CRSM056N04L2Q

SkyMOS2 N-MOSFET 40V, 4.4mΩ, 50A

Features

- Uses CRM(CQ) advanced SkyMOS2 technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent Q_gx$R_{DS(on)}$ product(FOM)
- AEC-Q101 Qualified

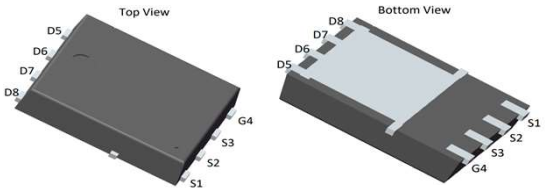
Product Summary

V_{DS}	40V
$R_{DS(on).typ}$	4.4mΩ
I_D	50A

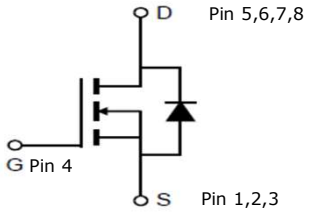
100% DVDS Tested
100% Avalanche Tested

Applications

- Motor control and drive
- Battery management System



CRSM056N04L2Q



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRSM056N04L2Q	056N04L2Q	PDFN5x6	Tape&reel	N/A	N/A	4000pcs

Absolute Maximum Ratings

Parameter	**Symbol**	**Value**	**Unit**
Drain-source voltage	V_{DS}	40	V
Continuous drain current T_C = 25°C (Silicon limit) T_C = 100°C (Silicon limit)	I_D	 80 60	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D\ pulse}$	200	A
Avalanche energy, single pulse (I_D = 25A, Rg=25Ω)[1]	E_{AS}	93	mJ
Gate-Source voltage	V_{GS}	±20	V
Power dissipation (T_C = 25°C)	P_{tot}	72	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+175	°C
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	Tsold	260	°C

※. Notes:
1.EAS is tested at starting Tj = 25℃, L = 0.3mH, IAS =25A, VGS = 10V.

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Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	R_{thJC}	2.10	°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						
Drain-source breakdown voltage	BV_{DSS}	40	-	-	V	V_{GS}=0V, I_D=250uA
		40	-	-	V	V_{GS}=0V, I_D=1mA
Gate threshold voltage	$V_{GS(th)}$	1.2	-	2.4	V	V_{DS}=V_{GS},I_D=250uA
Zero gate voltage drain current	I_{DSS}	- -	- -	1 100	μA	V_{DS}=40V,V_{GS}=0V T_j=25°C T_j=125°C
Gate-source leakage current	I_{GSS}	-	-	±100	nA	V_{GS}=±20V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	4.4 6.5	5.5 8.8	mΩ	VGS=10V, ID=40A VGS=4.5V, ID=35A
Transconductance	g_{fs}	-	92	-	S	V_{DS}=5V, I_D=40A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	1491	-	pF	VGS=0V, VDS=20V, f=1MHz
Output Capacitance	C_{oss}	-	537	-		
Reverse Transfer Capacitance	C_{rss}	-	16	-		
Gate Total Charge	Q_G	-	21	-	nC	VGS=10V, VDS=20V, ID=40A, f=1MHz
Gate-Source charge	Q_{gs}	-	4.6	-		
Gate-Drain charge	Q_{gd}	-	3.8	-		
Turn-on delay time	$t_{d(on)}$	-	14	-	ns	Vds=20V Id=40A Rg=3Ω Vgs=10V
Rise time	t_r	-	5	-		
Turn-off delay time	$t_{d(off)}$	-	36	-		
Fall time	t_f	-	5	-		
Gate resistance	R_G	-	1.5	-	Ω	V_{GS}=0V, V_{DS}=0V, f=1MHz

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Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Diode continous forward current	Is	-	-	50	A	Tc = 25°C
Diode pulse current	Is pulse	-	-	200	A	Tc = 25°C
Body Diode Forward Voltage	V_{SD}	-	0.84	1.4	V	V_{GS}=0V, I_{SD}=40A
Body Diode Reverse Recovery Time	t_{rr}	-	39	-	ns	I_F=40A,dI/dt=100A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	-	32	-	nC	

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Typical Performance Characteristics

Fig 1: Output Characteristics

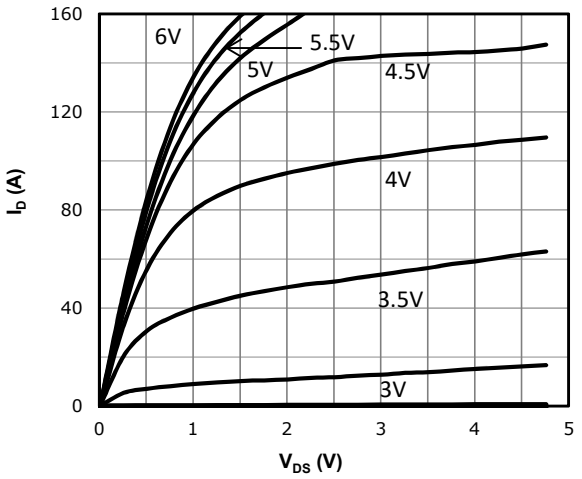


Fig 2: Transfer Characteristics

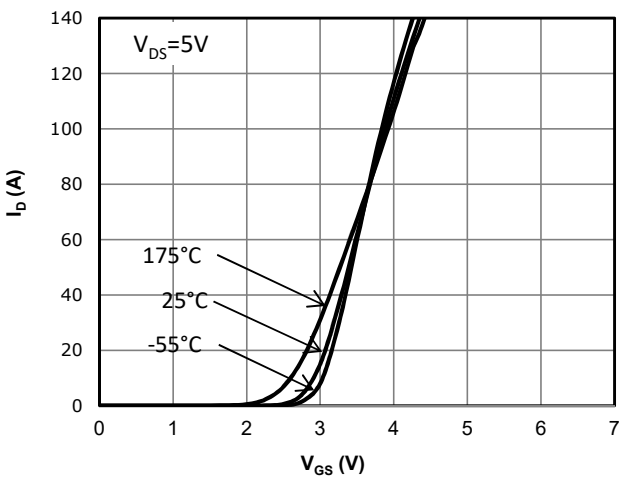


Fig 3: Rds(on) vs Drain Current and Gate Voltage

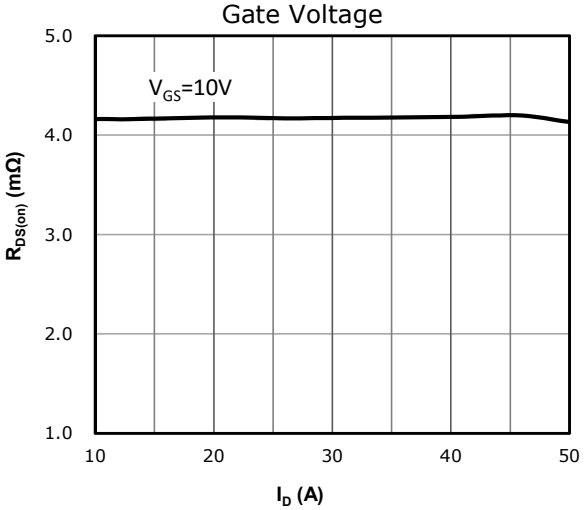


Fig 4: Rds(on) vs Gate Voltage

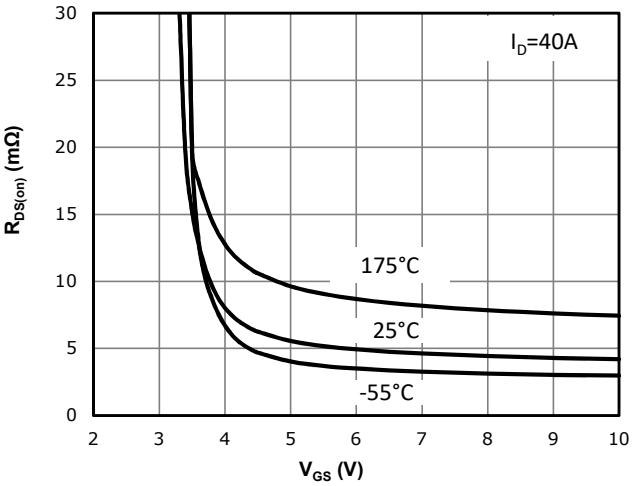


Fig 5: Rds(on) vs. Temperature

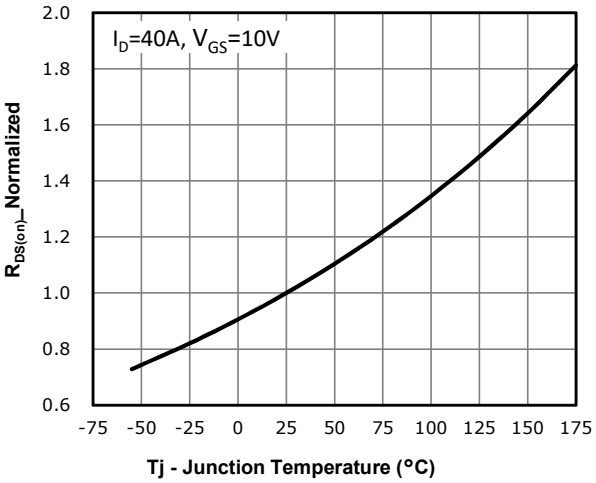
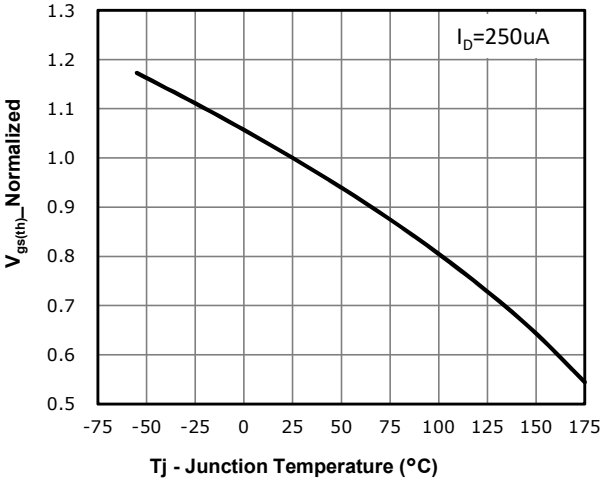


Fig 6: Vgs(th) vs. Temperature



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Fig 7: BVdss vs. Temperature

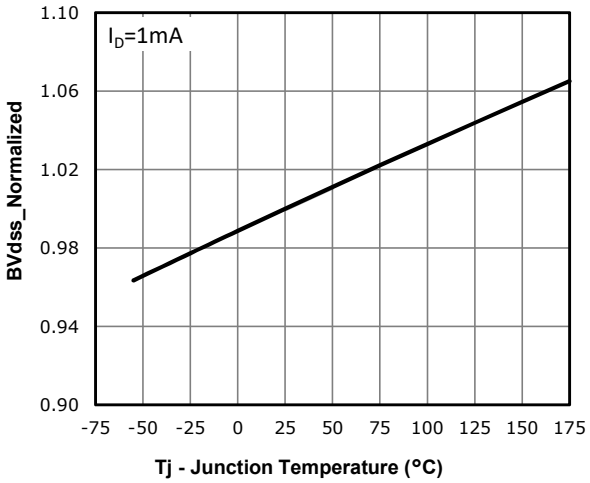


Fig 8: Capacitance Characteristics

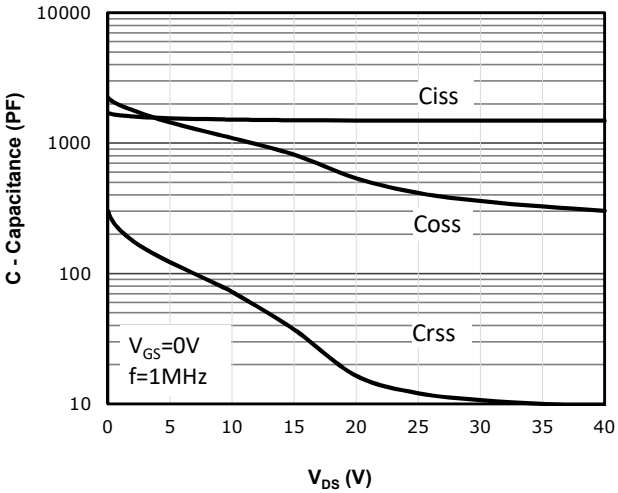


Fig 9: Gate Charge Characteristics

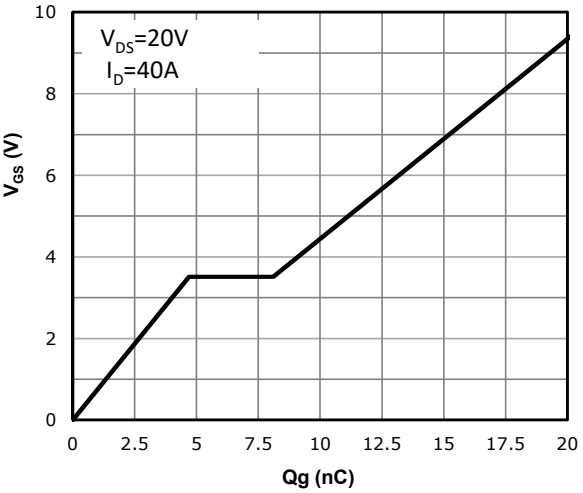


Fig 10: Body-diode Forward Characteristics

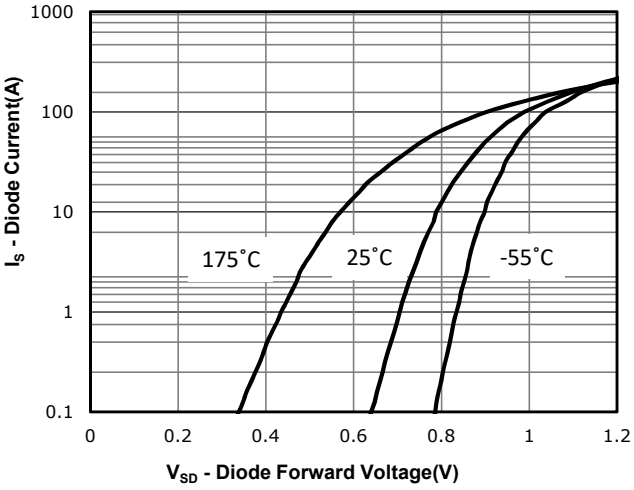


Fig 11: Power Dissipation

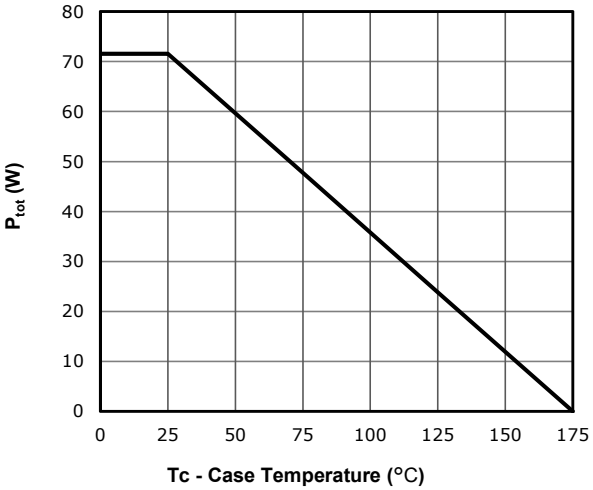
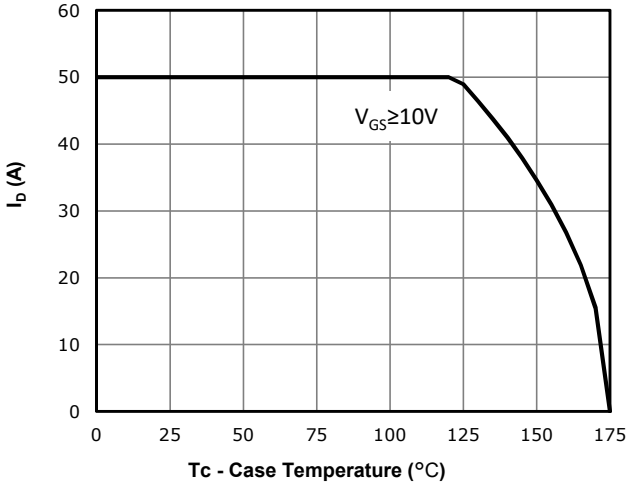


Fig 12: Drain Current Derating



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Fig 13: Safe Operating Area

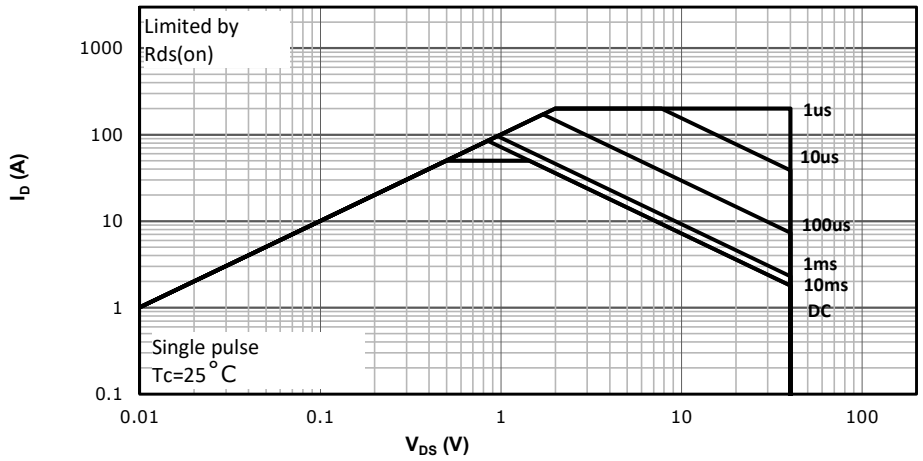
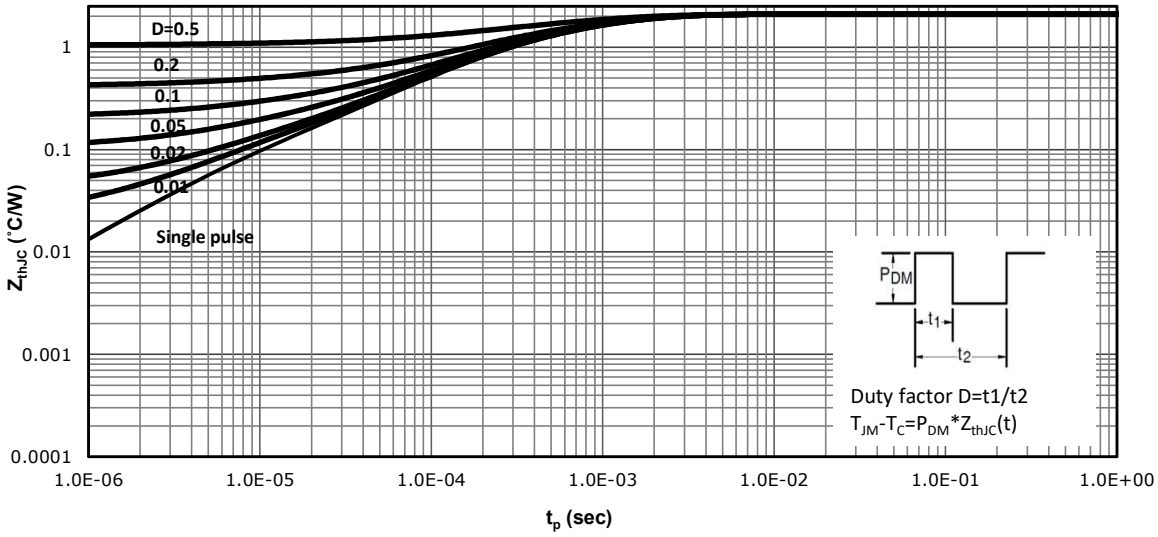


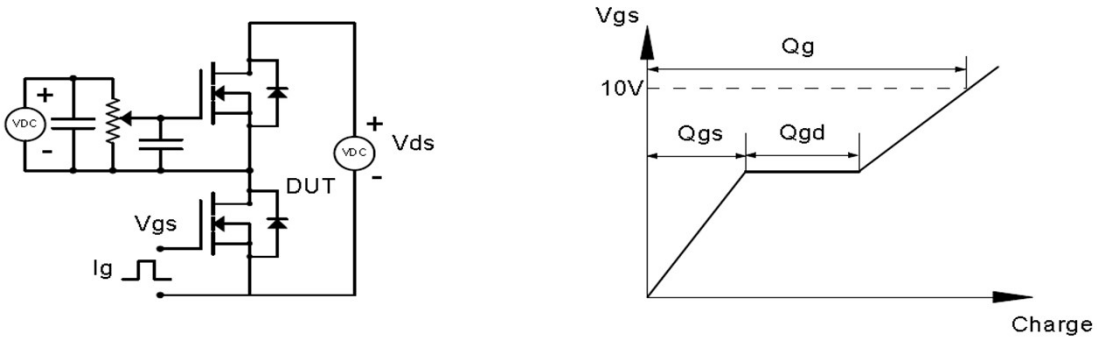
Fig 14: Max. Transient Thermal Impedance



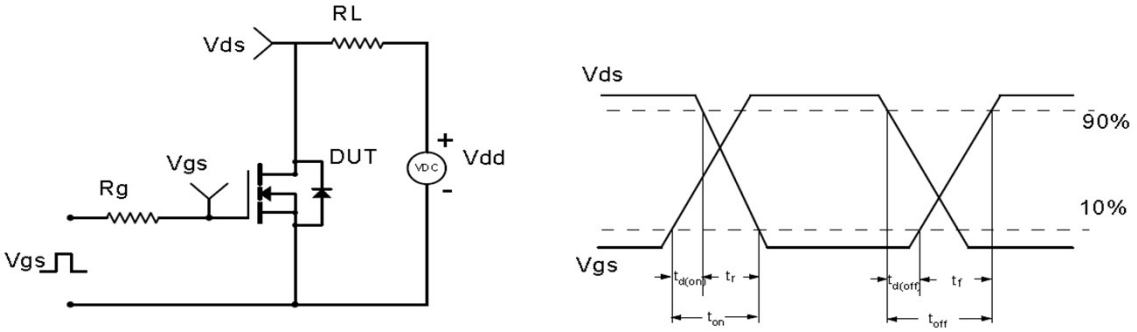
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Test Circuit & Waveform

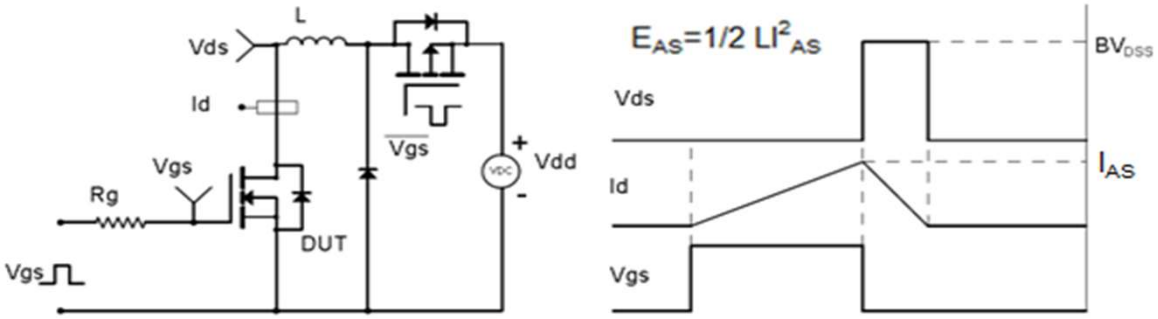
Gate Charge Test Circuit & Waveform



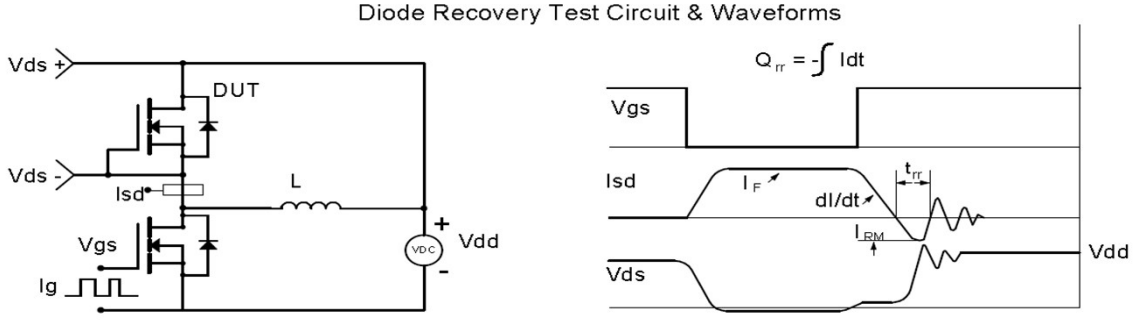
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

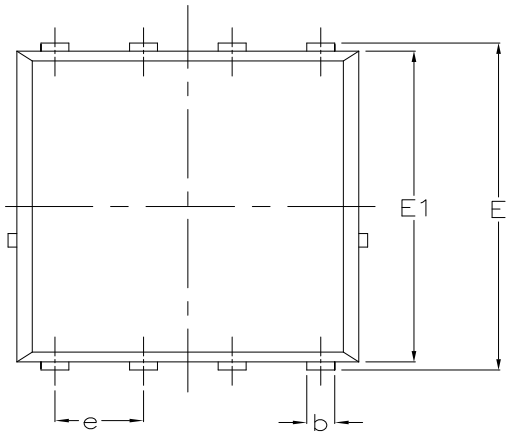


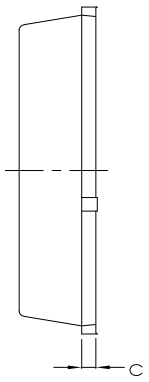
Diode Recovery Test Circuit & Waveforms

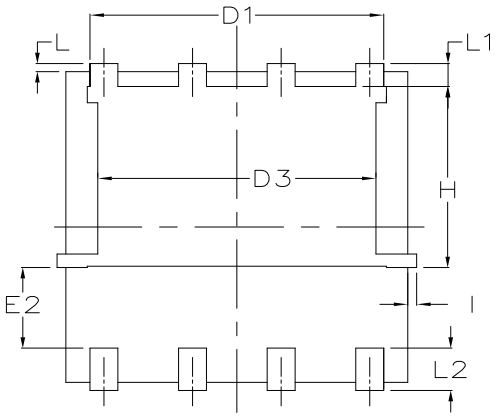


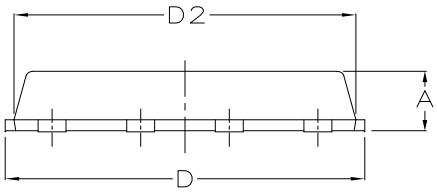
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Package Outline: PDFN5x6 Type P









Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	NOM.	Max.	Min.	NOM.	Max.
A	0.90	1.10	1.20	0.035	0.043	0.047
b	0.31	0.41	0.51	0.012	0.016	0.020
c	0.15	0.20	0.30	0.006	0.008	0.012
D	4.80	4.98	5.15	0.189	0.196	0.203
D1	3.91	4.22	4.36	0.154	0.166	0.172
D2	4.80	4.90	5.00	0.189	0.193	0.197
D3	3.85	4.00	4.15	0.152	0.157	0.163
E	5.90	6.05	6.15	0.232	0.238	0.242
E1	5.65	5.76	5.85	0.222	0.227	0.230
E2	1.10	-	-	0.043	-	-
e	1.27 BSC			0.050 BSC		
L	0.05	0.15	0.25	0.002	0.006	0.010
L1	0.38	0.43	0.50	0.015	0.017	0.020
L2	0.51	0.79	0.86	0.020	0.031	0.034
H	3.25	3.35	3.58	0.128	0.132	0.141
I	0.00	-	0.18	0.000	-	0.007

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Marking



NOTE:
XAAAAAAA-Y
X —Assembly location code
AAAAAAA —Assembly lot NO.last 7digits
Y —Bin code

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Revision History

Revision	Date	Major changes
1.0	2023/7/24	Release of Preliminary version.
2.0	2023/11/3	Update Package Outline.
2.1	2024/1/12	Update top and bottom view picture.
3.0	2024/3/8	Update Fig12/13,Add Is /Is pulse.
3.1	2024/3/16	1.Delete package limit. 2.Update Package name 3.Delete Dynamic Characteristic parameters spec

Disclaimer

CRM reserves the right to change any product or information in this Specification at any time without prior notice.

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