

Features

- Uses CRM(CQ) advanced Trench technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g \times R_{DS(on)}$ product(FOM)
- Complementary N-ch and P-ch MOSFET

Product Summary

Symbol	N-Ch	P-Ch
V_{DS}	30V	-30V
$R_{DS(on)}$ typ.	15.5m Ω	14m Ω
I_D	13A	-14A

Applications

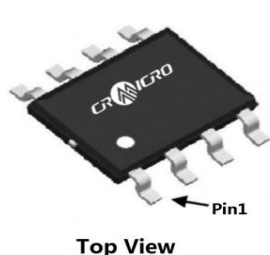
- Motor drive

100% DVDS Tested

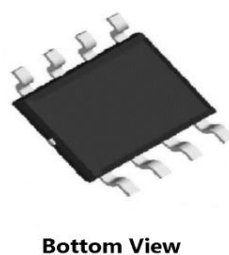
100% Avalanche Tested



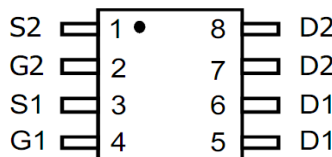
SOP-8



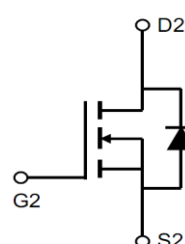
Top View



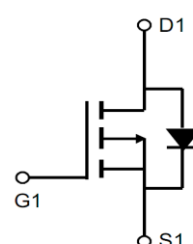
Bottom View



Top View



n-channel



p-channel

Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRMM4612C	CRMM4612C	SOP-8	Taping	N/A	N/A	4000pcs

Absolute Maximum Ratings

Parameter	Symbol	Maximum		Unit
		N-Ch	P-Ch	
Drain-source voltage	V_{DS}	30	-30	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Silicon limit)	I_D	13	-14	A
Continuous drain current $T_C = 25^\circ\text{C}$ (Package limit)	I_D	13	-14	A
Pulsed drain current ($T_C = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D \text{ pulse}}$	52	-55	A
Avalanche energy, single pulse ($L=0.5\text{mH}$, $R_g=25\Omega$)	E_{AS}	89	167	mJ
Gate-Source voltage	V_{GS}	± 20	± 20	V
Power dissipation ($T_C = 25^\circ\text{C}$)	P_{tot}	3.2	3.2	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+150		$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Typ	Max	Unit
Thermal resistance, junction-to-Lead.	R_{thJL}	28.0	39.2	°C/W
SMD version, device on PCB ¹	R_{thJA}	76.0	91.2	°C/W
Thermal resistance, junction – ambient(min. footprint)				

NOTE:

1.The value of R_{thJA} is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design.

N-Channel Electrical Characteristic (at $T_j = 25^{\circ}\text{C}$, unless otherwise specified)

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

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	30	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	1	1.5	2	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	0.08	1	μA	$V_{DS}=30V, V_{GS}=0V$ $T_j=25^{\circ}\text{C}$
		-	-	5		$T_j=125^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	± 10	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	20.0	24.0		$V_{GS}=4.5V, I_D=5A$
		-	15.5	18.6		$V_{GS}=10V, I_D=5A$
Transconductance	g_{fs}	-	25	-	S	$V_{DS}=5V, I_D=10A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	605	-	pF	$V_{GS}=0V, V_{DS}=30V, f=1\text{MHz}$
Output Capacitance	C_{oss}	-	70	-		
Reverse Transfer Capacitance	C_{rss}	-	57	-		
Gate Total Charge	Q_G	-	14.1	-	nC	$V_{GS}=10V, V_{DS}=30V,$ $I_D=5A, f=1\text{MHz}$
Gate-Source charge	Q_{gs}	-	2.5	-		
Gate-Drain charge	Q_{gd}	-	3.4	-		
Turn-on delay time	$t_{d(on)}$	-	5.4	-	ns	$V_{GS}=10V, V_{DD}=15V,$ $R_{G_ext}=2.7\Omega, I_D=5A$
Rise time	t_r	-	17.6	-		
Turn-off delay time	$t_{d(off)}$	-	18.4	-		
Fall time	t_f	-	18.2	-		
Gate resistance	R_G	-	2.8	-	Ω	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	0.88	1.20	V	$V_{GS}=0V, I_{SD}=10A$
Body Diode Reverse Recovery Time	t_{rr}	-	8.7	-	ns	$I_F=5A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	2.5	-	nC	

N-Channel Typical Performance Characteristics

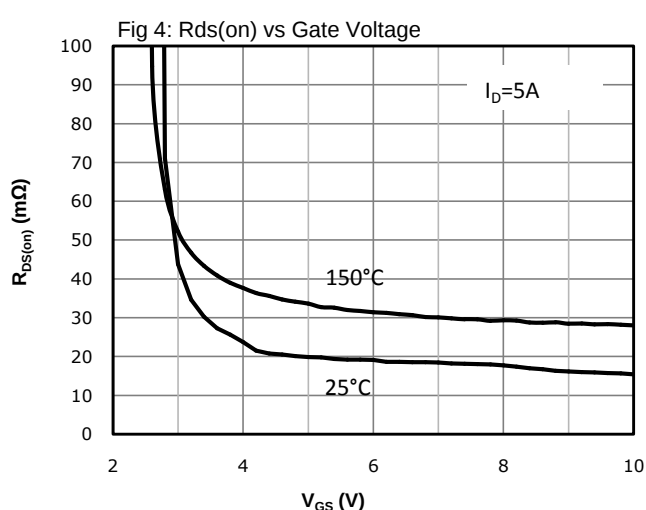
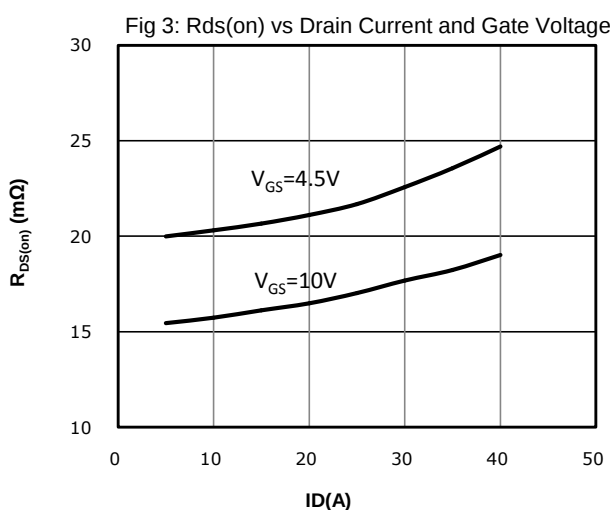
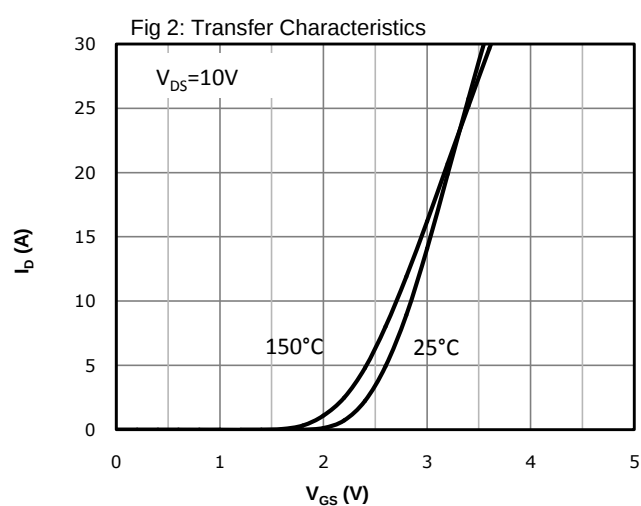
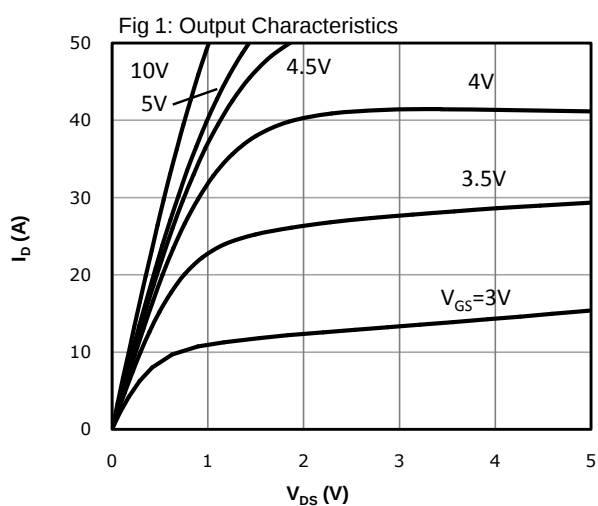


Fig 5: $R_{ds(on)}$ vs. Temperature

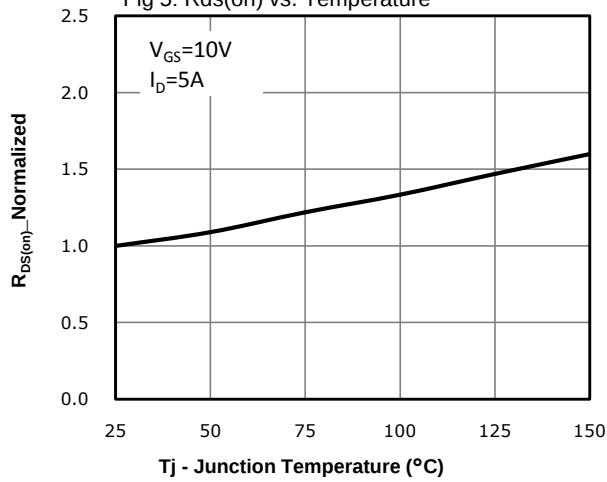


Fig 6: Capacitance Characteristics

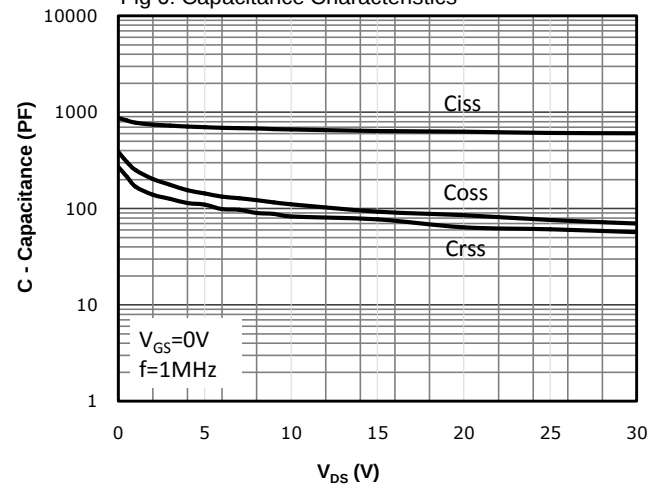


Fig 7: Gate Charge Characteristics

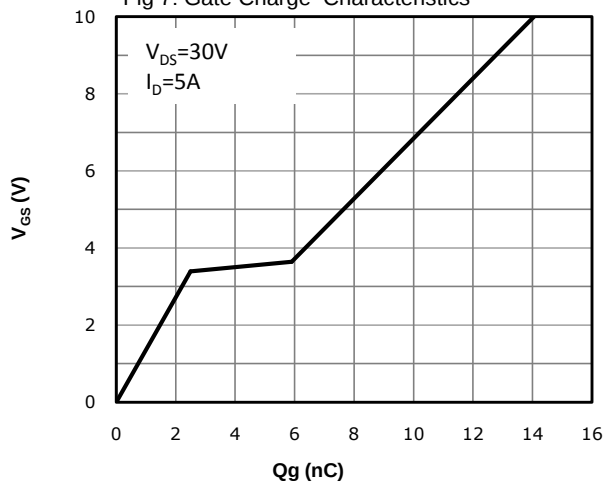


Fig 8: Body-diode Forward Characteristics

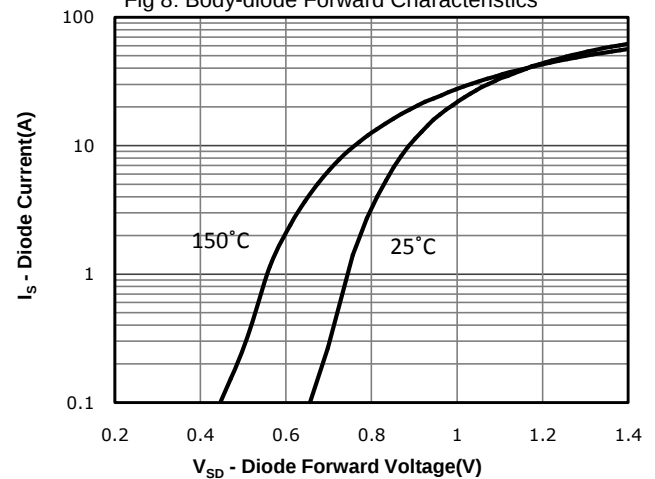


Fig 9: Safe Operating Area

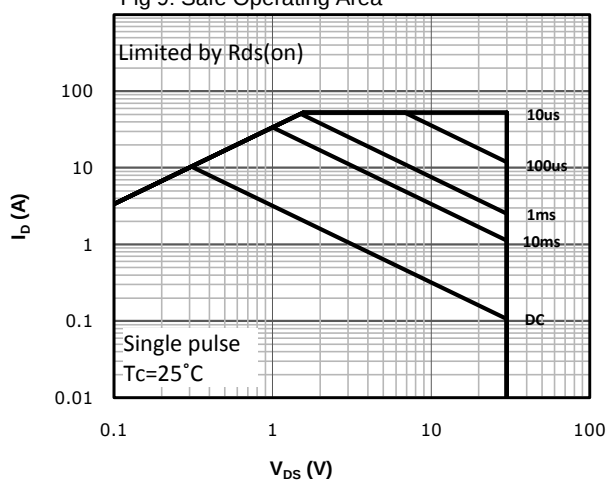
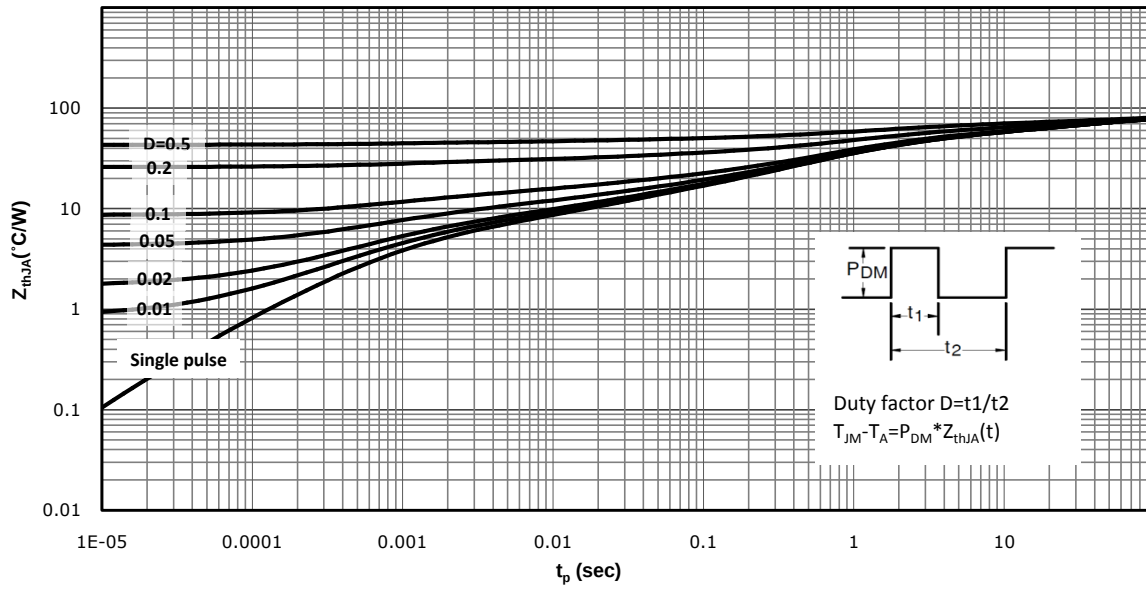


Fig 10: Max. Transient Thermal Impedance



P-Channel Electrical Characteristic (at $T_j = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV _{DSS}	-30	-	-	V	V _{GS} =0V, I _D =-250uA
Gate threshold voltage	V _{GS(th)}	-0.9	-1.4	-2	V	V _{DS} =V _{GS} , I _D =-250uA
Zero gate voltage drain current	I _{DSS}	-	-0.08	-1	μA	V _{DS} =-30V, V _{GS} =0V T _j =25°C 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)}	-	18.0	21.6		V _{GS} =-4.5V, I _D =-5A
		-	14.0	16.8		V _{GS} =-10V, I _D =-5A
Transconductance	g _{fs}	-	35.3	-	S	V _{DS} =-5V, I _D =-10A
Dynamic Characteristic						
Input Capacitance	C _{iss}	-	2509	-	pF	V _{GS} =0V, V _{DS} =-30V, f=1MHz
Output Capacitance	C _{oss}	-	261	-		
Reverse Transfer Capacitance	C _{rss}	-	155	-		
Gate Total Charge	Q _G	-	56.8	-	nC	V _{GS} =-10V, V _{DS} =-30V, I _D =-10A, f=1MHz
Gate-Source charge	Q _{gs}	-	7.4	-		
Gate-Drain charge	Q _{gd}	-	14.8	-		
Turn-on delay time	t _{d(on)}	-	9.2	-	ns	V _{GS} =-10V, V _{DD} =-15V, R _{G_ext} =2.7Ω, ID=-5A
Rise time	t _r	-	22.6	-		
Turn-off delay time	t _{d(off)}	-	82.2	-		
Fall time	t _f	-	62.8	-		
Gate resistance	R _G	-	48.0	-	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}	-	-0.87	-1.20	V	$V_{GS}=0V, I_{SD}=-10A$
Body Diode Reverse Recovery Time	t_{rr}	-	31.5	-	ns	$I_F=10A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	11.8	-	nC	

P-Channel Typical Performance Characteristics

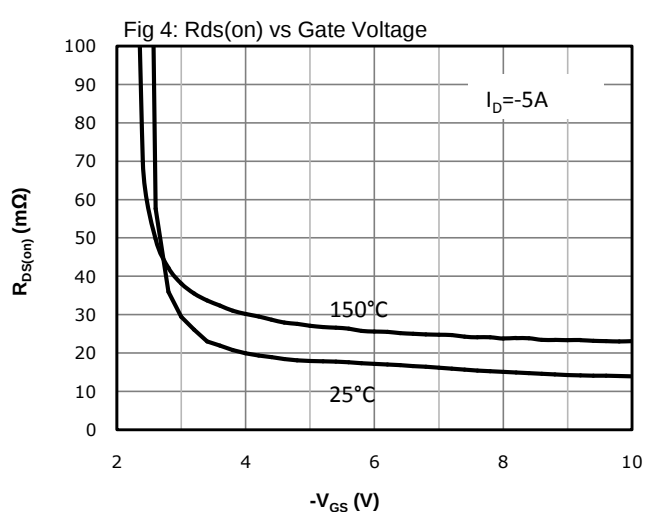
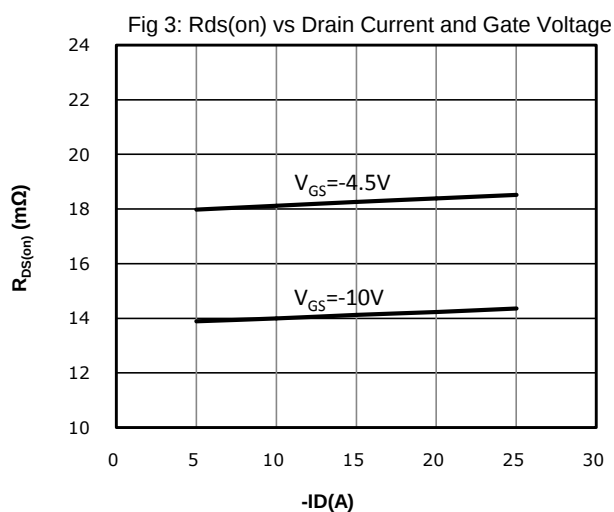
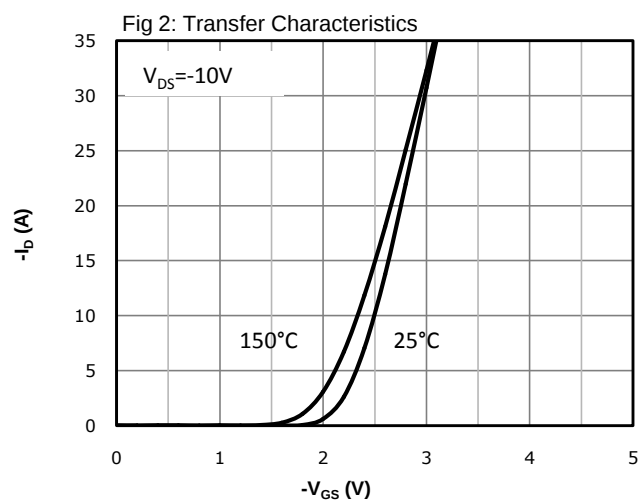
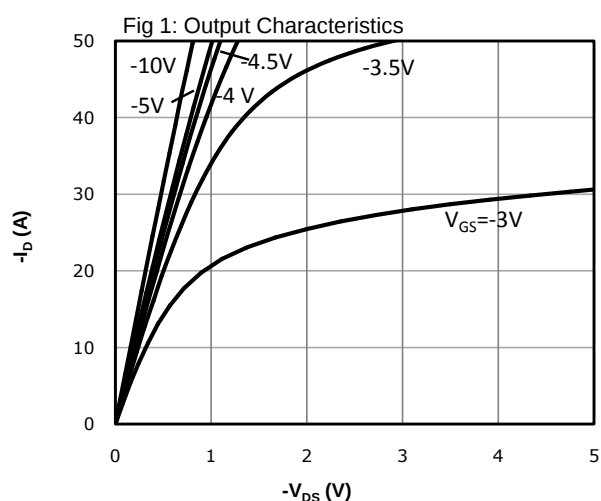


Fig 5: $R_{ds(on)}$ vs. Temperature

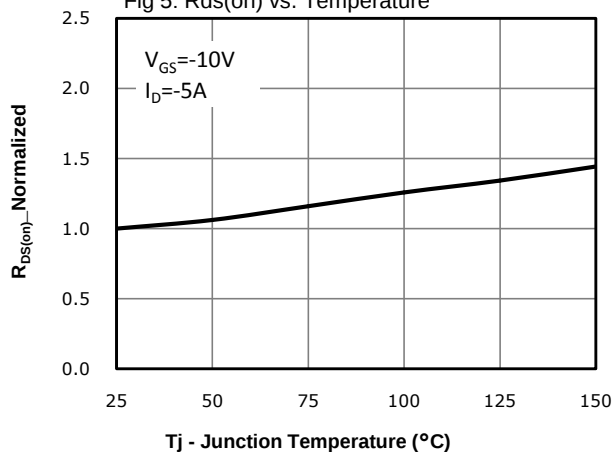


Fig 6: Capacitance Characteristics

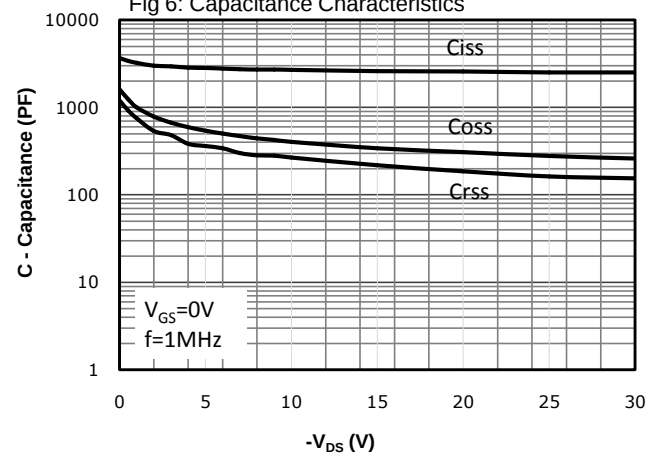


Fig 7: Gate Charge Characteristics

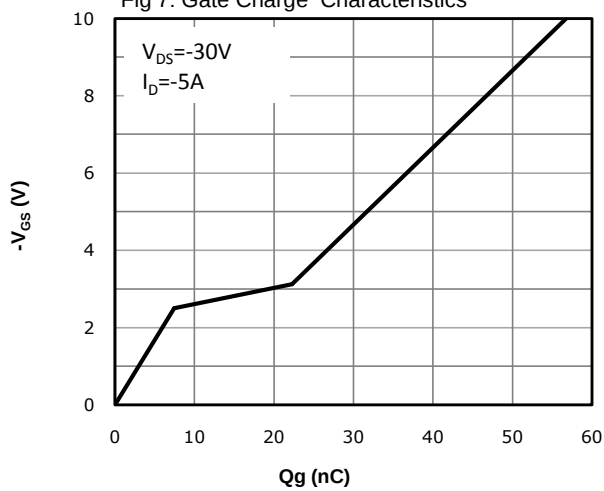


Fig 8: Body-diode Forward Characteristics

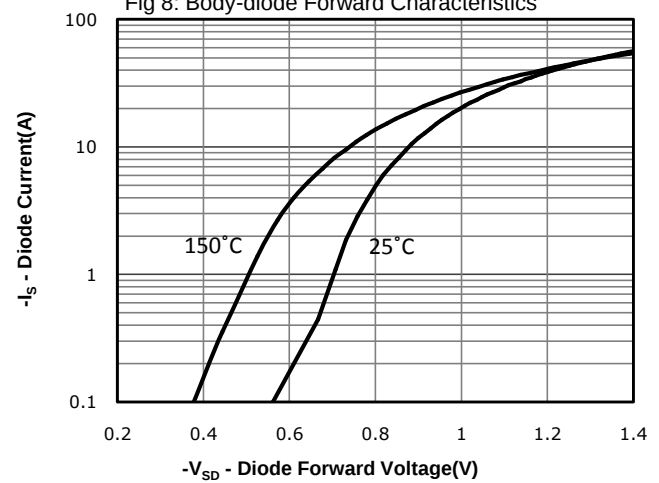
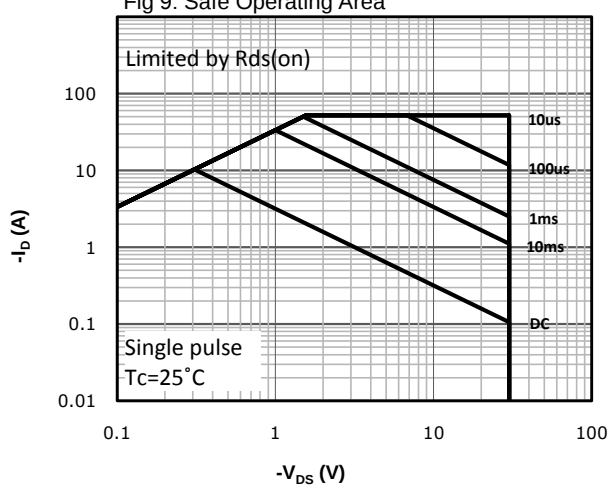
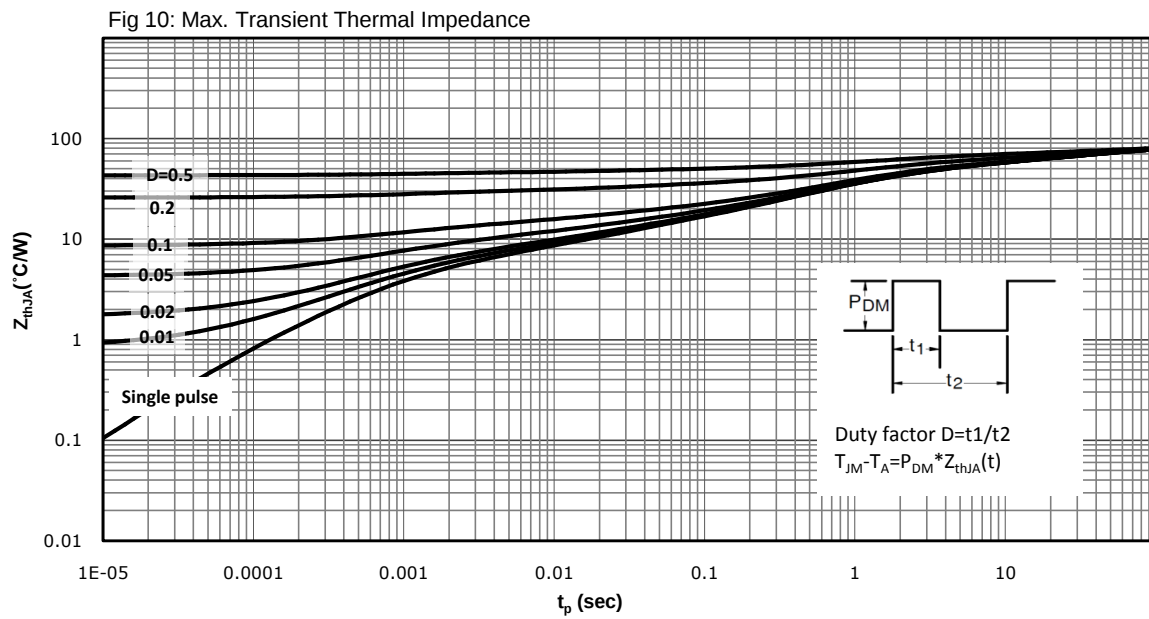
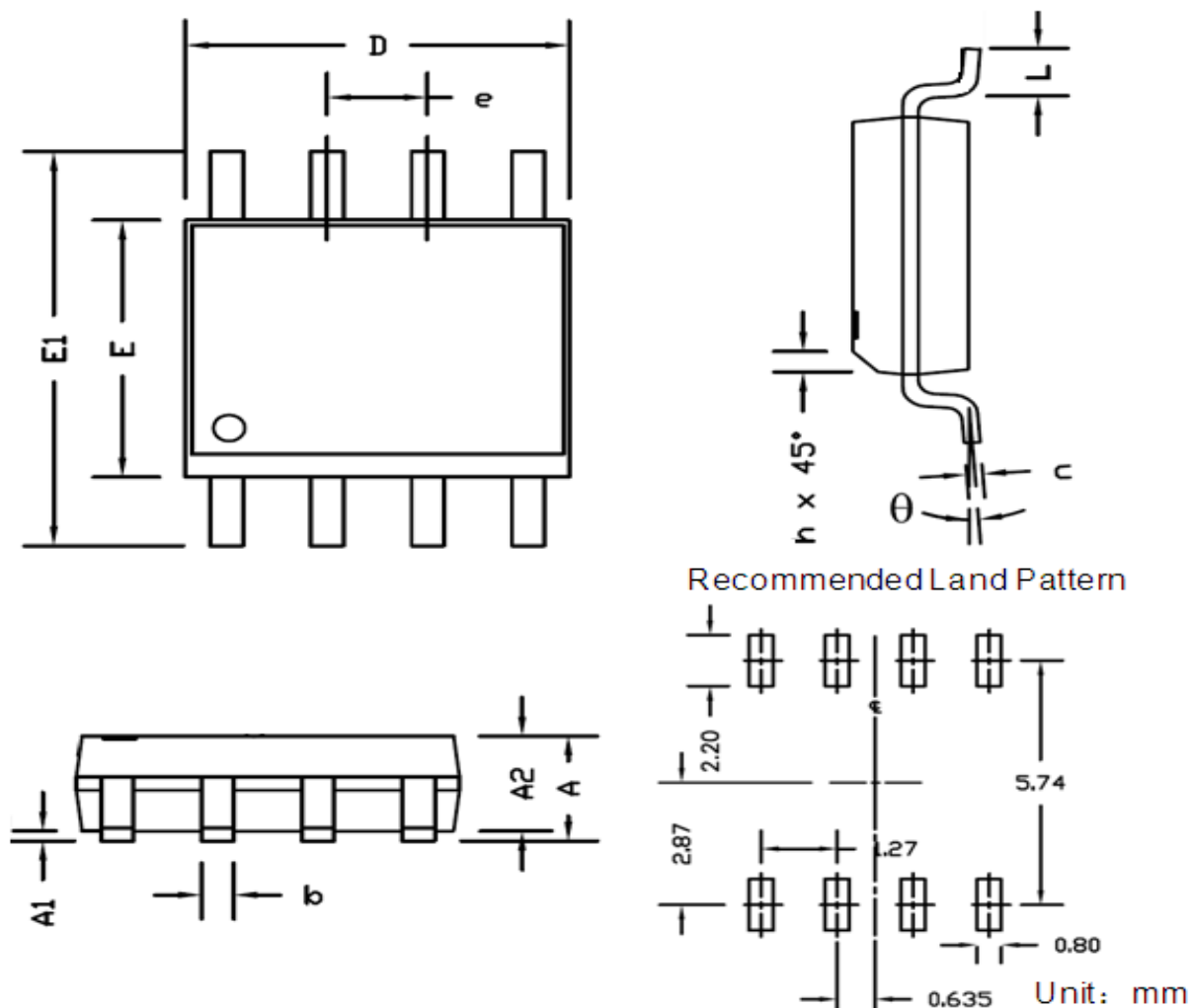


Fig 9: Safe Operating Area





Package Outline: SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
b	0.33	0.51	0.013	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
e	1.27 BSC.		0.050 BSC.	
E	3.80	4.00	0.150	0.157
E1	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

Revision History

Revision	Date	Major changes
1.1	2022/12/20	Release of formal 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.