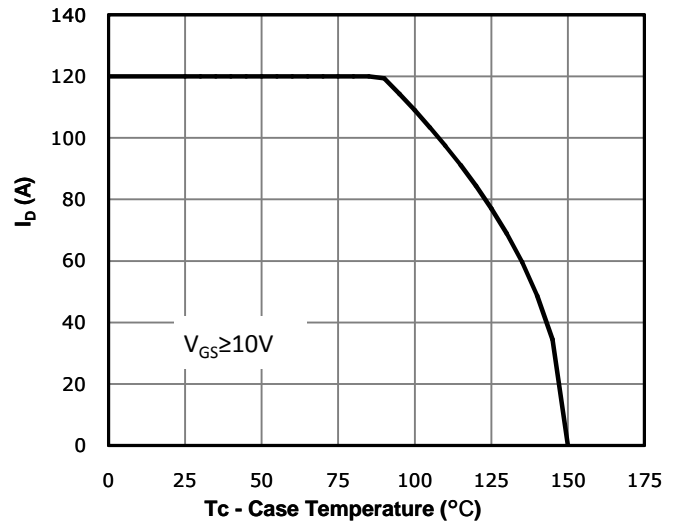
Fig 11: Safe Operating Area

Limited by Rds(on)

1us
10us
100us
1ms
10ms
DC

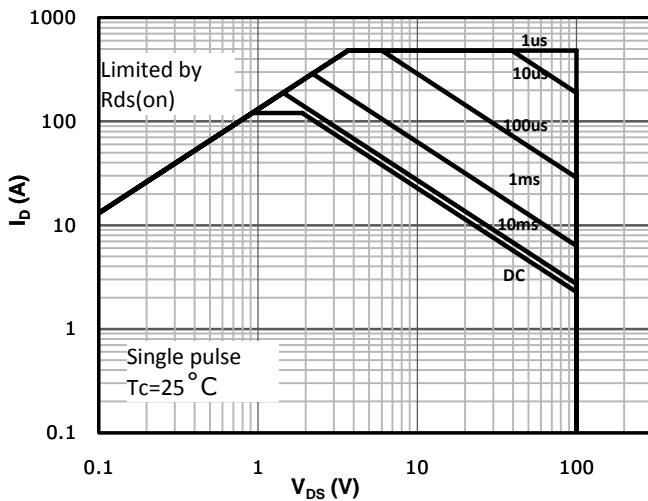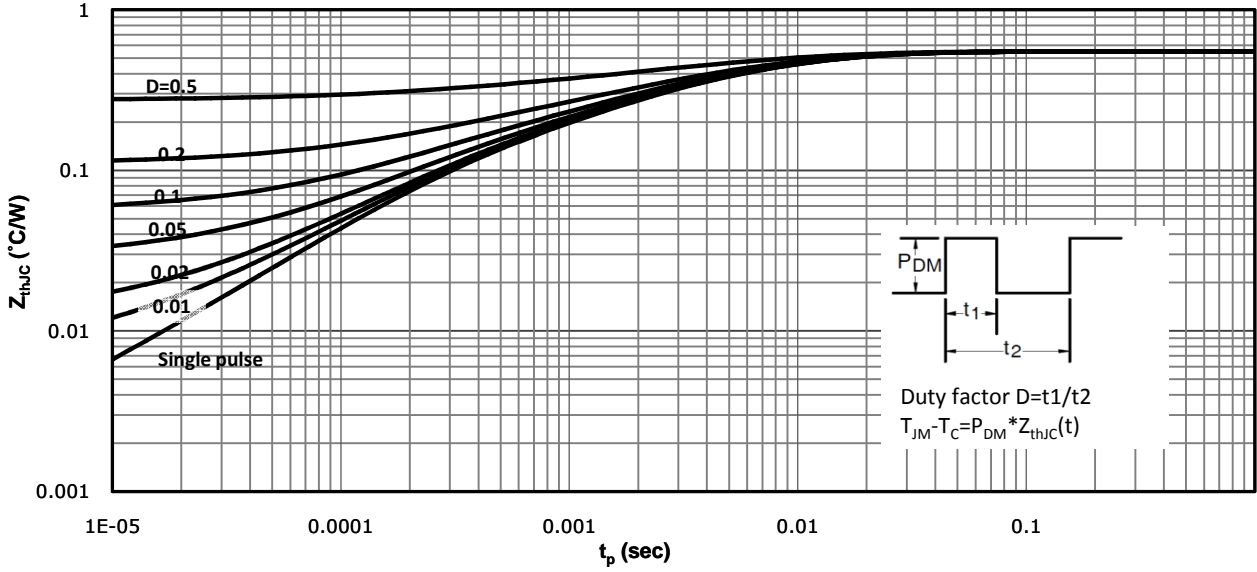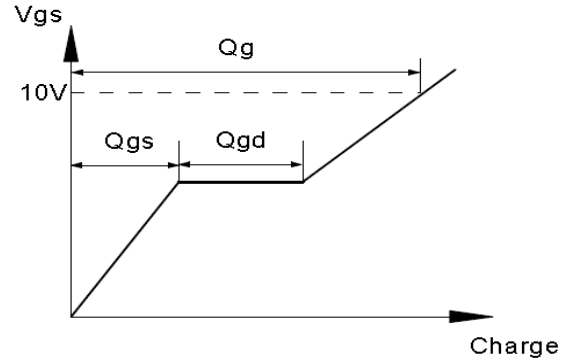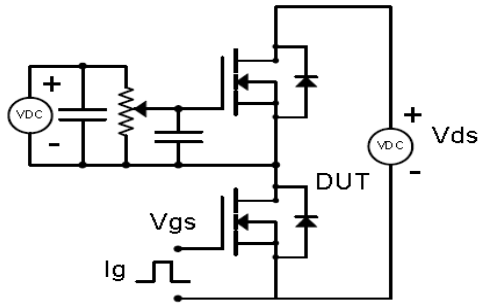Single pulse
Tc=25°C

X-axis: V_{DS} (V)
Y-axis: I_D (A)
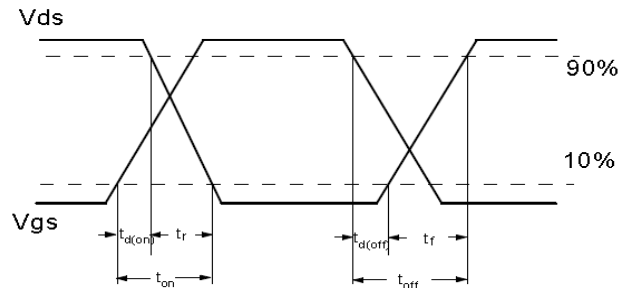
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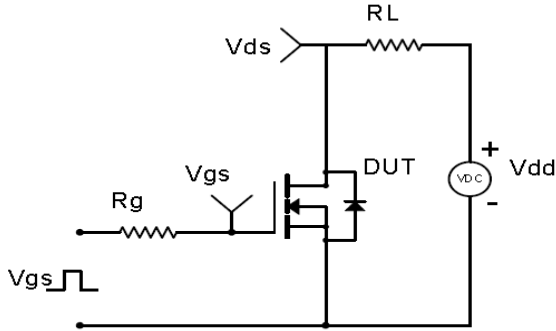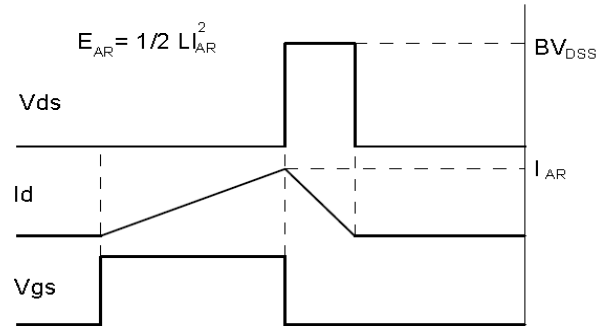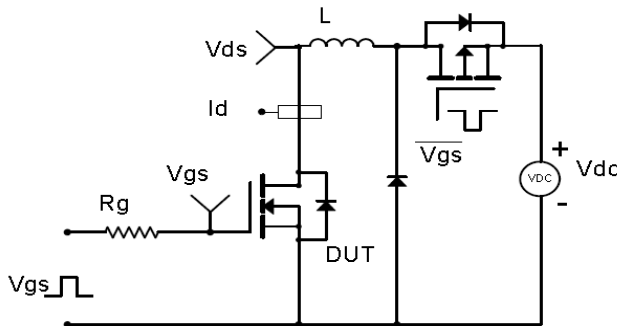Fig 12: Max. Transient Thermal Impedance

Test Circuit & Waveform

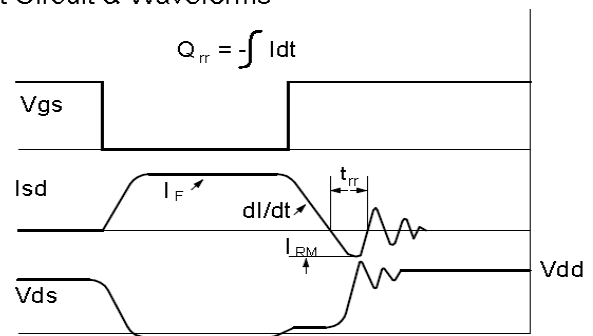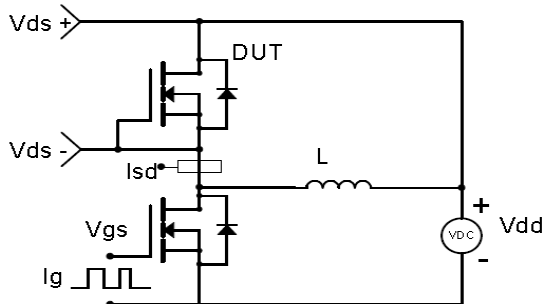### Gate Charge Test Circuit & Waveform
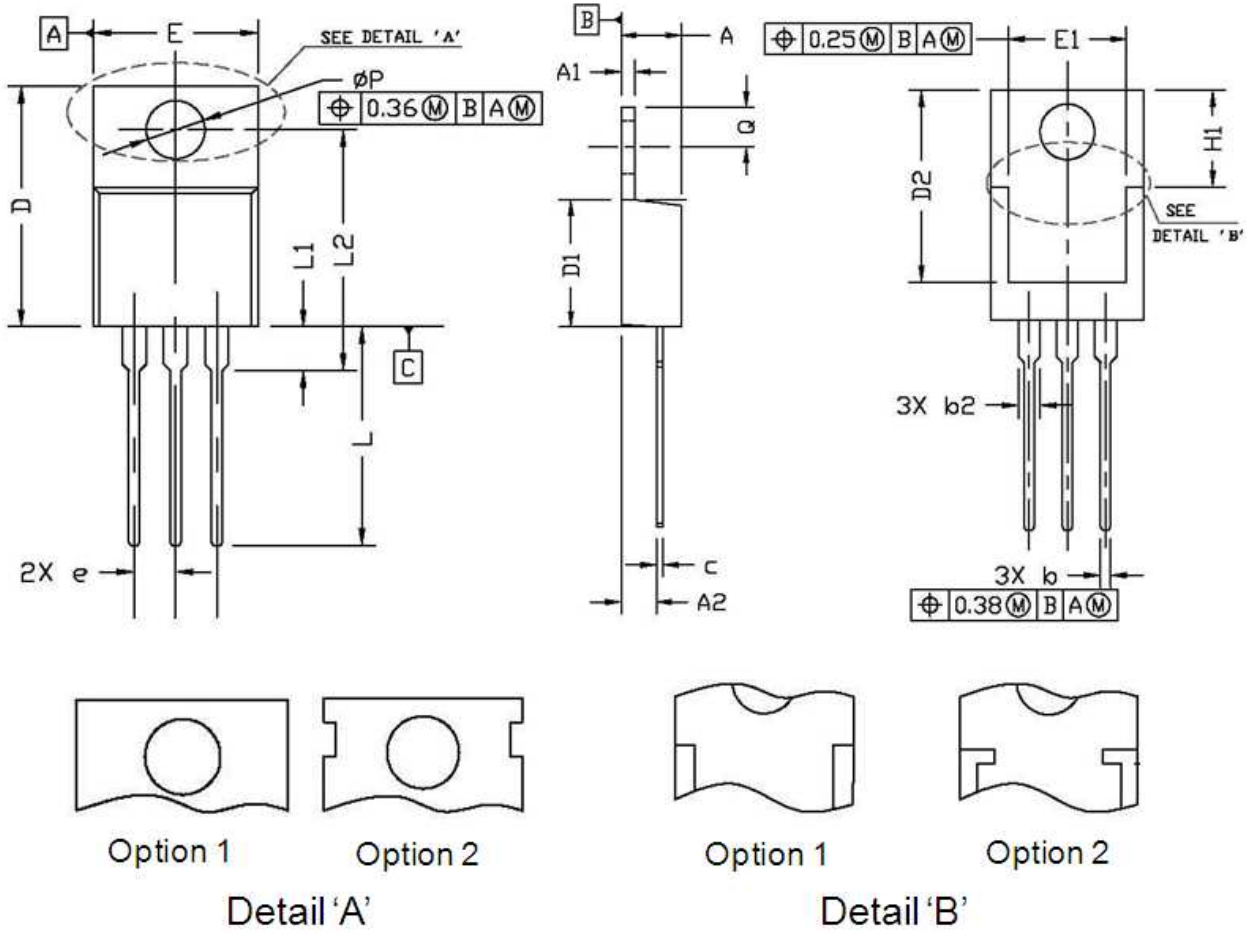

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2\ LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = \int Idt$$

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	8.46	0.276	0.333
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	3.90	0.138	0.154

Package Outline: TO-263
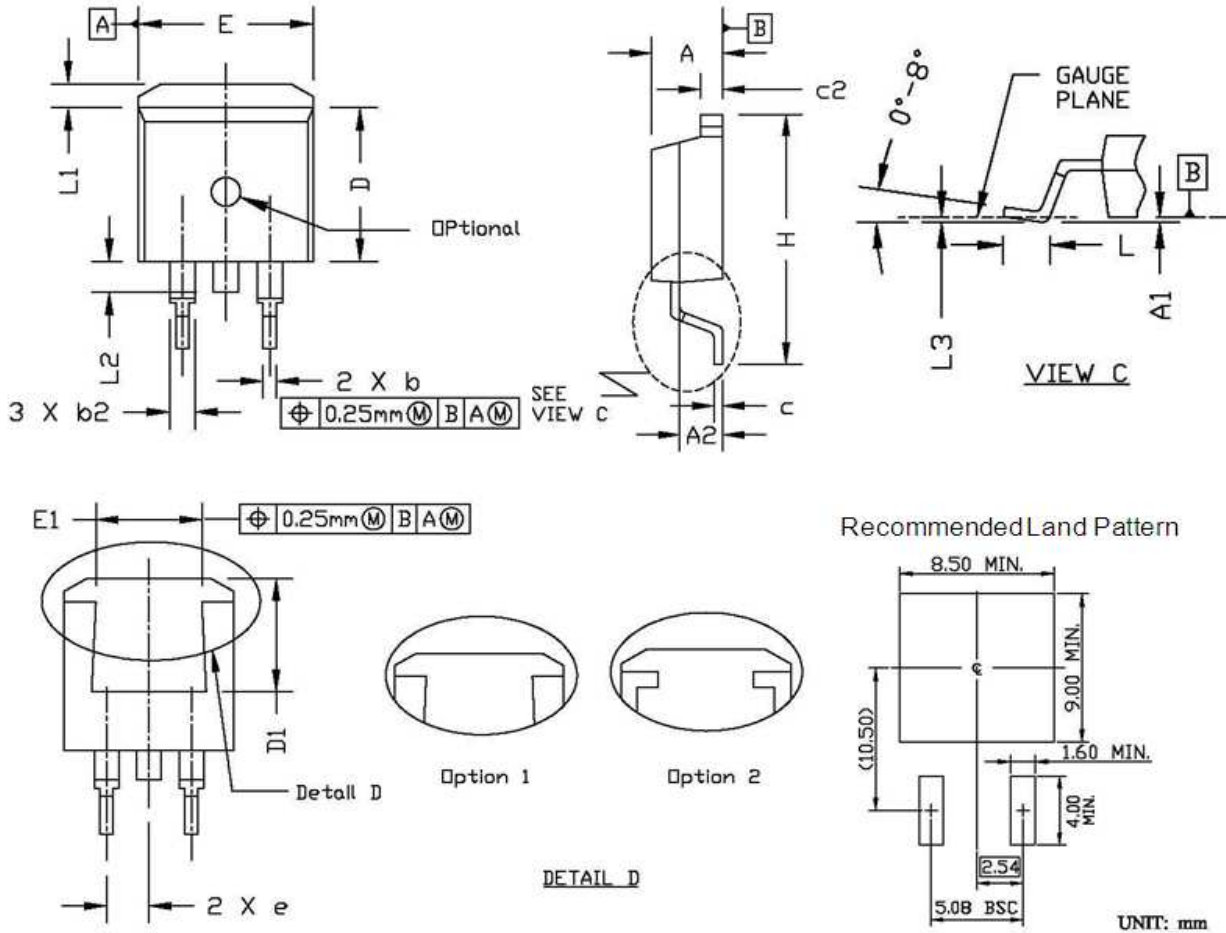
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.30	4.86	0.169	0.191
A1	0.00	0.25	0.000	0.010
A2	2.34	2.79	0.092	0.110
b	0.68	0.94	0.027	0.037
b2	1.15	1.35	0.045	0.053
c	0.33	0.65	0.013	0.026
c2	1.17	1.40	0.046	0.055
D	8.38	9.45	0.330	0.372
D1	6.90	8.17	0.272	0.322
e	2.54 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	2.24	3.00	0.088	0.118
L1	0.70	1.60	0.028	0.063
L2	1.00	1.78	0.039	0.070
L3	0.00	0.25	0.000	0.010

Revision History

Revison	Date	Major changes
1.0	2018-02-09	Release of formal version.
2.0	2019-05-28	Supplement package outline info.

Disclaimer

Unless otherwise specified in the datasheet, the product is designed and qulified 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 semicondutor 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.