

Features

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

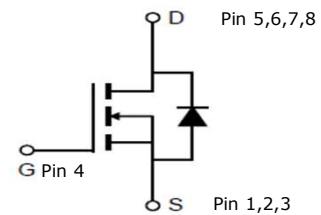
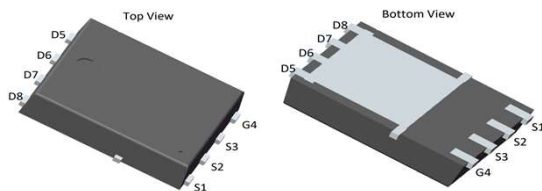
Applications

- Motor control and drive
- Battery management System

Product Summary

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

100% DVDS Tested
100% Avalanche Tested



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

※. Notes:

1.EAS is tested at starting $T_j = 25^\circ\text{C}$, $L = 0.3\text{mH}$, $I_{AS} = 25\text{A}$, $V_{GS} = 10\text{V}$.

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 $T_j = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

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

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	40	-	-	V	$V_{GS}=0V, I_D=250\mu A$
		40	-	-	V	$V_{GS}=0V, I_D=1mA$
Gate threshold voltage	$V_{GS(th)}$	1.2	-	2.4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=40V, V_{GS}=0V$ $T_j=25^{\circ}\text{C}$
		-	-	100		$T_j=125^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	4.4	5.5	mΩ	$V_{GS}=10V, I_D=40A$
			6.5	8.8		$V_{GS}=4.5V, I_D=35A$
Transconductance	g_{fs}	-	92	-	S	$V_{DS}=5V, I_D=40A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	1491	-	pF	$V_{GS}=0V, V_{DS}=20V,$ $f=1MHz$
Output Capacitance	C_{oss}	-	537	-		
Reverse Transfer Capacitance	C_{rss}	-	16	-		
Gate Total Charge	Q_G	-	21	-	nC	$V_{GS}=10V, V_{DS}=20V,$ $I_D=40A, f=1MHz$
Gate-Source charge	Q_{gs}	-	4.6	-		
Gate-Drain charge	Q_{gd}	-	3.8	-		
Turn-on delay time	$t_{d(on)}$	-	14	-	ns	$V_{DS}=20V, I_D=40A$ $R_g=3\Omega, V_{GS}=10V$
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	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Diode continuous forward current	I_S	-	-	50	A	$T_C = 25^{\circ}\text{C}$
Diode pulse current	I_S pulse	-	-	200	A	$T_C = 25^{\circ}\text{C}$
Body Diode Forward Voltage	V_{SD}	-	0.84	1.4	V	$V_{GS}=0\text{V}, I_{SD}=40\text{A}$
Body Diode Reverse Recovery Time	t_{rr}	-	39	-	ns	$I_F=40\text{A}, dI/dt=100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{rr}	-	32	-	nC	

Typical Performance Characteristics

Fig 1: Output Characteristics

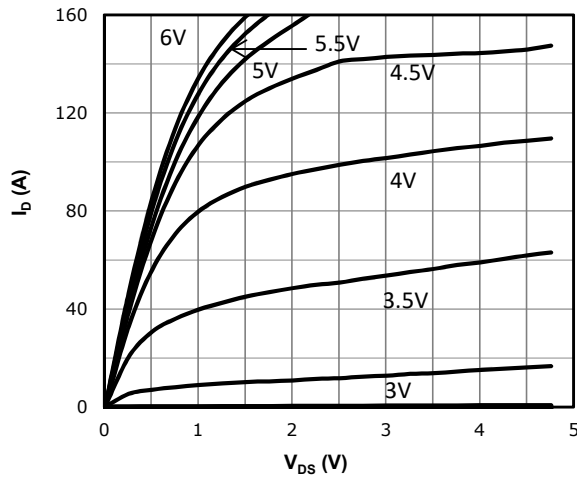


Fig 2: Transfer Characteristics

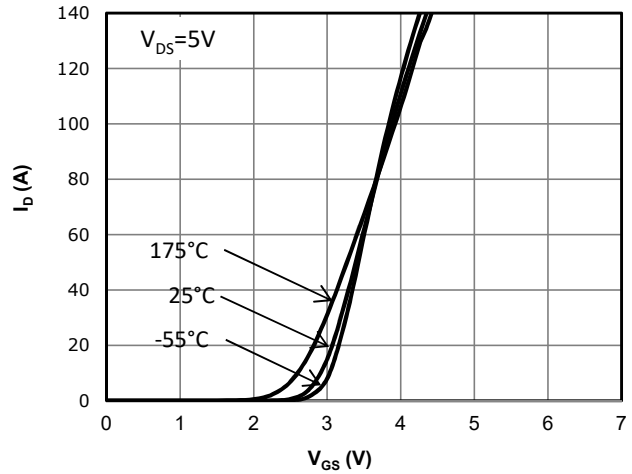


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

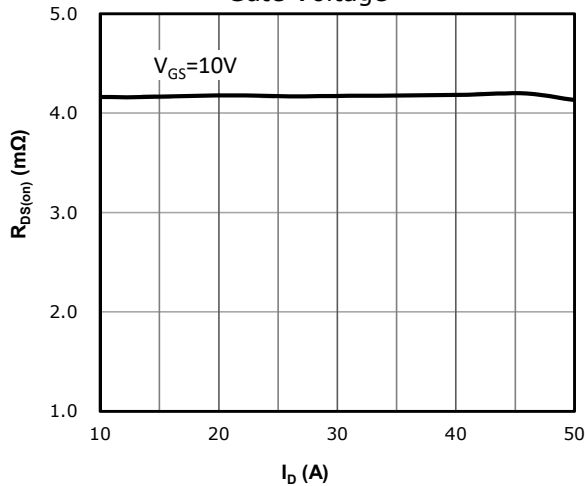


Fig 4: $R_{DS(on)}$ vs Gate Voltage

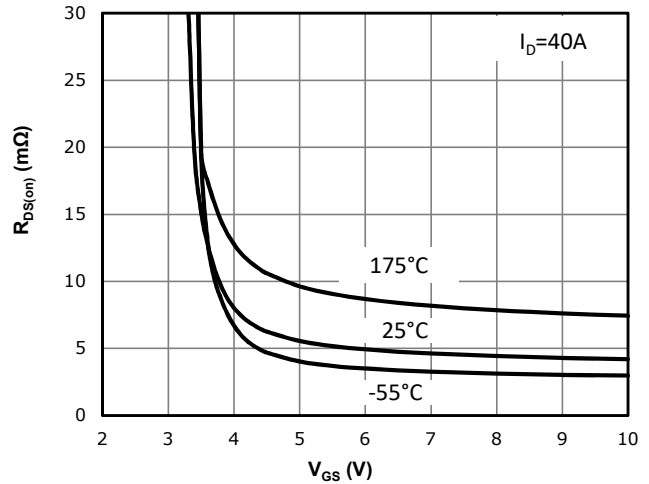


Fig 5: $R_{DS(on)}$ vs. Temperature

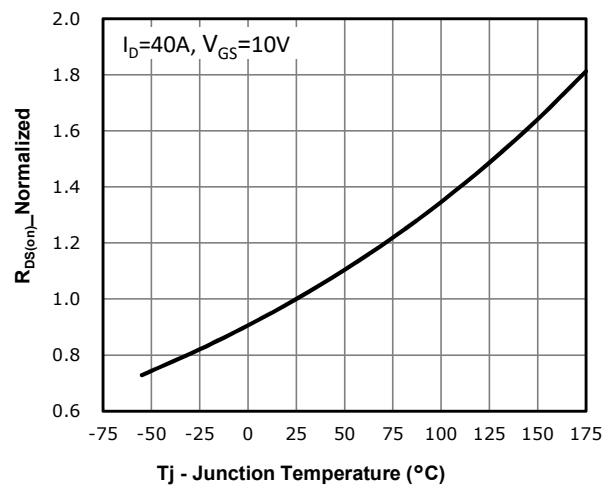


Fig 6: $V_{GS(th)}$ vs. Temperature

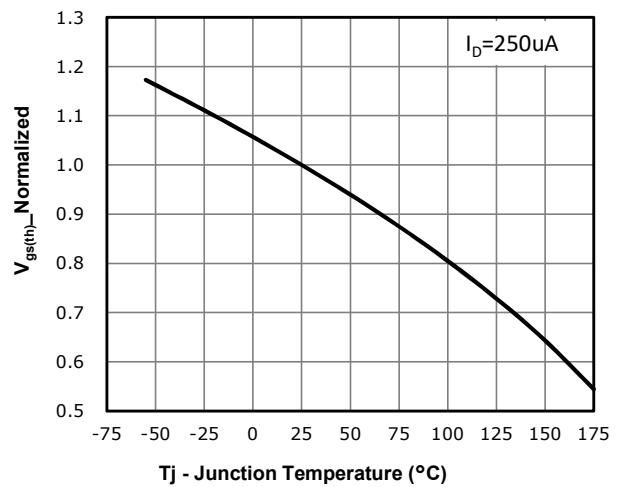


Fig 7: BVdss vs. Temperature

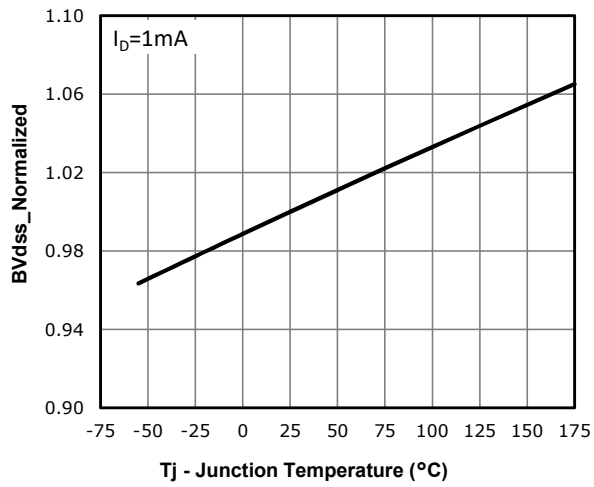


Fig 8: Capacitance Characteristics

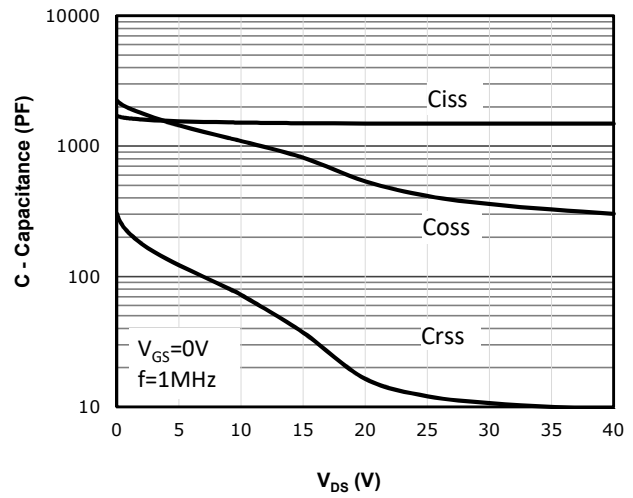


Fig 9: Gate Charge Characteristics

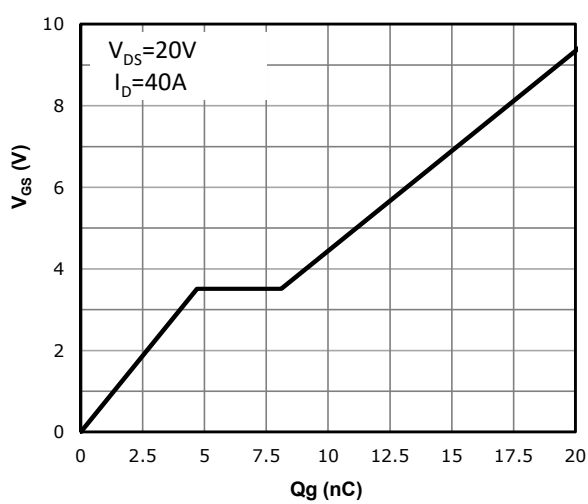


Fig 10: Body-diode Forward Characteristics

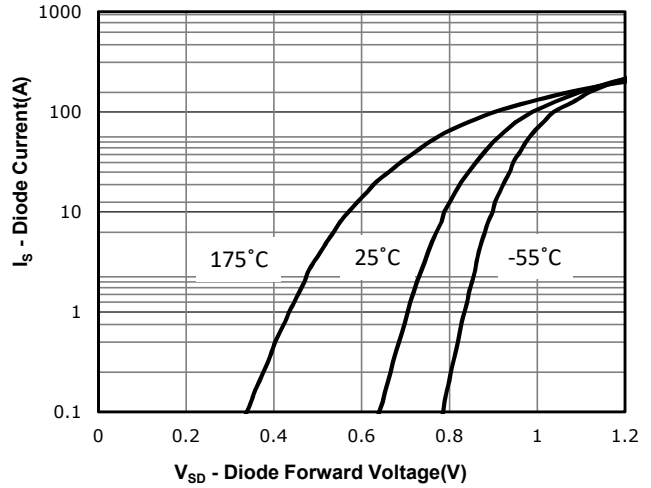


Fig 11: Power Dissipation

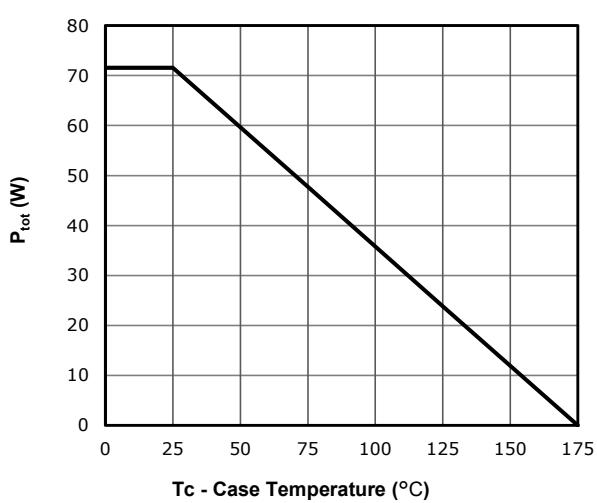


Fig 12: Drain Current Derating

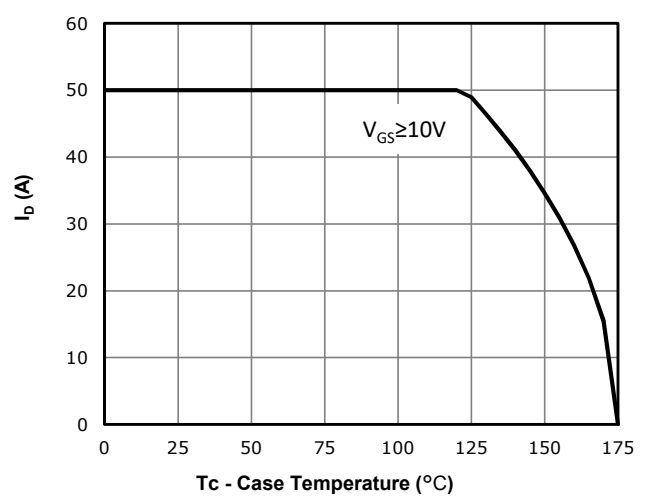


Fig 13: Safe Operating Area

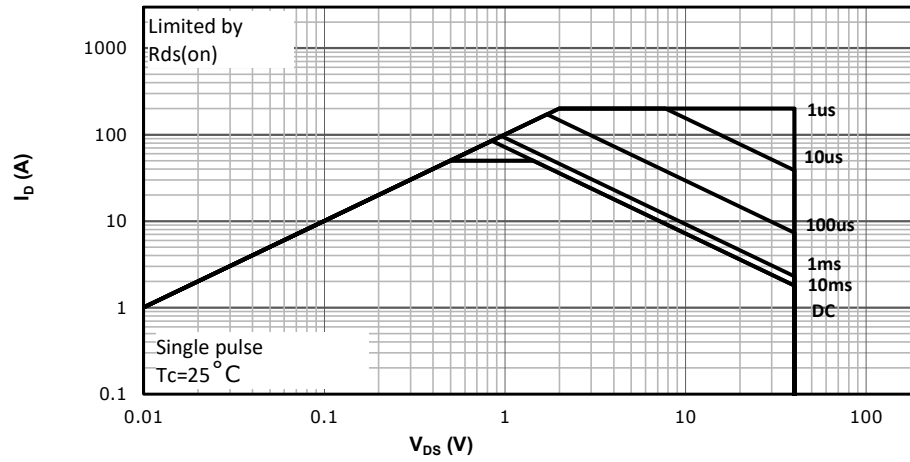
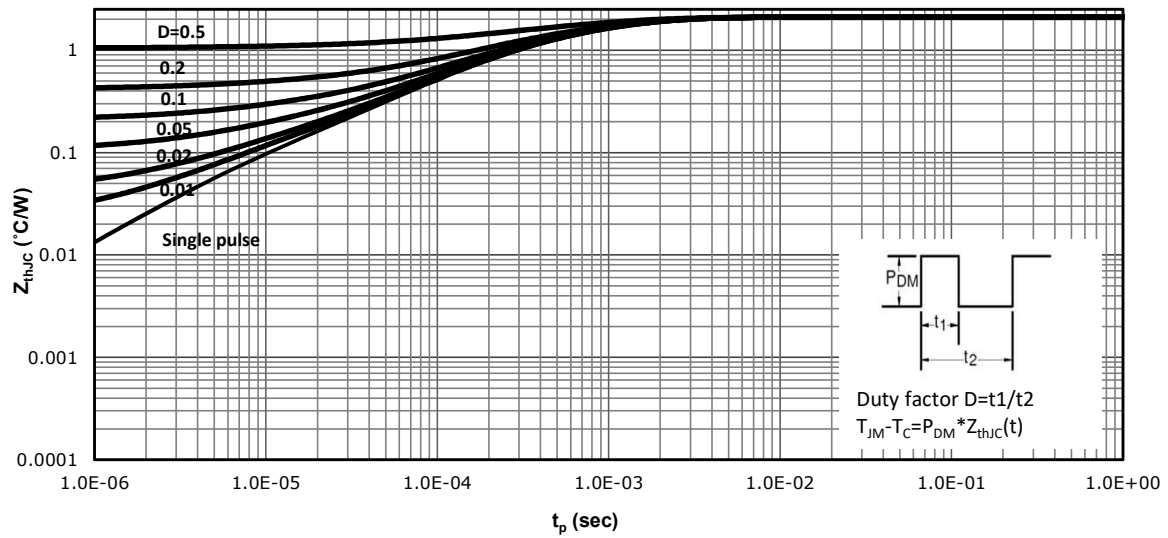
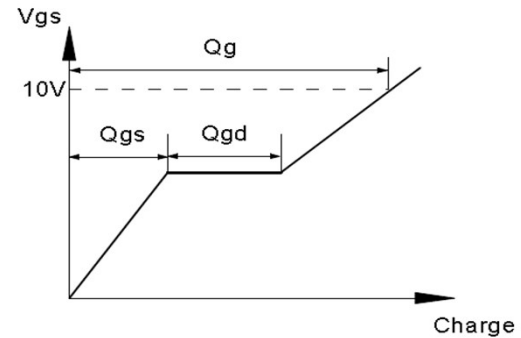
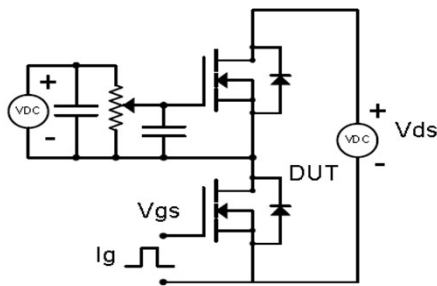


Fig 14: Max. Transient Thermal Impedance

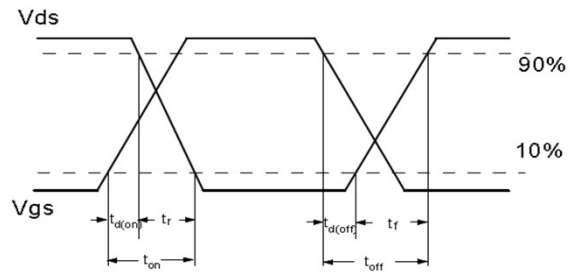
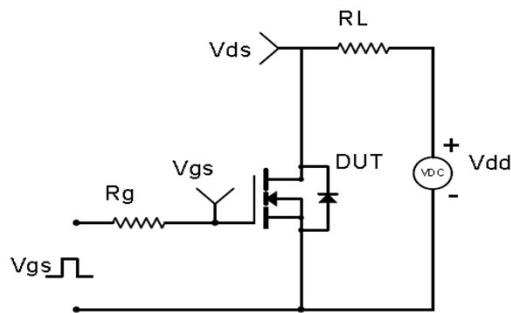


Test Circuit & Waveform

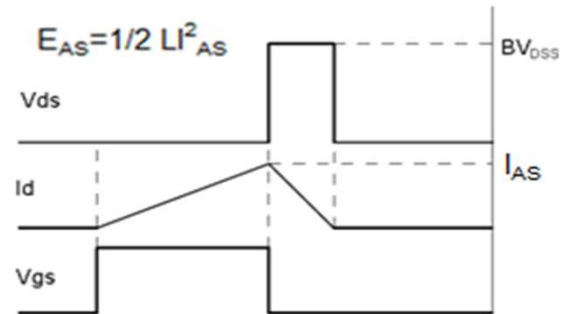
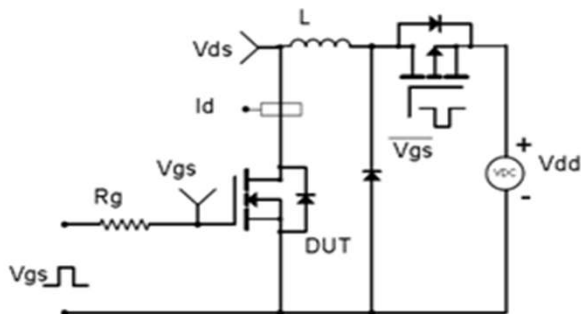
Gate Charge Test Circuit & Waveform



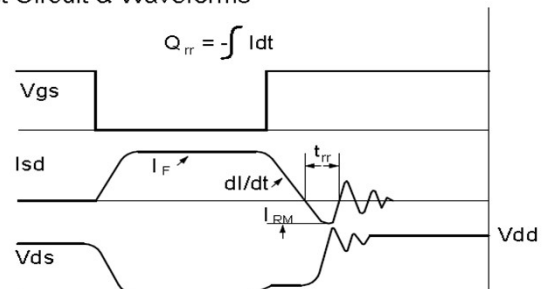
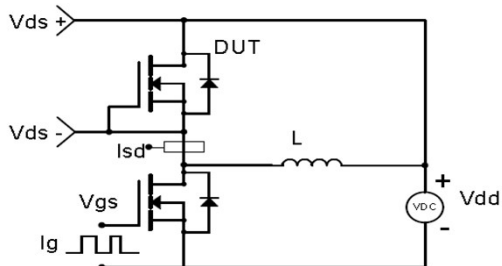
Resistive Switching Test Circuit & Waveforms



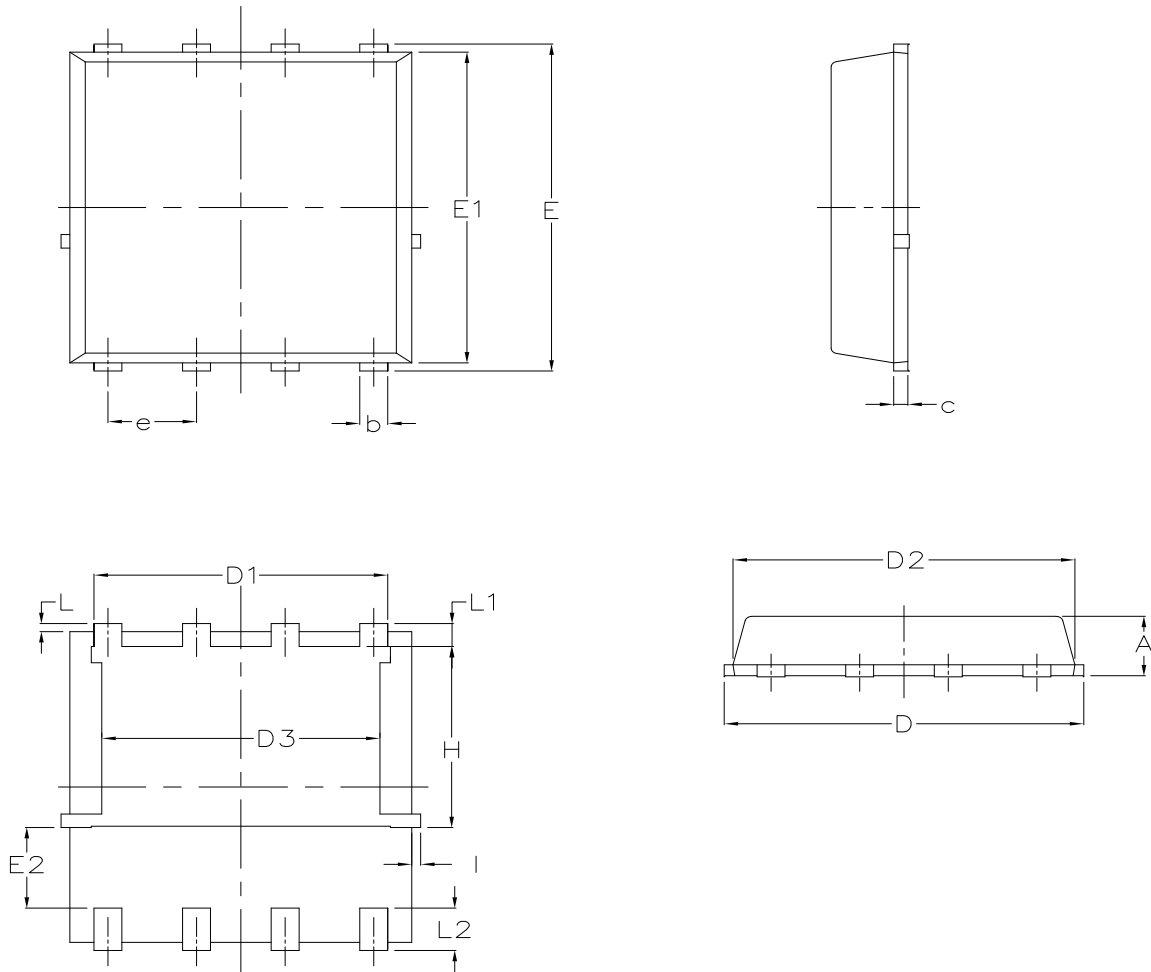
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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

Marking**NOTE:**

XAAAAAAAA-Y

X —Assembly location code

AAAAAAA —Assembly lot NO.last 7digits

Y —Bin code

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

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