CRST046N14N, CRSS043N14N

SkyMOS1 N-MOSFET 135V, 3.5mΩ, 160A

Features

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

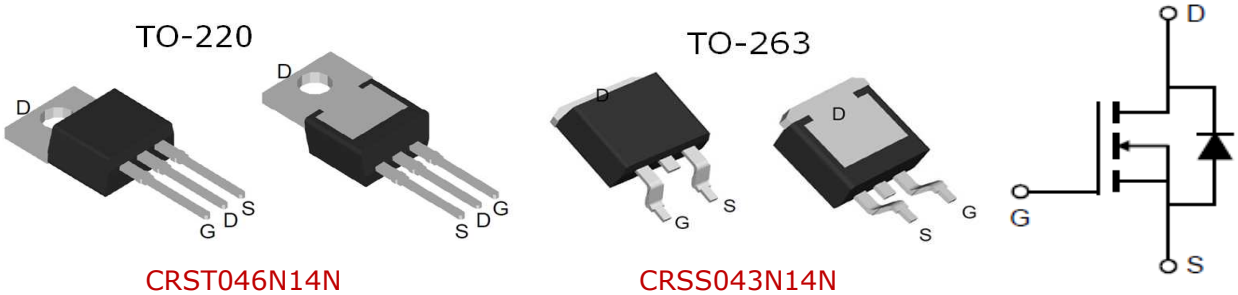
Product Summary

V_{DS}	135V
$R_{DS(on)}$	3.5mΩ
I_D	160A

Applications

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

100% Avalanche Tested



CRST046N14N CRSS043N14N

Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRST046N14N	-	TO-220	Tube	N/A	N/A	50pcs
CRSS043N14N	-	TO-263	Tube	N/A	N/A	50pcs

Absolute Maximum Ratings

Parameter	**Symbol**	**Value**	**Unit**
Drain-source voltage	V_{DS}	135	V
Continuous drain current T_C = 25°C (Silicon limit) T_C = 25°C (Package limit) T_C = 100°C (Silicon limit)	I_D	 174 160 105	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D\ pulse}$	640	A
Avalanche energy, single pulse (L=0.5mH, Rg=25Ω)	E_{AS}	400	mJ
Gate-Source voltage	V_{GS}	±20	V
Power dissipation (T_C = 25°C)	P_{tot}	250	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+150	°C

※. Notes:1.EAS is tested at starting Tj = 25℃, L = 0.5mH, IAS = 40A, VGS = 10V.

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Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	R_{thJC}	0.50	°C/W
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	60	

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

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	135	-	-	V	V_{GS}=0V, I_D=250uA
Gate threshold voltage	$V_{GS(th)}$	2.0	3.0	4.0	V	V_{DS}=V_{GS},I_D=250uA
Zero gate voltage drain current	I_{DSS}	-	0.1	1	μA	V_{DS}=108V,V_{GS}=0V T_j=25°C
		-	10	100		T_j=125°C
Gate-source leakage current	I_{GSS}	-	10	100	nA	V_{GS}=±20V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	-	3.5	4.4	mΩ	V_{GS}=10V, I_D=80A TO-220
		-	3.2	4.1		TO-263
		-	3.8	4.8	mΩ	V_{GS}=8V, I_D=64A TO-220
		-	3.5	4.4		TO-263
Transconductance	g_{fs}		91.8	-	S	V_{DS}=5V,I_D=40A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	10371	-	pF	V_{GS}=0V, V_{DS}=68V, f=1MHz
Output Capacitance	C_{oss}	-	892.7	-		
Reverse Transfer Capacitance	C_{rss}	-	35.0	-		
Gate Total Charge	Q_G	-	139.3	-	nC	V_{GS}=10V, V_{DS}=68V, I_D=50A, f=1MHz
Gate-Source charge	Q_{gs}	-	52.6	-		
Gate-Drain charge	Q_{gd}	-	23.6	-		
Turn-on delay time	$t_{d(on)}$	-	29.2	-	ns	Vds=68V Id=80A Rg=2.7Ω Vgs=10V; (Note 2,3)
Rise time	t_r	-	110	-		
Turn-off delay time	$t_{d(off)}$	-	82.2	-		
Fall time	t_f	-	105	-		

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Gate resistance	R_G	-	2.8	-	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}=80A
Body Diode Reverse Recovery Time	t_{rr}	-	117.3	-	ns	ISD=80A, VGS=0V, dIF/dt=100A/us;
Body Diode Reverse Recovery Charge	Q_{rr}	-	517.0	-	nC	

Typical Performance Characteristics

Fig 1: Output Characteristics

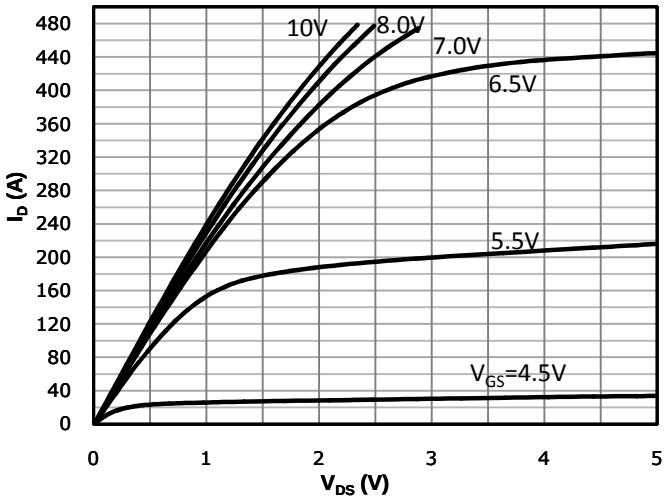


Fig 2: Transfer Characteristics

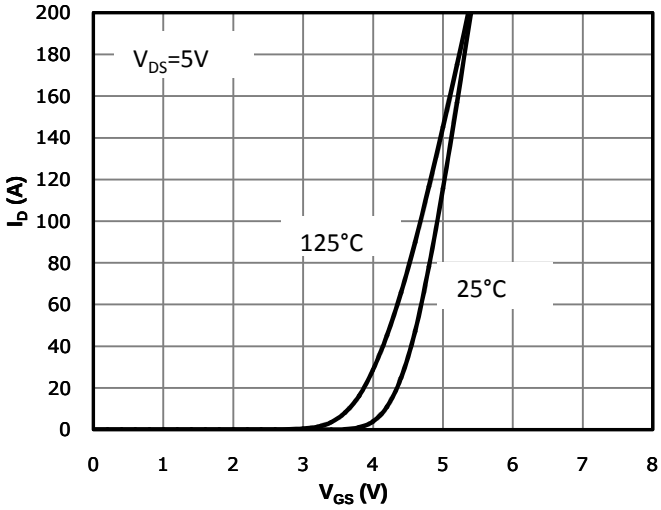


Fig 3: Rds(on) vs Drain Current and Gate Voltage

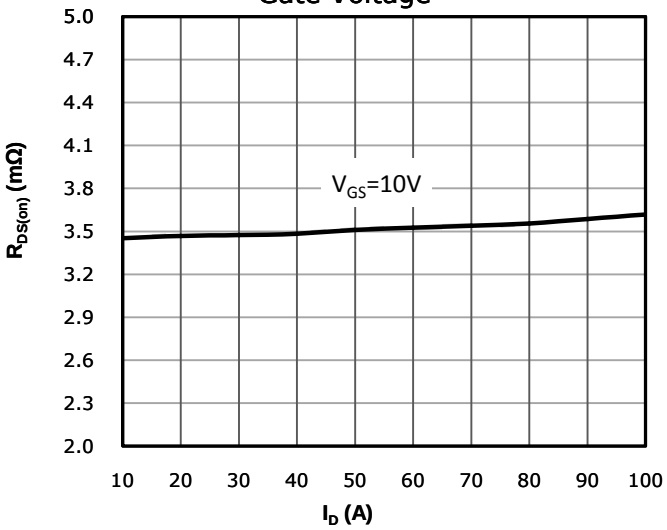


Fig 4: Rds(on) vs Gate Voltage

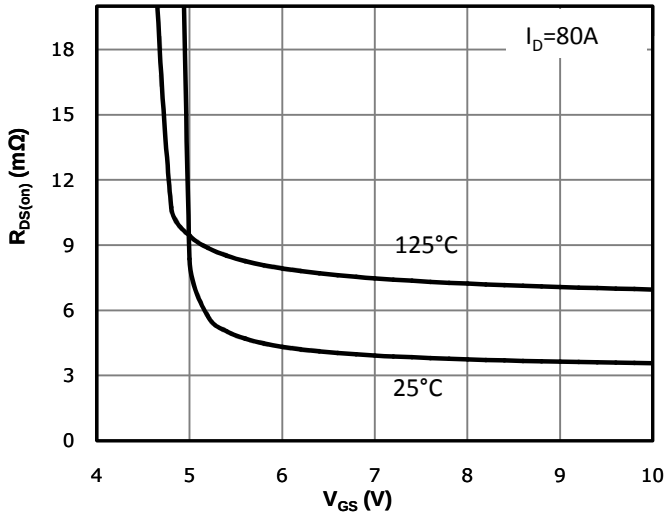


Fig 5: Rds(on) vs. Temperature

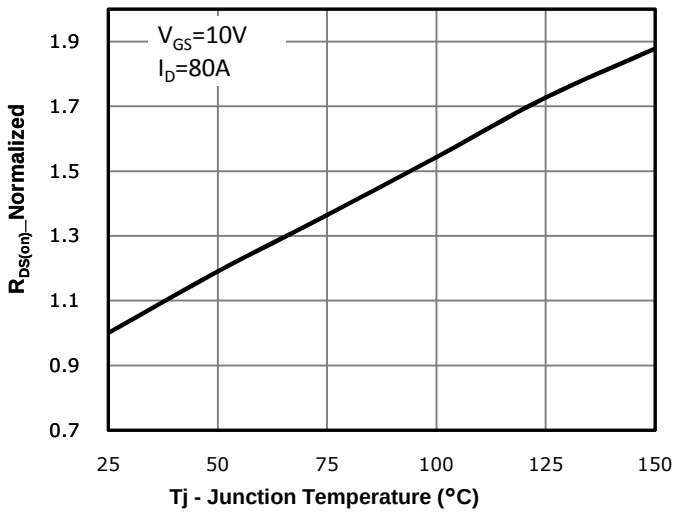


Fig 6: Capacitance Characteristics

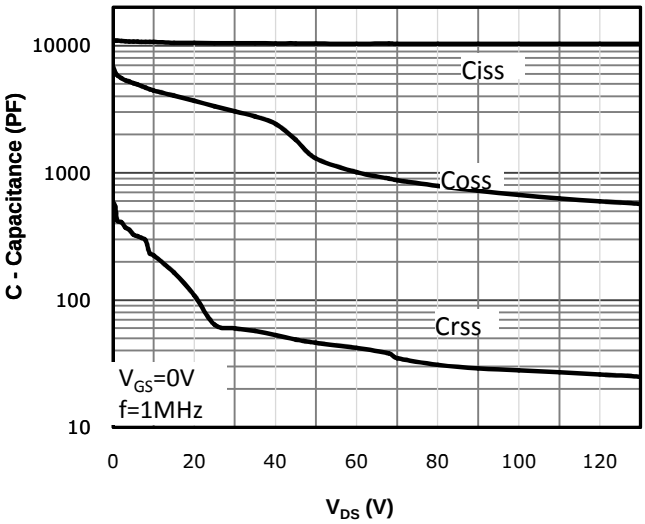


Fig 7: Gate Charge Characteristics

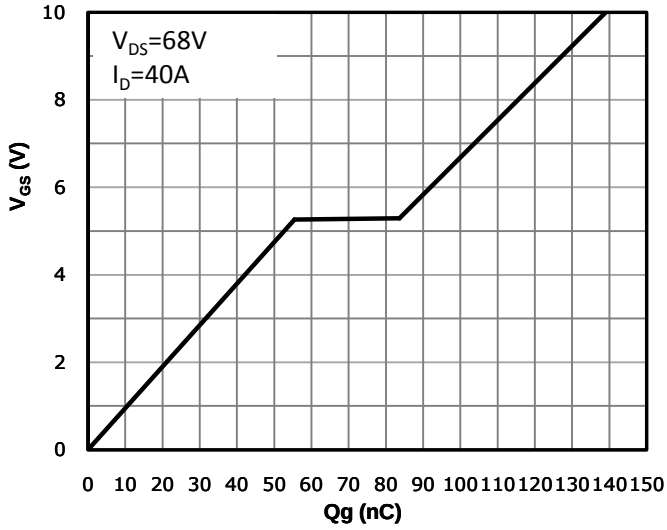


Fig 8: Body-diode Forward Characteristics

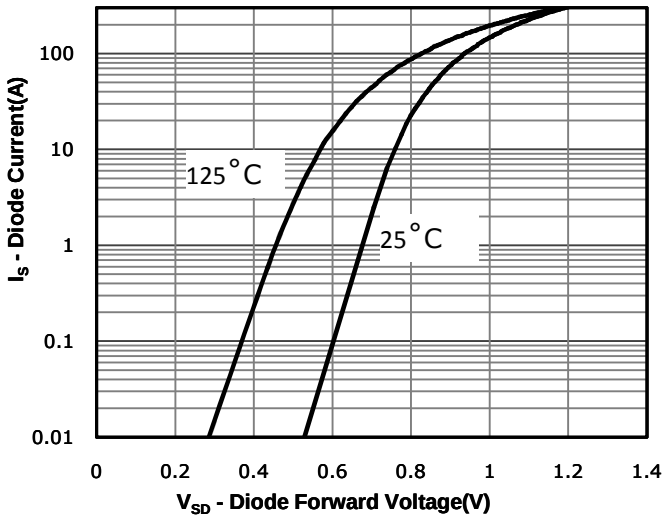


Fig 9: Power Dissipation

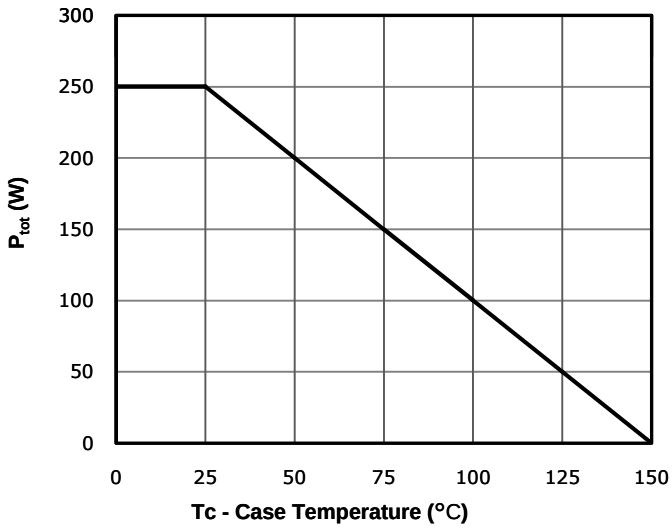


Fig 10: Drain Current Derating

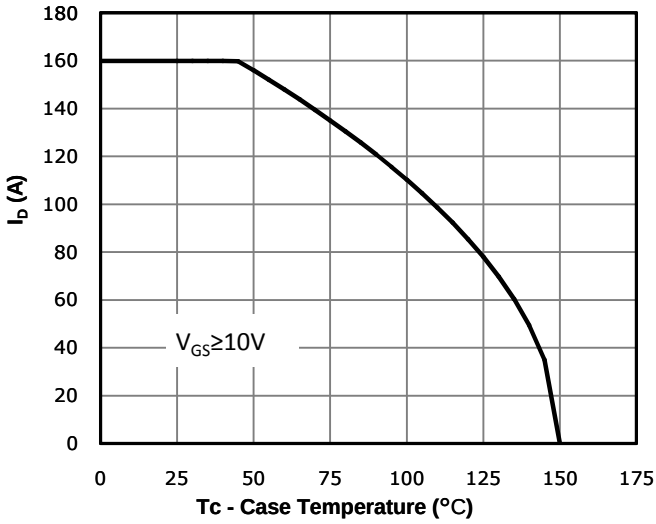


Fig 11: Safe Operating Area

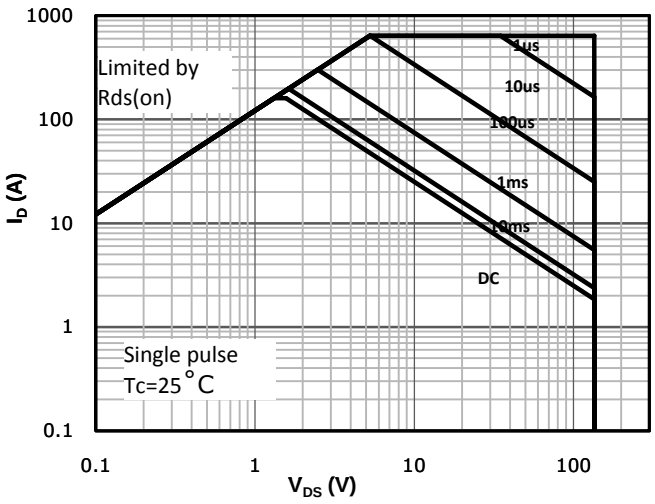
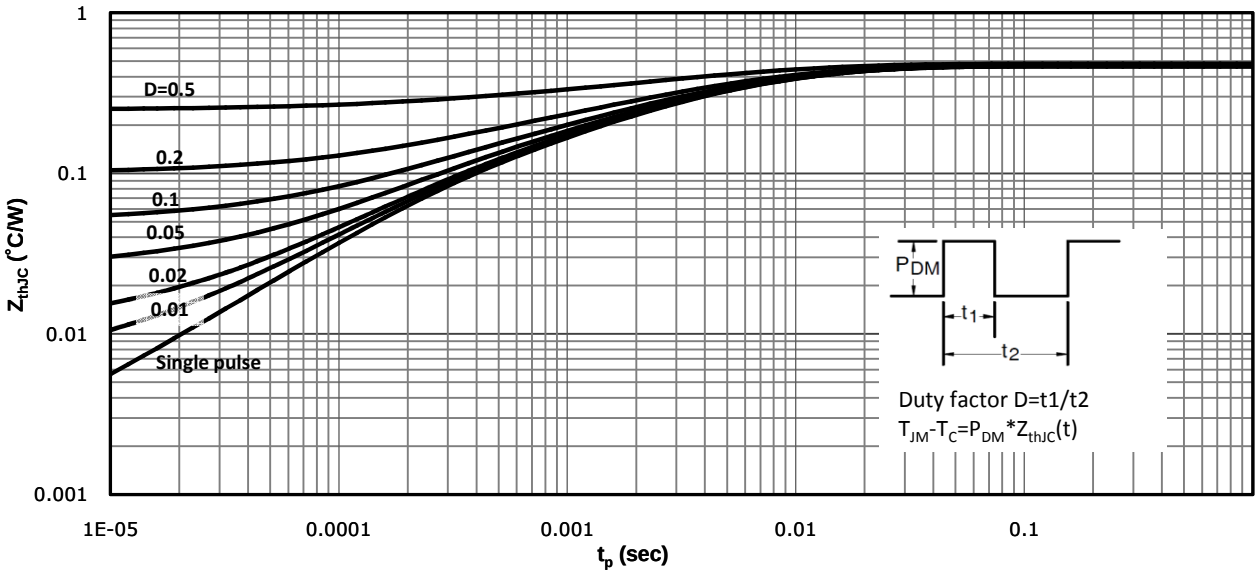
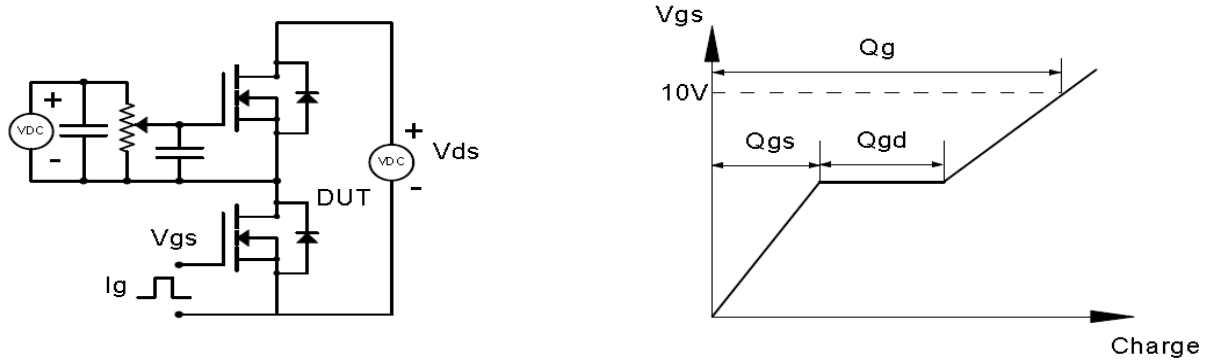


Fig 12: Max. Transient Thermal Impedance

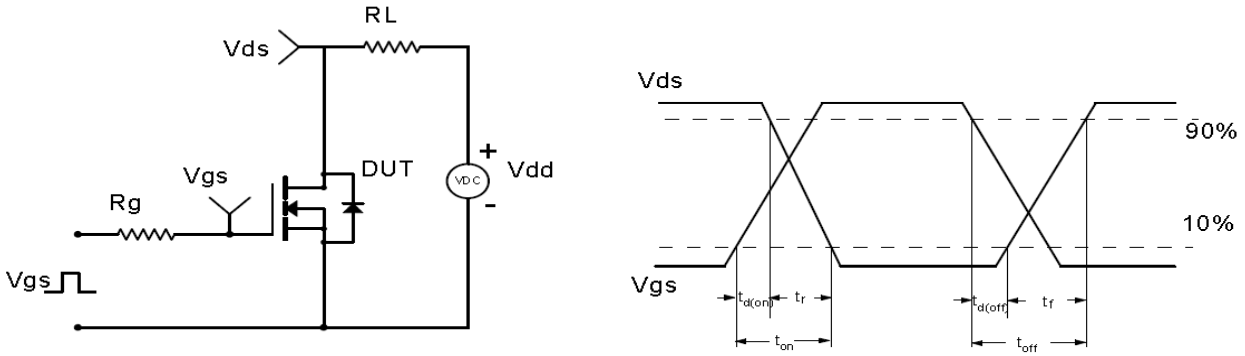


Test Circuit & Waveform

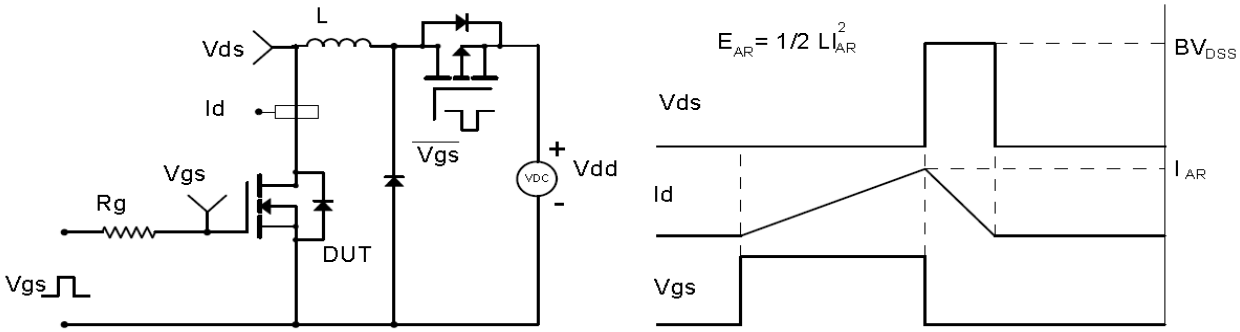
Gate Charge Test Circuit & Waveform



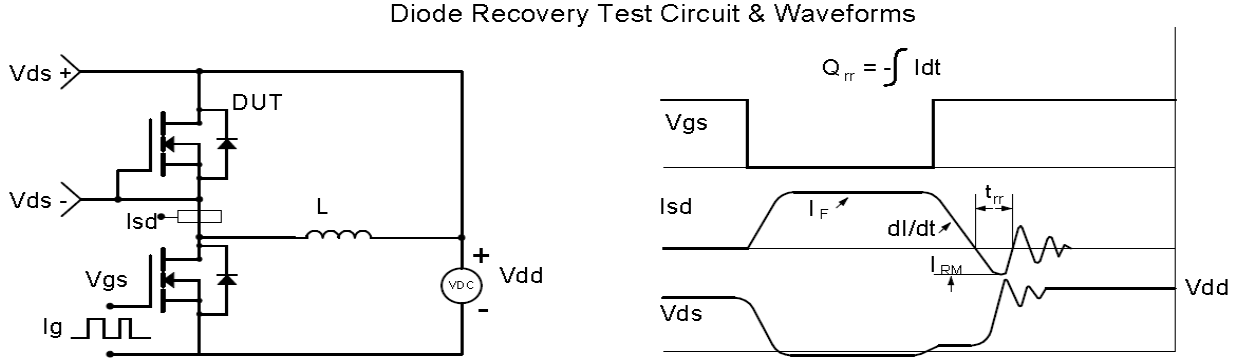
Resistive Switching Test Circuit & Waveforms



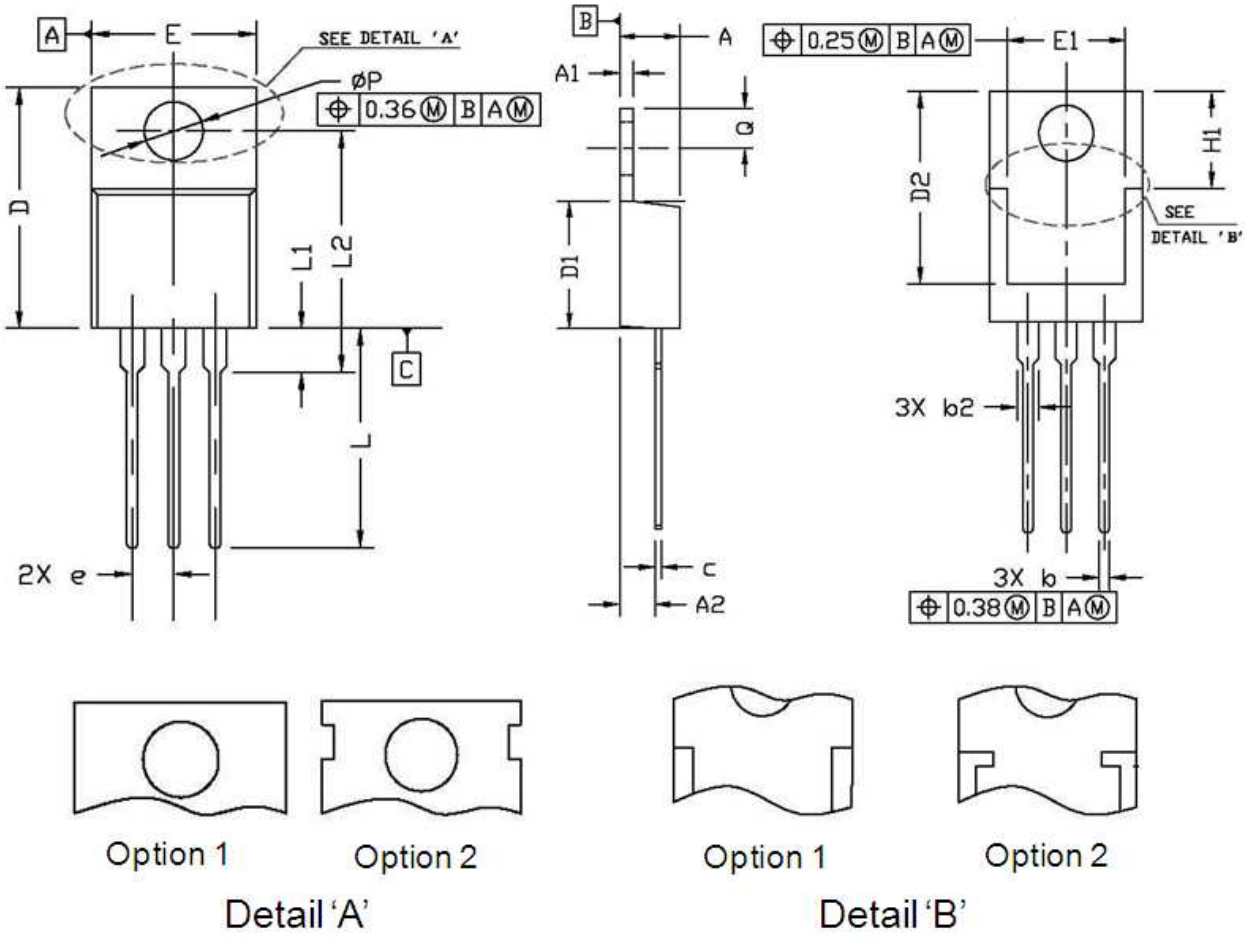
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

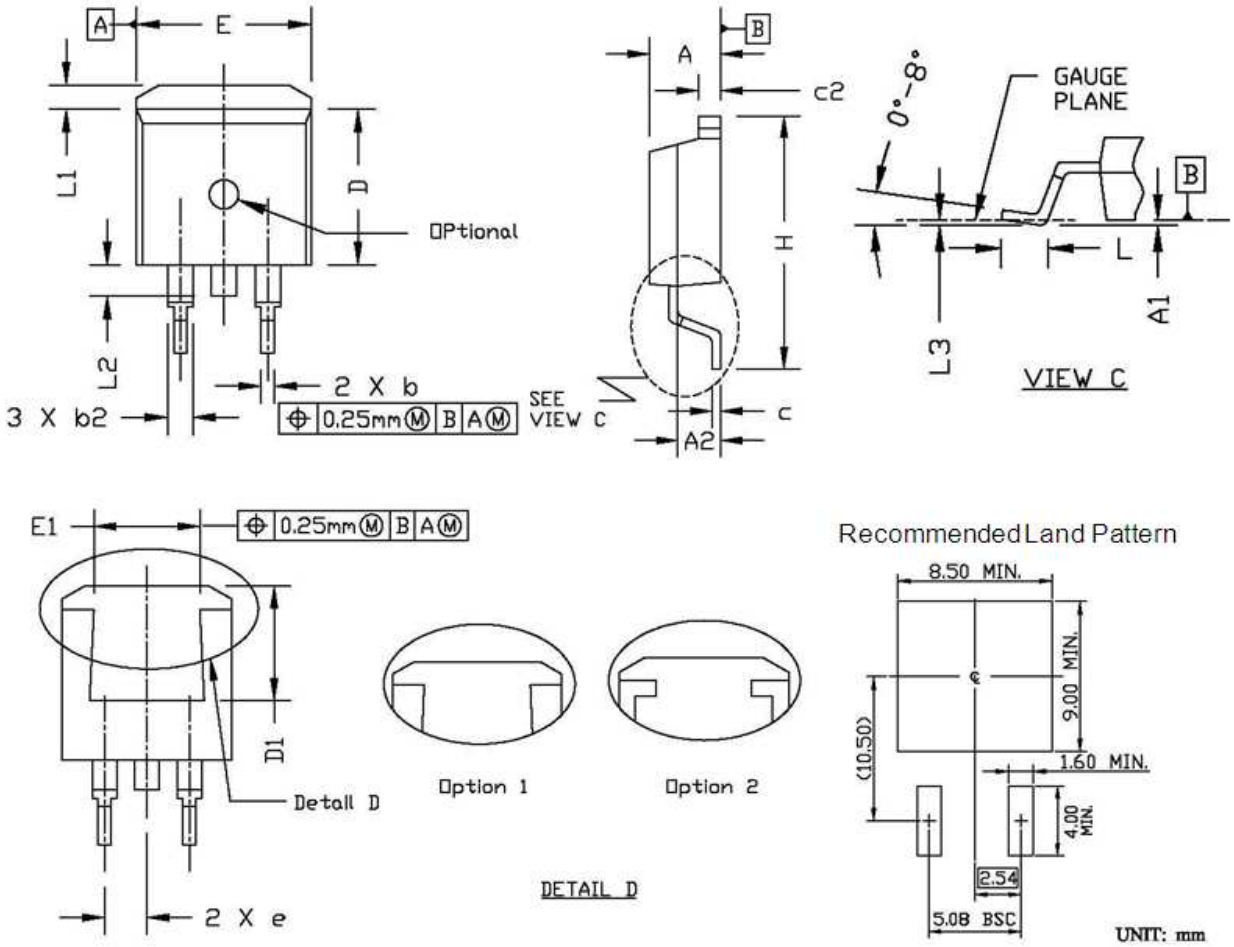


Package Outline: TO-220-3L



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	2019-01-25	preliminary version.
2.0	2019-06-04	Supplement package outline info.
3.0	2020-03-25	Update Id&Ron;

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.