CRMM3520C

20V Complementary Power MOSFET

Features

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

Product Summary

Symbol	N-Ch	P-Ch
V_{DS}	20V	-20V
$R_{DS(on)\ typ.}$	30mΩ	80mΩ
I_D	5A	-3A

Applications

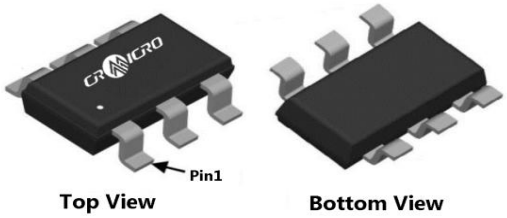
- Motor drive

100% DVDS Tested

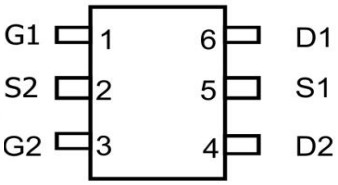
100% Avalanche Tested

RoHS HF

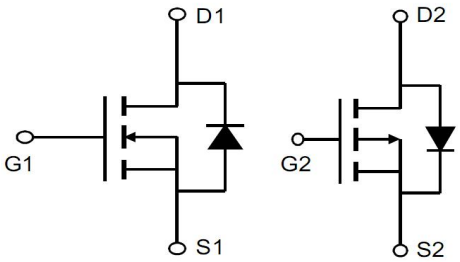
SOT-23-6



Top View Bottom View



Top View



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRMM3520C	CRMM3520C	SOT-23-6	Taping	N/A	N/A	3000pcs

Absolute Maximum Ratings

Parameter	Symbol	Maximum		Unit
		N-Ch	P-Ch	
Drain-source voltage	V_{DS}	20	-20	V
Continuous drain current T_C = 25°C (Silicon limit)	I_D	5	-3	A
Continuous drain current T_C = 25°C (Package limit)	I_D	5	-3	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D\ pulse}$	20	-13	A
Avalanche energy, single pulse (L=0.5mH, Rg=25Ω)	E_{AS}	16	18	mJ
Gate-Source voltage	V_{GS}	±12	±12	V
Power dissipation (T_C = 25°C)	P_{tot}	1.3	1.3	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+150		°C

Thermal Resistance

Parameter	Symbol	Typ	Max	Unit
Thermal resistance, junction – case.	R_{thJC}	69.0	97.0	°C/W
SMD version, device on PCB [1] Thermal resistance, junction – ambient(min. footprint)	R_{thJA}	92.0	129.0	°C/W

NOTE:
1.The value of RθJA is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with TA =25°C. The value in any given application depends on the user's specific board design.

N-Channel 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}	20	-	-	V	V_{GS}=0V, I_D=250uA
Gate threshold voltage	$V_{GS(th)}$	0.4	0.6	0.9	V	V_{DS}=V_{GS}, I_D=250uA
Zero gate voltage drain current	I_{DSS}	- -	0.08 -	1 5	μA	V_{DS}=20V, V_{GS}=0V Tj=25°C T_j=125°C
Gate-source leakage current	I_{GSS}	-	±10	±100	nA	V_{GS}=±12V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	38.0 30.0	46.0 36.0	mΩ	V_{GS}=2.5V, I_D=2A V_{GS}=4.5V, I_D=2A
Transconductance	g_{fs}	-	14	-	S	V_{DS}=5V, I_D=2A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	337	-	pF	V_{GS}=0V, V_{DS}=20V, f=1MHz
Output Capacitance	C_{oss}	-	46	-		
Reverse Transfer Capacitance	C_{rss}	-	39	-		
Gate Total Charge	Q_G	-	9.6	-	nC	V_{GS}=8V, V_{DS}=20V, I_D=2A, f=1MHz
Gate-Source charge	Q_{gs}	-	1.1	-		
Gate-Drain charge	Q_{gd}	-	1.6	-		
Turn-on delay time	$t_{d(on)}$	-	4.9	-	ns	V_{GS}=8V, V_{DD}=10V, R_{G_ext}=2.7Ω, ID=2A
Rise time	t_r	-	11.8	-		
Turn-off delay time	$t_{d(off)}$	-	16.0	-		
Fall time	t_f	-	2.5	-		
Gate resistance	R_G	-	0.9	-	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}	-	0.76	1.20	V	V_{GS}=0V, I_{SD}=2A
Body Diode Reverse Recovery Time	t_{rr}	-	10.0	-	ns	I_F=2A, dI/dt=50A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	-	1.0	-	nC	

N-Channel Typical Performance Characteristics

Fig 1: Output Characteristics

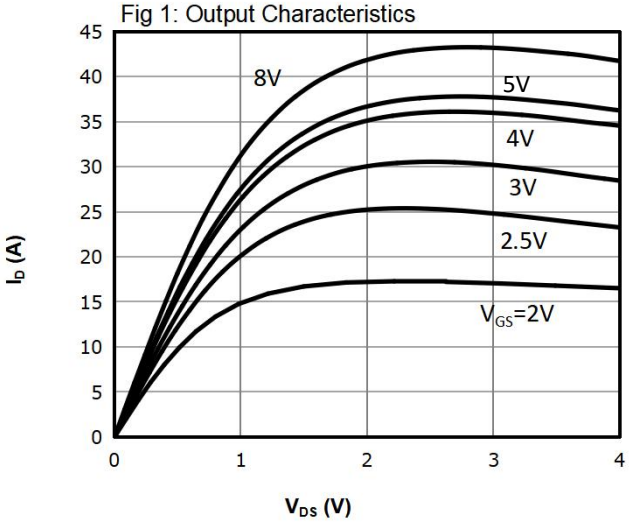


Fig 2: Transfer Characteristics

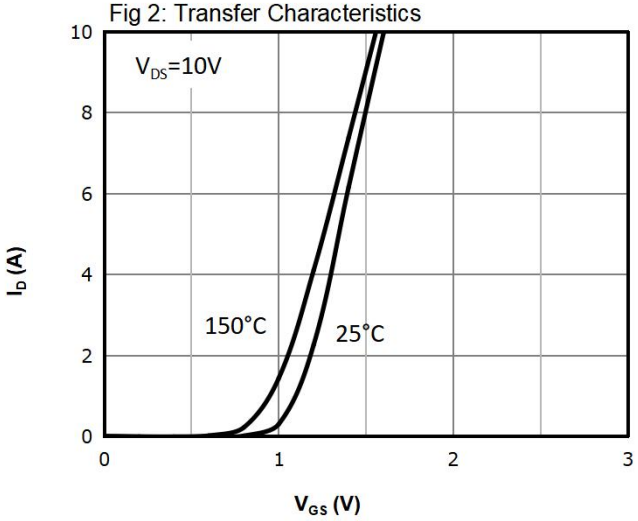


Fig 3: Rds(on) vs Drain Current and Gate Voltage

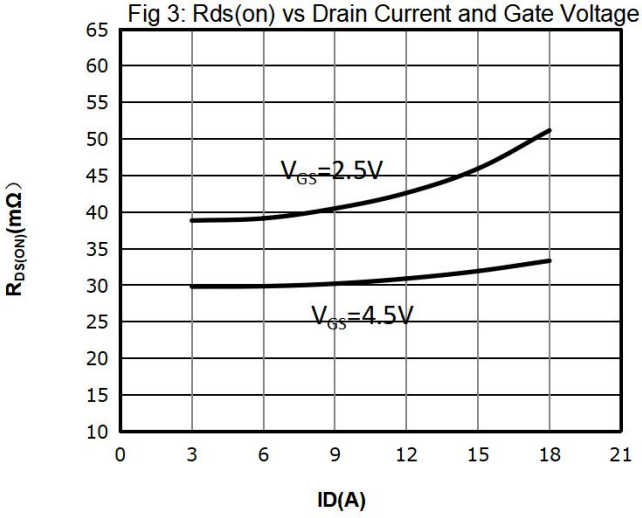


Fig 4: Rds(on) vs Gate Voltage

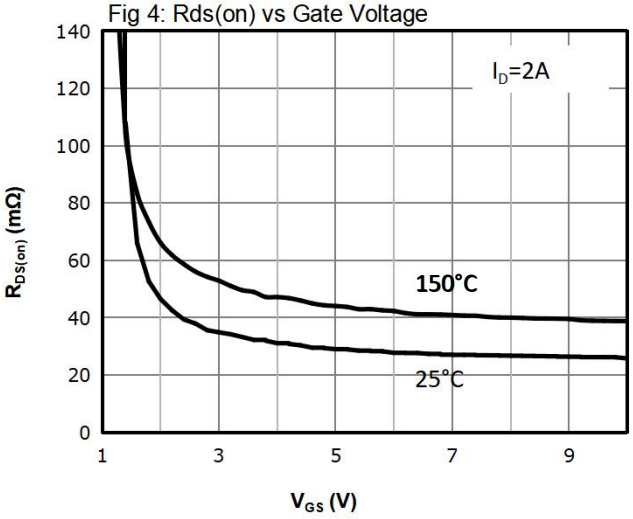


Fig 5: Rds(on) vs. Temperature

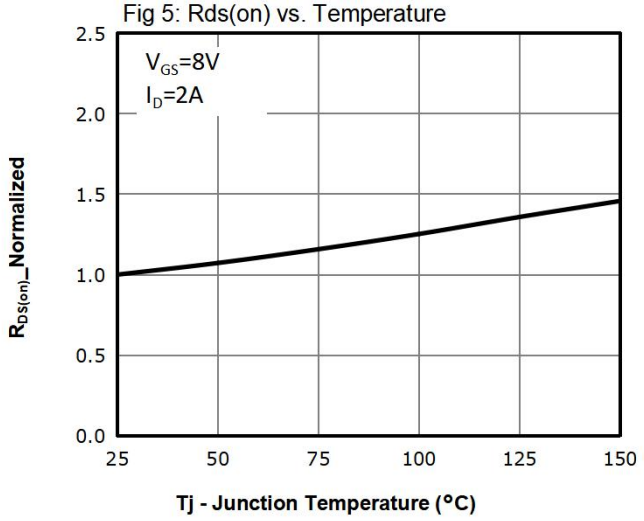


Fig 6: Capacitance Characteristics

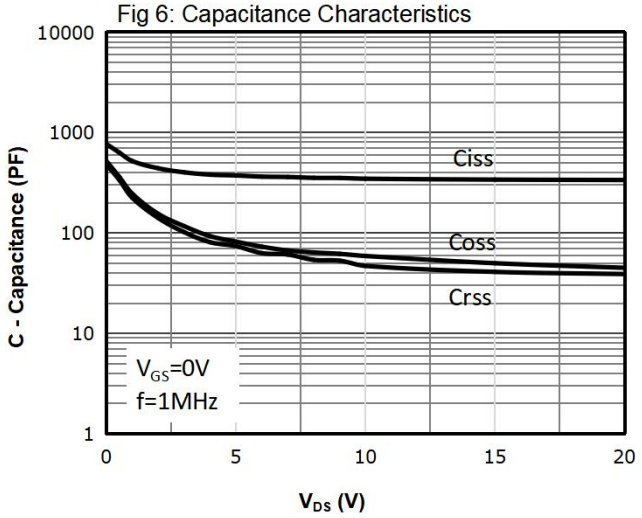


Fig 7: Gate Charge Characteristics

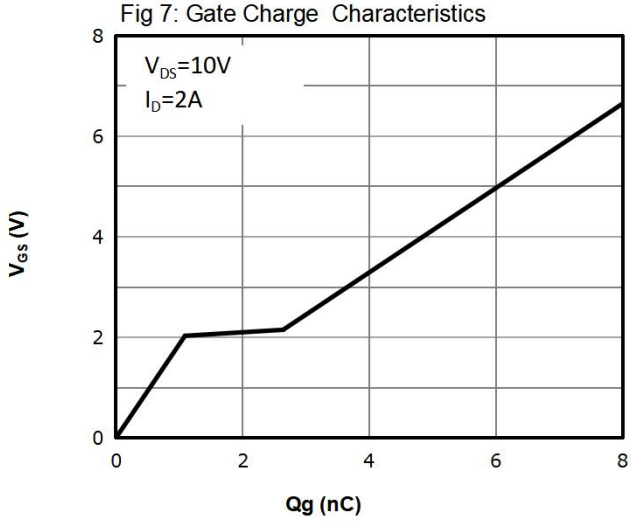


Fig 8: Body-diode Forward Characteristics

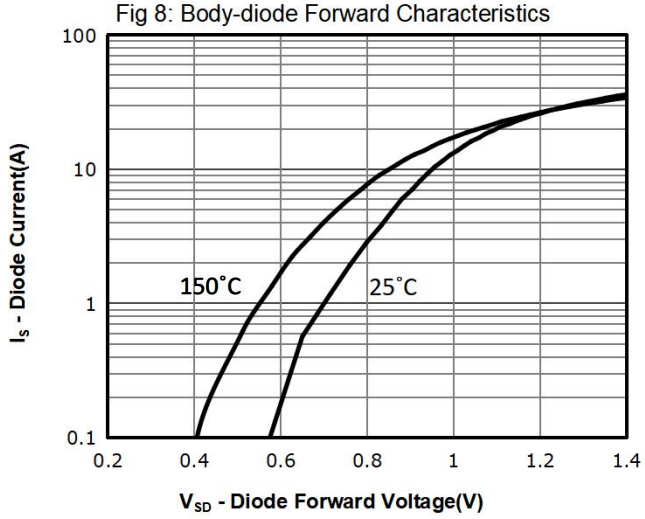


Fig 9: Safe Operating Area

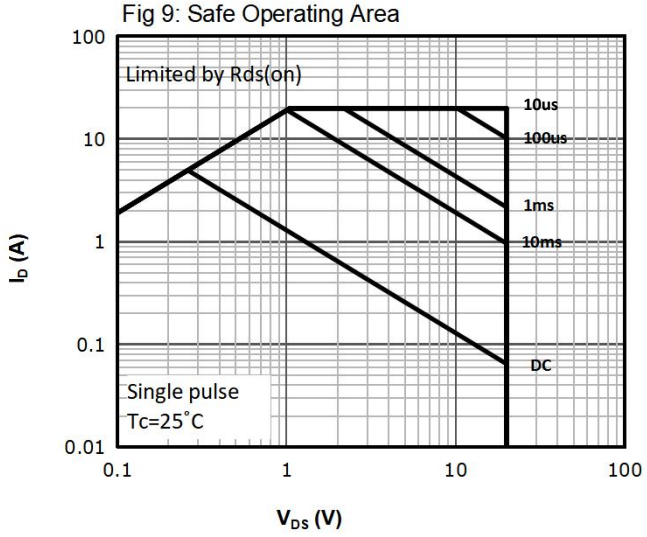
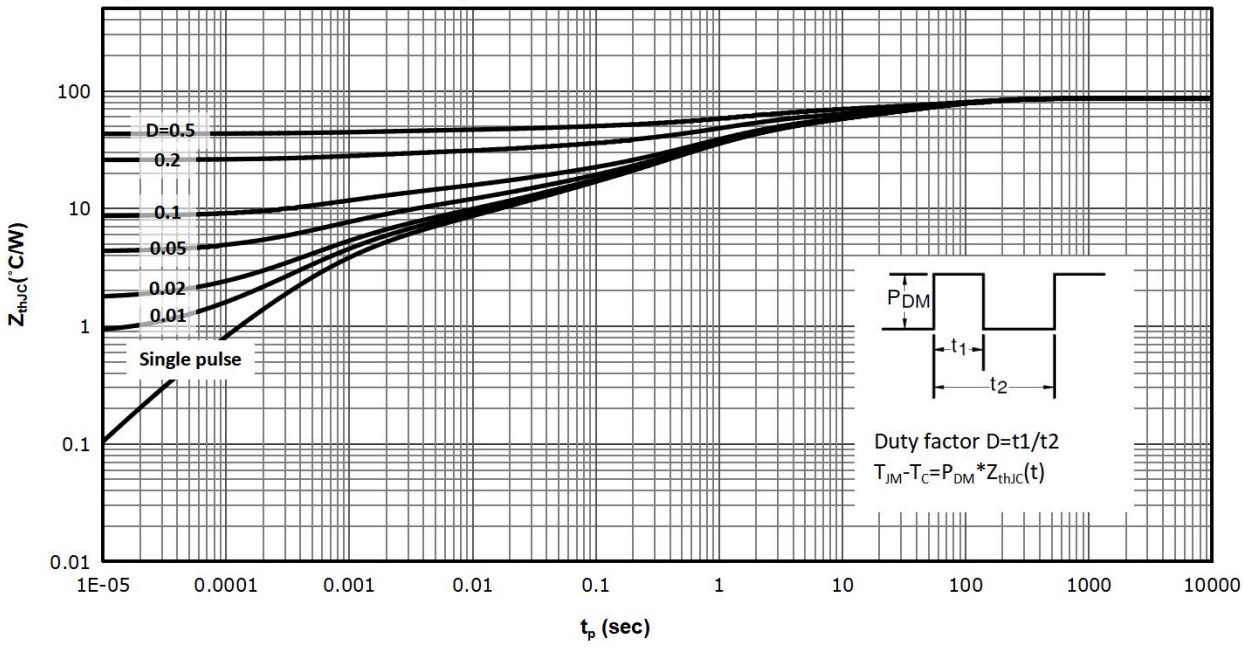


Fig 10: Max. Transient Thermal Impedance



P-Channel 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}	-20	-	-	V	V_{GS}=0V, I_D=-250uA
Gate threshold voltage	$V_{GS(th)}$	-0.5	-0.8	-1.1	V	V_{DS}=V_{GS}, I_D=-250uA
Zero gate voltage drain current	I_{DSS}	- -	-0.08 -	-1 -5	μA	V_{DS}=-20V, V_{GS}=0V Tj=25°C T_j=125°C
Gate-source leakage current	I_{GSS}	-	±10	±100	nA	V_{GS}=±12V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	108.0 80.0	130.0 96.0	mΩ	V_{GS}=-2.5V, I_D=-2A V_{GS}=-4.5V, I_D=-2A
Transconductance	g_{fs}	-	7.4	-	S	V_{DS}=-5V, I_D=-2A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	357	-	pF	V_{GS}=0V, V_{DS}=-20V, f=1MHz
Output Capacitance	C_{oss}	-	50	-		
Reverse Transfer Capacitance	C_{rss}	-	42	-		
Gate Total Charge	Q_G	-	8.5	-	nC	V_{GS}=-8V, V_{DS}=-20V, I_D=2A, f=1MHz
Gate-Source charge	Q_{gs}	-	1.2	-		
Gate-Drain charge	Q_{gd}	-	1.6	-		
Turn-on delay time	$t_{d(on)}$	-	5.7	-	ns	V_{GS}=-8V, V_{DD}=-10V, R_{G_ext}=2.7Ω, ID=-2A
Rise time	t_r	-	14.2	-		
Turn-off delay time	$t_{d(off)}$	-	22.7	-		
Fall time	t_f	-	40.9	-		
Gate resistance	R_G	-	3.0	-	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}	-	-0.88	-1.20	V	V_{GS}=0V, I_{SD}=-2A
Body Diode Reverse Recovery Time	t_{rr}	-	13.4	-	ns	I_F=2A, dI/dt=50A/μs
Body Diode Reverse Recovery Charge	Q_{rr}	-	1.6	-	nC	

P-Channel Typical Performance Characteristics

Fig 1: Output Characteristics

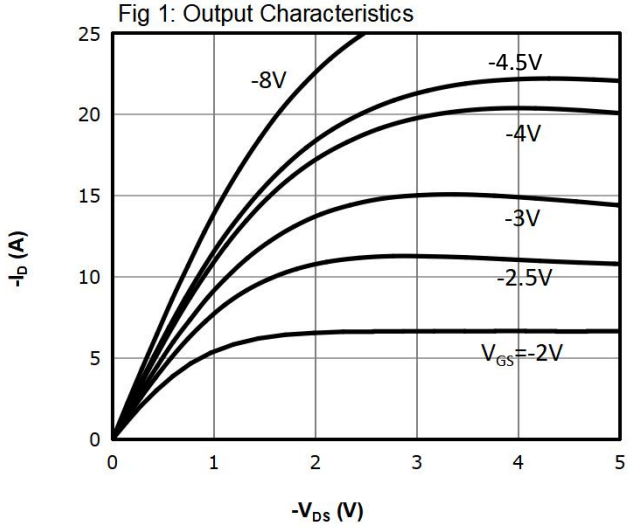


Fig 2: Transfer Characteristics

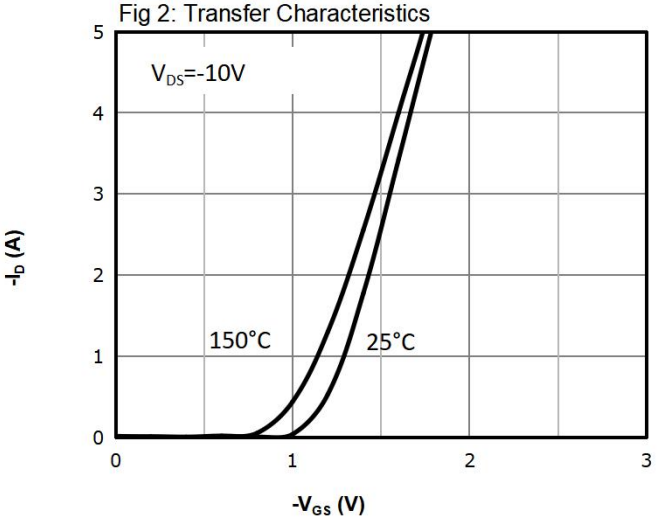


Fig 3: Rds(on) vs Drain Current and Gate Voltage

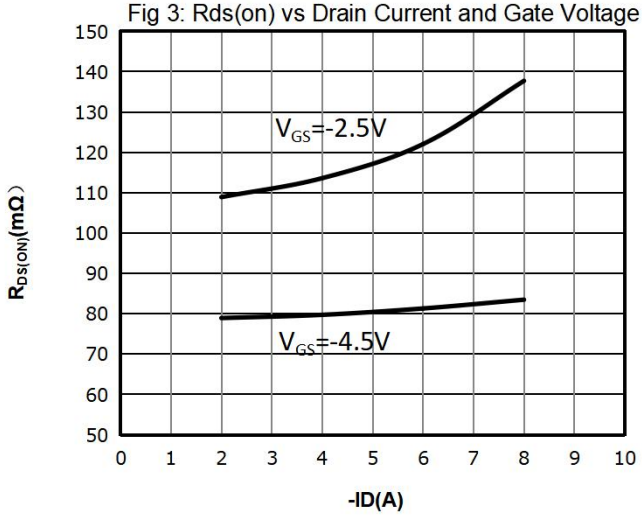


Fig 4: Rds(on) vs Gate Voltage

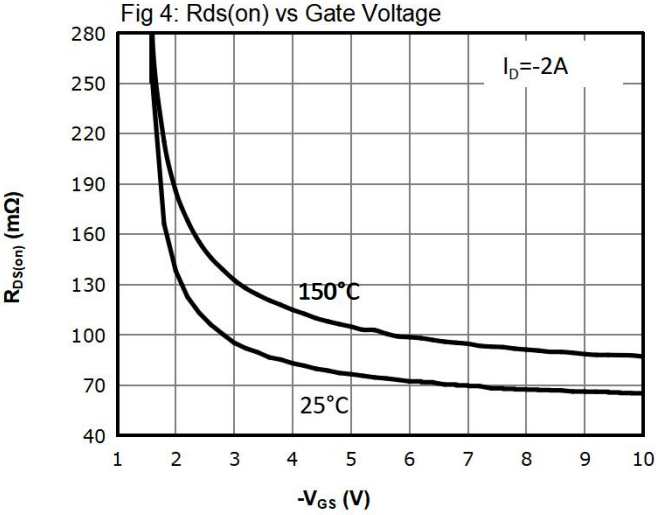


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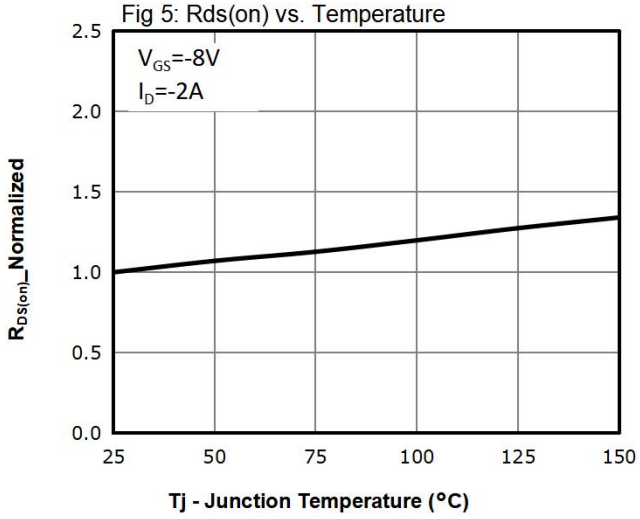


Fig 6: Capacitance Characteristics

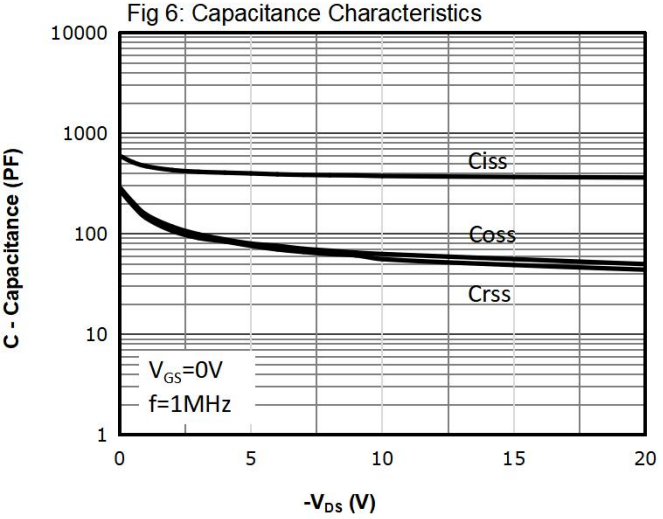


Fig 7: Gate Charge Characteristics

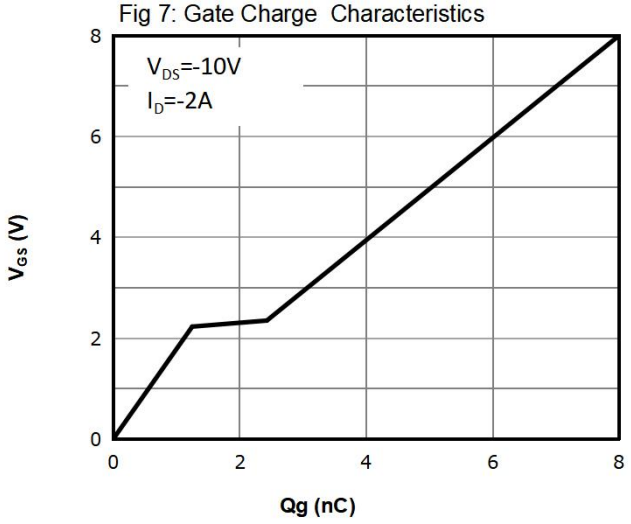


Fig 8: Body-diode Forward Characteristics

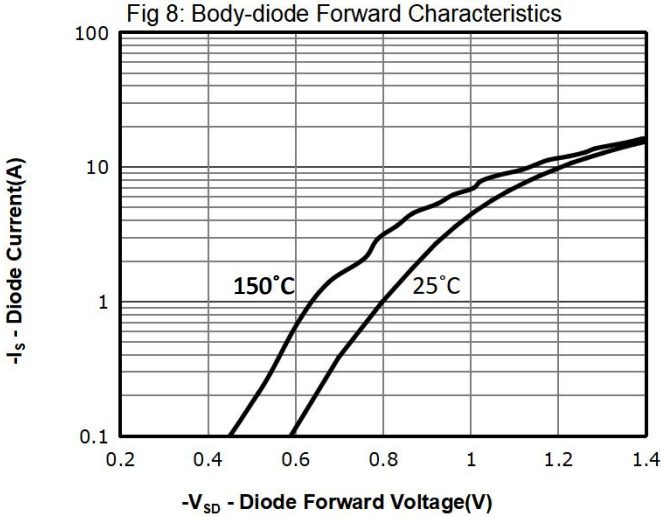


Fig 9: Safe Operating Area

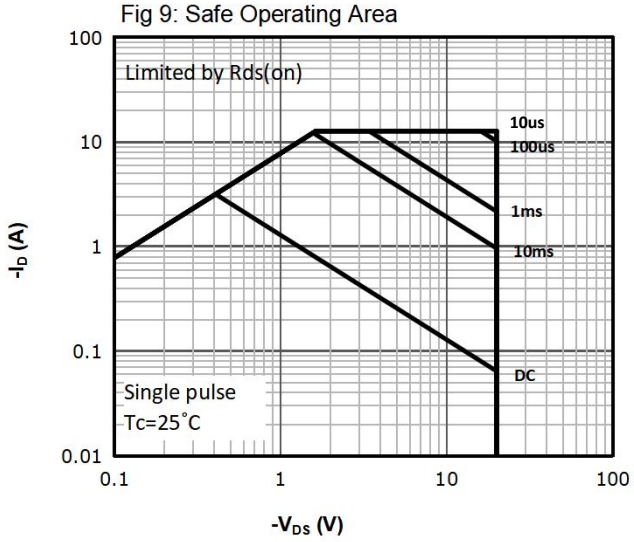
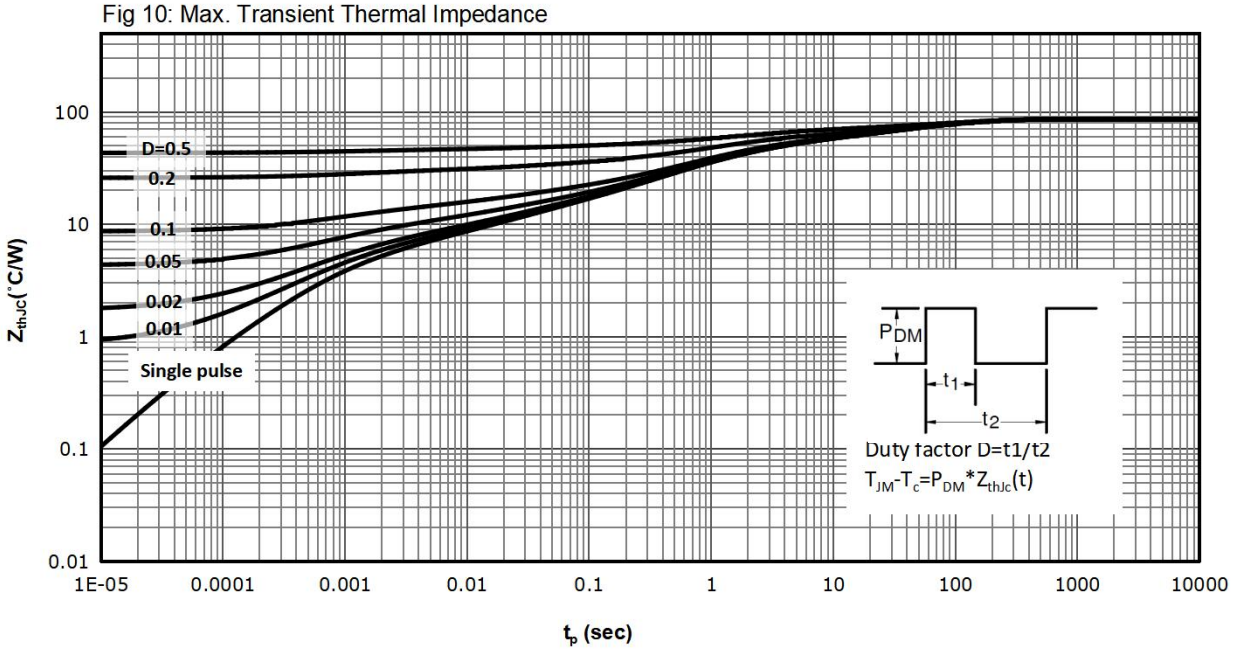
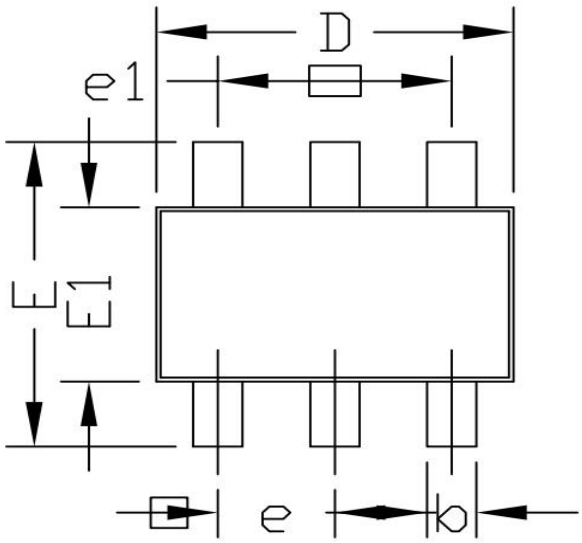
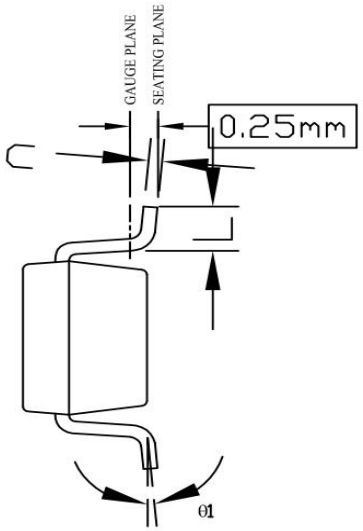


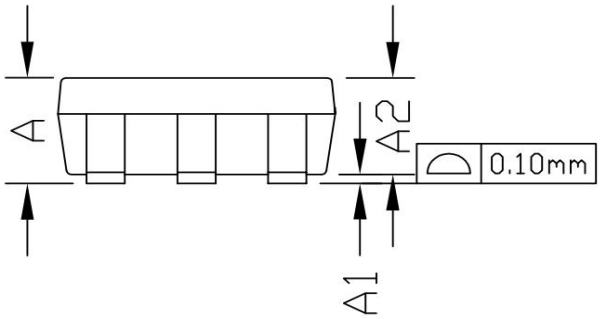
Fig 10: Max. Transient Thermal Impedance



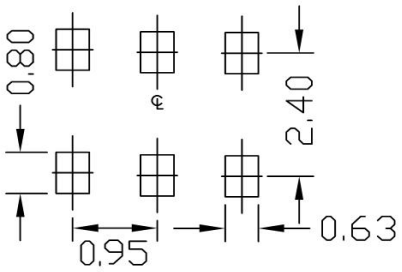
Package Outline: SOT-23-6







RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	----	1.25	0.031	----	0.049
A1	0.00	----	0.15	0.000	----	0.006
A2	0.70	1.10	1.20	0.028	0.043	0.047
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.08	0.13	0.20	0.003	0.005	0.008
D	2.70	2.90	3.10	0.106	0.114	0.122
E	2.50	2.80	3.10	0.098	0.110	0.122
E1	1.50	1.60	1.70	0.059	0.063	0.067
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.30	----	0.60	0.012	----	0.024
θ1	0°	----	8°	0°	----	8°

NOTE

1.PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 5 MILS EACH.
2.DIMENSION "L"IS MEASURED IN GAUGE PLANE.
3.TOLERANCE ±0.100 mm(4 mil) UNLESS OTHERWISE SPECIFIED.
4.FOLLOWED FROM JEDEC MO-178C & MO-193C.
5.CONTROLLING DIMENSIONS IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

Revision History

Revison	Date	Major changes
3.1	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 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.

This product is suitable for reflow soldering up to 260℃, not very suitable for wave soldering.
The reliability of this product is not guaranteed under specific conditions when accepted by customers.
CRM(CQ) reserves the right to improve product design, function and reliability without notice.