## Features

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

## Product Summary

| Symbol | N-Ch | P-Ch |
|---|---|---|
| $V_{DS}$ | 30V | -30V |
| $R_{DS(on)}$ typ. | 15mΩ | 55mΩ |
| $I_D$ | 11A | -11A |

## Applications

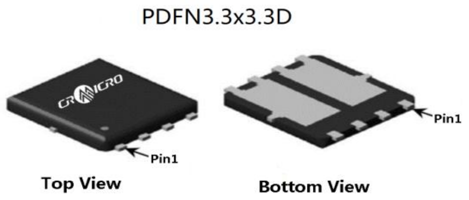
- Motor drive

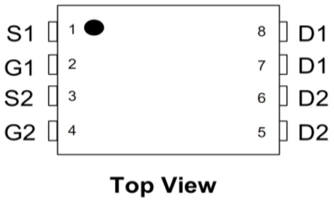
***100% DVDS Tested***

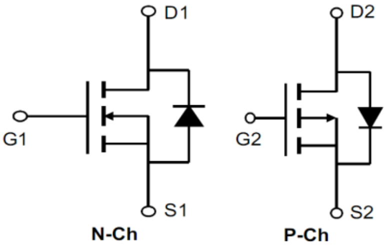
***100% Avalanche Tested***

RoHS

H F







## Package Marking and Ordering Information

| Part # | Marking | Package | Packing | Reel Size | Tape Width | Qty |
|---|---|---|---|---|---|---|
| CRMB0305C | B0305C | PDFN3.3x3.3D | Taping | N/A | N/A | 5000pcs |

## 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°C (Silicon limit) | $I_D$ | 23 | -12 | A |
| Continuous drain current $T_C$ = 25°C (Package limit) | $I_D$ | 11 | -11 | A |
| Pulsed drain current ($T_C$ = 25°C, $t_p$ limited by $T_{jmax}$) | $I_{D\ pulse}$ | 43 | -43 | A |
| Avalanche energy, single pulse (L=0.5mH, Rg=25Ω) | $E_{AS}$ | 42 | 30 | mJ |
| Gate-Source voltage | $V_{GS}$ | ±20 | ±12 | V |
| Power dissipation ($T_C$ = 25°C) | $P_{tot}$ | 15.9 | 15.9 | W |
| Operating junction and storage temperature | $T_j$ , $T_{stg}$ | -55...+150 | | °C |

## Thermal Resistance

| Parameter | Symbol | Typ | Max | Unit |
|---|---|---|---|---|
| Thermal resistance, junction – case. | $R_{thJC}$ | 5.6 | 7.8 | °C/W |
| SMD version, device on PCB [1]<br>Thermal resistance, junction – ambient(min. footprint) | $R_{thJA}$ | 68.2 | 81.8 | °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 | $BV_{DSS}$ | 30 | - | - | V | $V_{GS}$=0V, $I_D$=250uA |
| Gate threshold voltage | $V_{GS(th)}$ | 1 | 1.5 | 2 | V | $V_{DS}$=$V_{GS}$, $I_D$=250uA |
| Zero gate voltage drain current | $I_{DSS}$ | -<br>- | 0.08<br>- | 1<br>5 | μA | $V_{DS}$=30V, $V_{GS}$=0V<br>Tj=25°C<br>$T_j$=125°C |
| Gate-source leakage current | $I_{GSS}$ | - | ±10 | ±100 | nA | $V_{GS}$=±20V, $V_{DS}$=0V |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 20.0 | 24.0 | mΩ | $V_{GS}$=4.5V, $I_D$=3A |
| | | - | 15.0 | 18.0 | | $V_{GS}$=10V, $I_D$=3A |
| Transconductance | $g_{fs}$ | - | 18.9 | - | S | $V_{DS}$=5V, $I_D$=5A |
| **Dynamic Characteristic** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 567 | - | pF | $V_{GS}$=0V, $V_{DS}$=30V, f=1MHz |
| Output Capacitance | $C_{oss}$ | - | 73 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 60 | - | | |
| Gate Total Charge | $Q_G$ | - | 14.6 | - | nC | $V_{GS}$=10V, $V_{DS}$=30V, $I_D$=3A, f=1MHz |
| Gate-Source charge | $Q_{gs}$ | - | 2.2 | - | | |
| Gate-Drain charge | $Q_{gd}$ | - | 3.9 | - | | |
| Turn-on delay time | $t_{d(on)}$ | - | 6.2 | - | ns | $V_{GS}$=10V, $V_{DD}$=15V, $R_{G\_ext}$=2.7Ω, ID=5A |
| Rise time | $t_r$ | - | 20.4 | - | | |
| Turn-off delay time | $t_{d(off)}$ | - | 19.6 | - | | |
| Fall time | $t_f$ | - | 21.0 | - | | |
| Gate resistance | $R_G$ | - | 3.8 | - | 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 | $V_{SD}$ | - | 0.81 | 1.2 | V | $V_{GS}$=0V, $I_{SD}$=5A |
| Body Diode Reverse Recovery Time | $t_{rr}$ | - | 13.33 | - | ns | $I_F$=5A, dI/dt=100A/μs |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | - | 3.48 | - | nC |  |

## N-Channel Typical Performance Characteristics

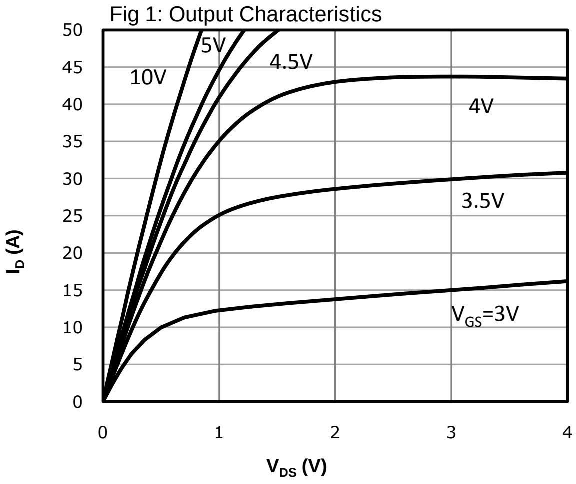


Fig 1: Output Characteristics

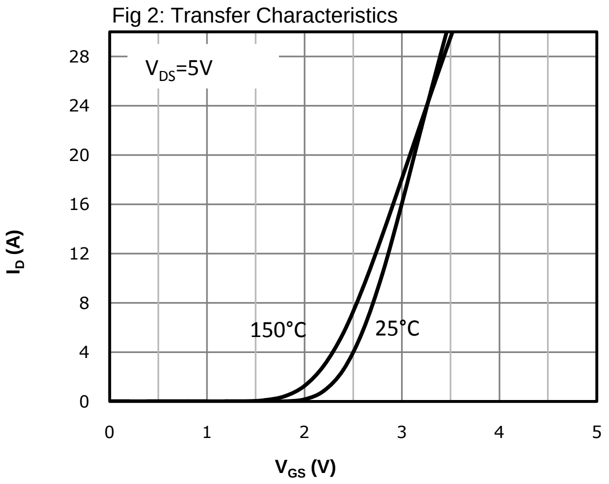


Fig 2: Transfer Characteristics

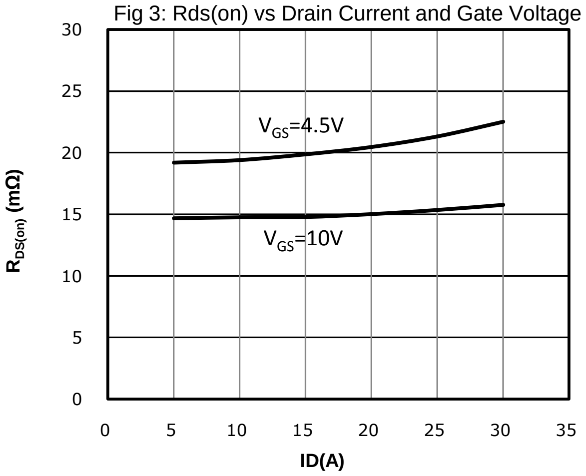


Fig 3: Rds(on) vs Drain Current and Gate Voltage

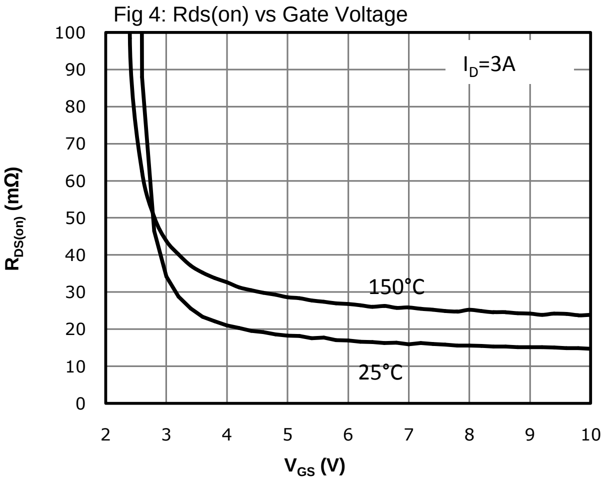


Fig 4: Rds(on) vs Gate Voltage

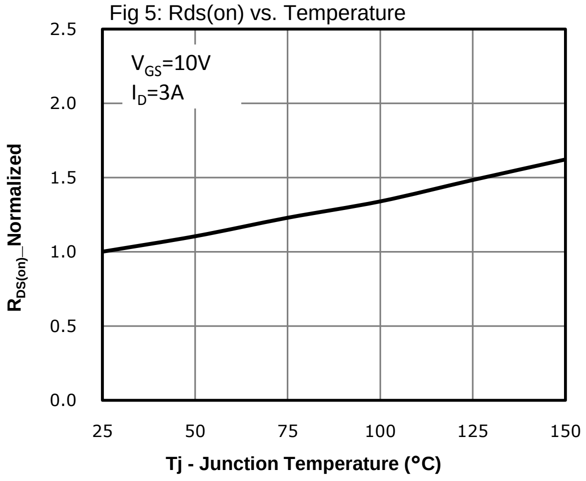


Fig 5: Rds(on) vs. Temperature

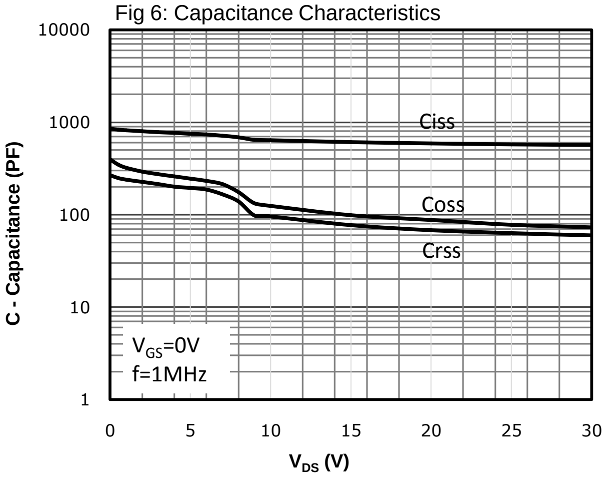


Fig 6: Capacitance Characteristics

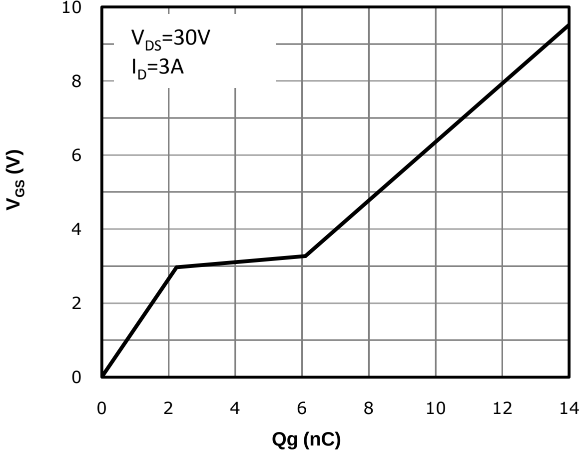


Fig 7: Gate Charge Characteristics

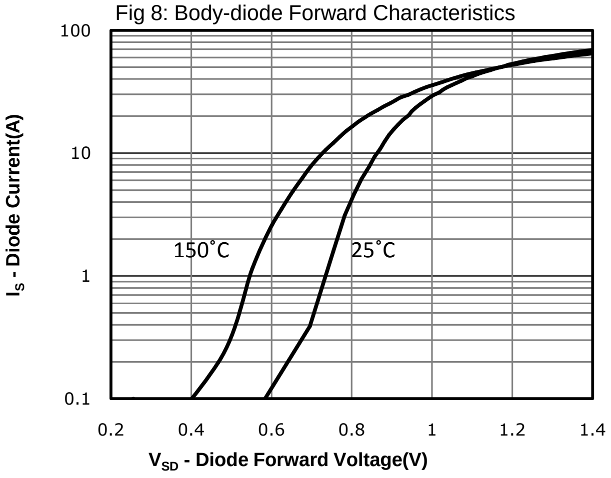


Fig 8: Body-diode Forward Characteristics

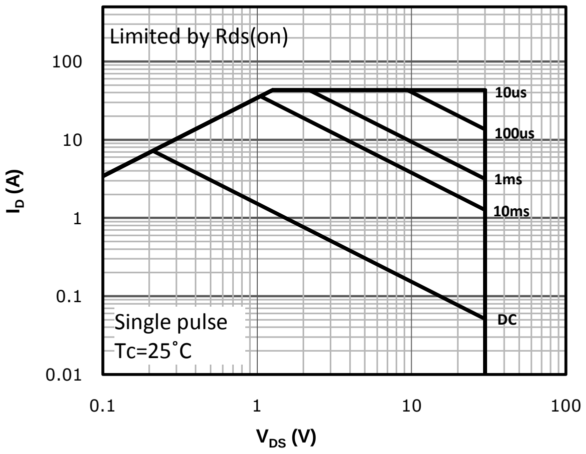
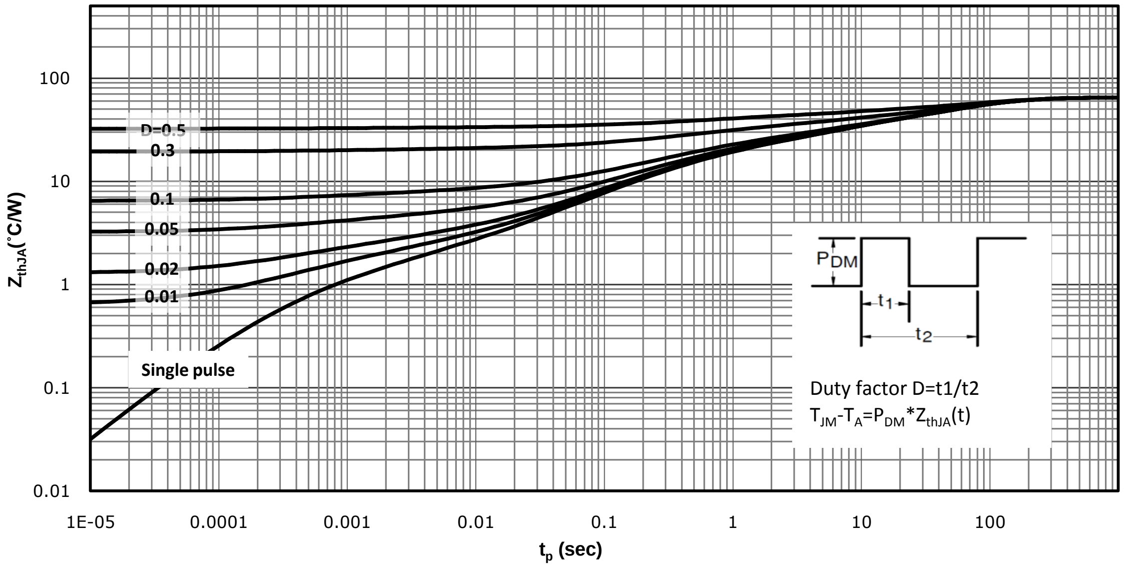


Fig 9: Safe Operating Area

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 | $BV_{DSS}$ | -30 | - | - | V | $V_{GS}$=0V, $I_D$=-250uA |
| Gate threshold voltage | $V_{GS(th)}$ | -0.4 | -0.7 | -1.2 | V | $V_{DS}$=$V_{GS}$, $I_D$=-250uA |
| Zero gate voltage drain current | $I_{DSS}$ | -<br>- | -0.08<br>- | -1<br>-5 | μA | $V_{DS}$=-30V, $V_{GS}$=0V<br>$T_j$=25°C<br>$T_j$=125°C |
| Gate-source leakage current | $I_{GSS}$ | - | ±10 | ±100 | nA | $V_{GS}$=±12V, $V_{DS}$=0V |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 62.0 | 74.4 | mΩ | $V_{GS}$=-4.5V, $I_D$=-3A |
| | | - | 55.0 | 66.0 | | $V_{GS}$=-10V, $I_D$=-3A |
| Transconductance | $g_{fs}$ | - | 14.2 | - | S | $V_{DS}$=-5V, $I_D$=-5A |
| **Dynamic Characteristic** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 1322 | - | pF | $V_{GS}$=0V, $V_{DS}$=-30V, f=1MHz |
| Output Capacitance | $C_{oss}$ | - | 148 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 127 | - | | |
| Gate Total Charge | $Q_G$ | - | 16.5 | - | nC | $V_{GS}$=-10V, $V_{DS}$=-30V, $I_D$=-5A, f=1MHz |
| Gate-Source charge | $Q_{gs}$ | - | 1.8 | - | | |
| Gate-Drain charge | $Q_{gd}$ | - | 2.6 | - | | |
| Turn-on delay time | $t_{d(on)}$ | - | 5.6 | - | ns | $V_{GS}$=-10V, $V_{DD}$=-15V, $R_{G\_ext}$=2.7Ω, ID=-5A |
| Rise time | $t_r$ | - | 23.2 | - | | |
| Turn-off delay time | $t_{d(off)}$ | - | 37.6 | - | | |
| Fall time | $t_f$ | - | 64.6 | - | | |
| Gate resistance | $R_G$ | - | 15.0 | - | 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 | $V_{SD}$ | - | -0.92 | -1.2 | V | $V_{GS}$=0V, $I_{SD}$=-5A |
| Body Diode Reverse Recovery Time | $t_{rr}$ | - | 9.33 | - | ns | $I_F$=5A, dI/dt=100A/μs |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | - | 3.18 | - | nC | |

## P-Channel Typical Performance Characteristics

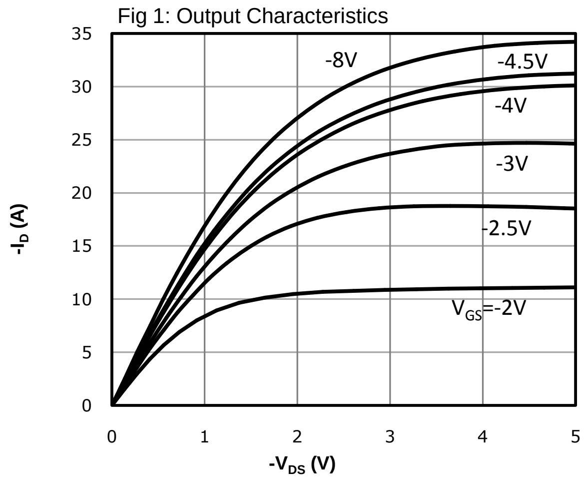


Fig 1: Output Characteristics

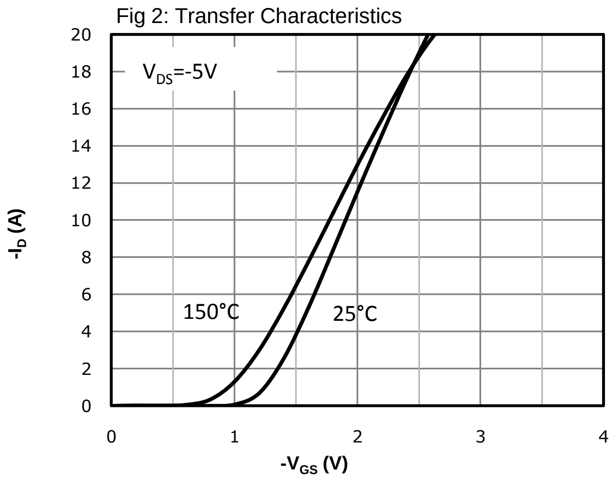


Fig 2: Transfer Characteristics

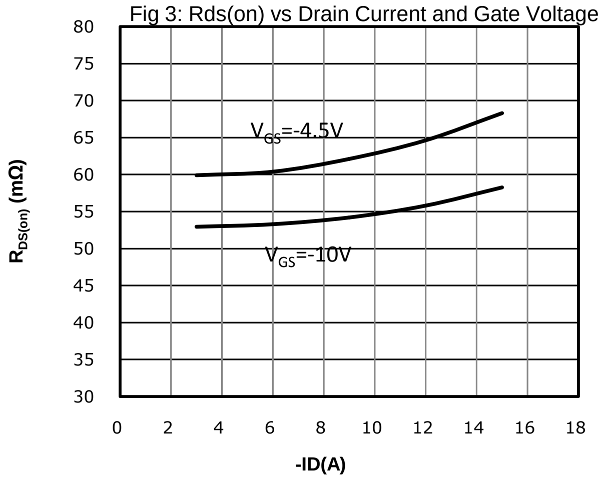


Fig 3: Rds(on) vs Drain Current and Gate Voltage

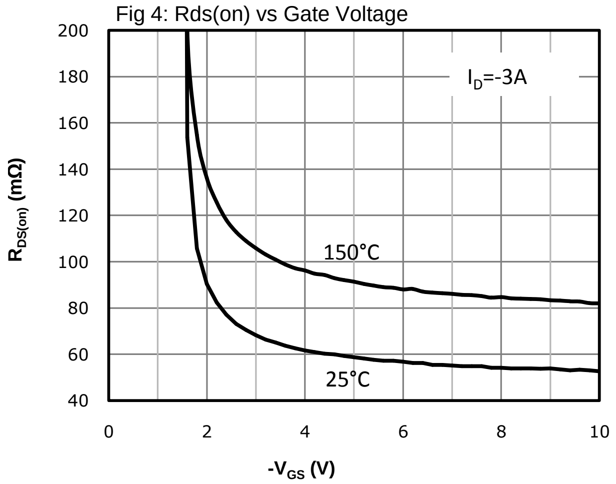


Fig 4: Rds(on) vs Gate Voltage

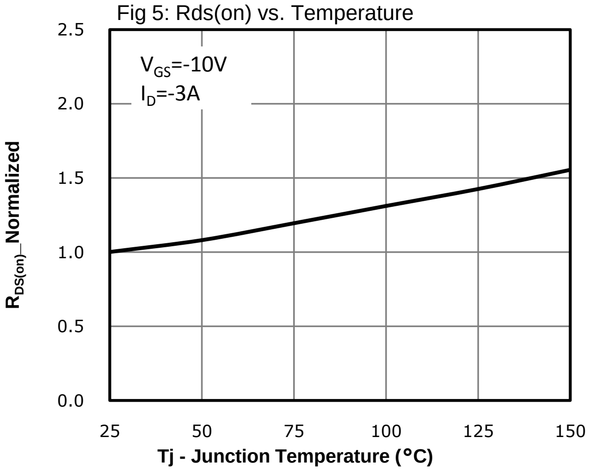


Fig 5: Rds(on) vs. Temperature
VGS=-10V
ID=-3A
RDS(on)_Normalized
2.5
2.0
1.5
1.0
0.5
0.0
25
50
75
100
125
150
Tj - Junction Temperature (°C)

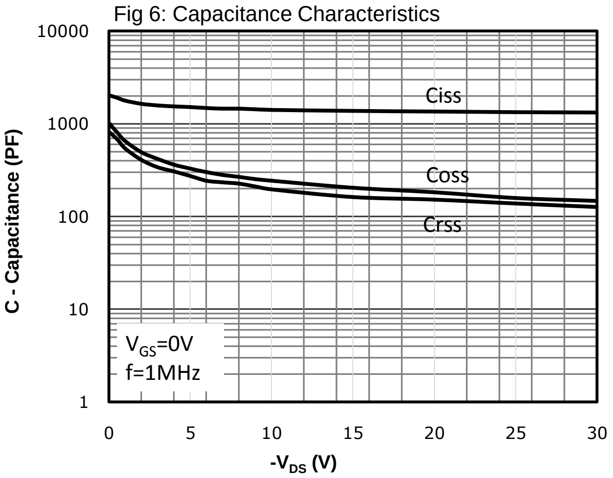


Fig 6: Capacitance Characteristics
C - Capacitance (PF)
10000
1000
100
10
1
Ciss
Coss
Crss
VGS=0V
f=1MHz
0
5
10
15
20
25
30
-VDS (V)

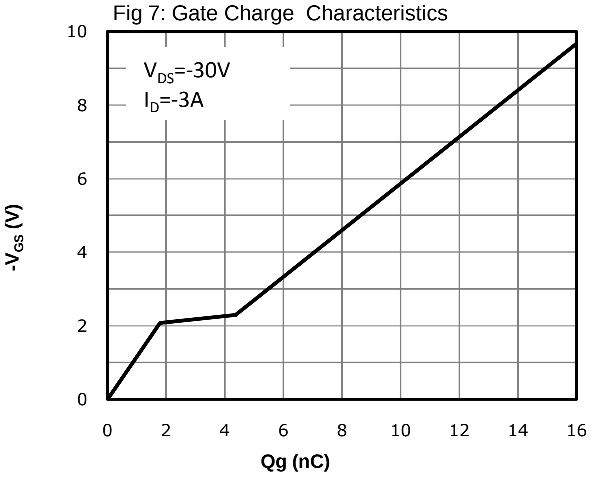


Fig 7: Gate Charge Characteristics
VDS=-30V
ID=-3A
-VGS (V)
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
Qg (nC)

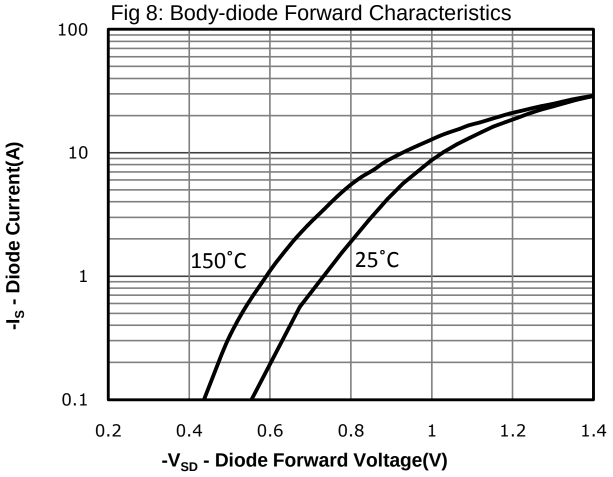


Fig 8: Body-diode Forward Characteristics
-IS - Diode Current(A)
100
10
1
0.1
150˚C
25˚C
0.2
0.4
0.6
0.8
1
1.2
1.4
-VSD - Diode Forward Voltage(V)

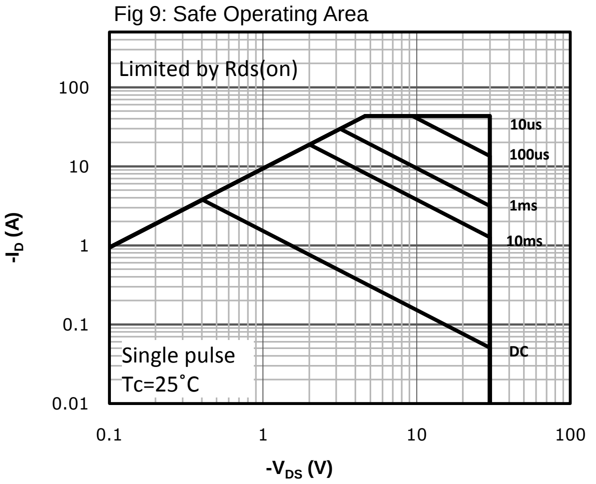
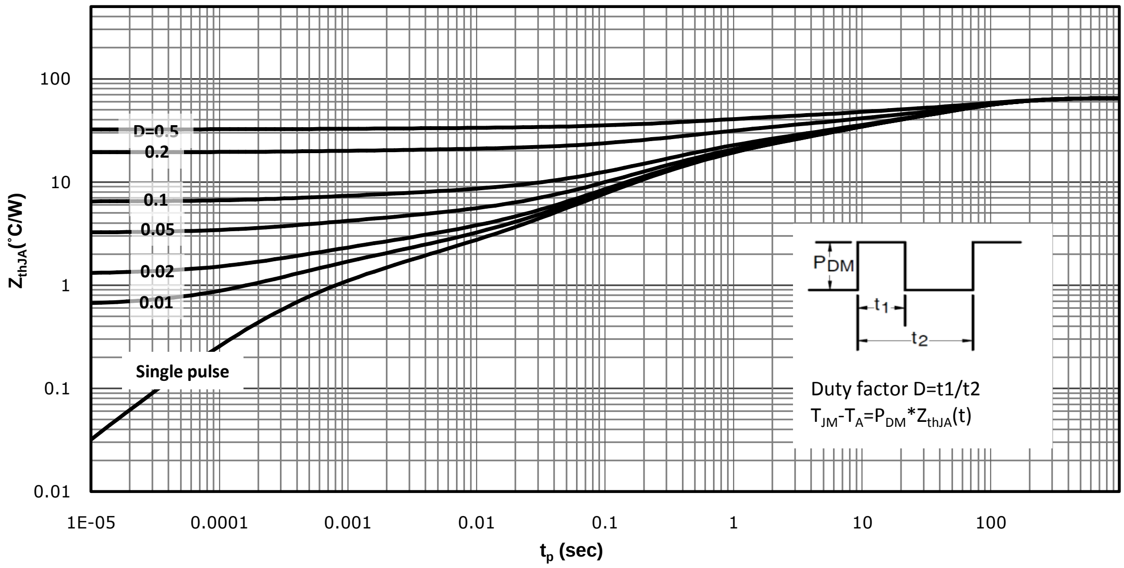
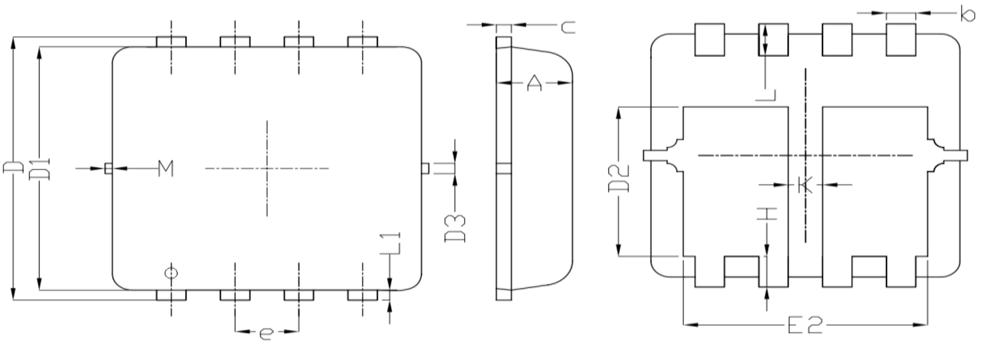


Fig 9: Safe Operating Area
Limited by Rds(on)
-ID (A)
100
10
1
0.1
0.01
10us
100us
1ms
10ms
DC
Single pulse
Tc=25˚C
0.1
1
10
100
-VDS (V)

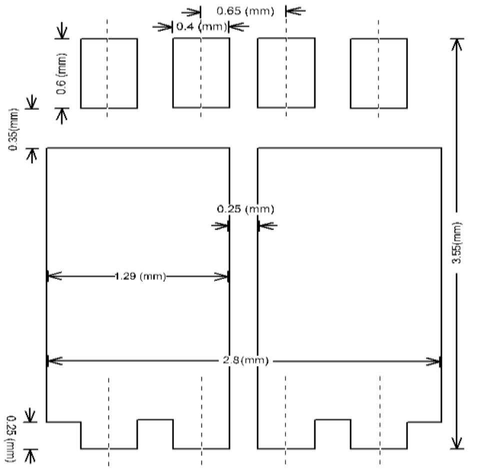
Fig 10: Max. Transient Thermal Impedance

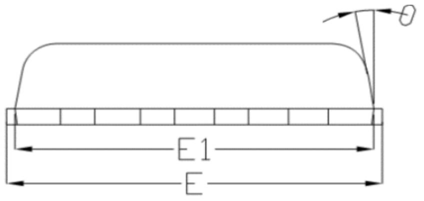


## Package Outline: PDFN3.3x3.3D



Land Pattern
(Only For Reference)





UNIT: mm

| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.70 | 0.75 | 0.80 | 0.028 | 0.030 | 0.031 |
| b | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 |
| c | 0.10 | 0.15 | 0.25 | 0.004 | 0.006 | 0.010 |
| D | 3.25 | 3.35 | 3.45 | 0.128 | 0.132 | 0.136 |
| D1 | 3.00 | 3.10 | 3.20 | 0.118 | 0.122 | 0.126 |
| D2 | 1.78 | 1.88 | 1.98 | 0.070 | 0.074 | 0.078 |
| D3 | ---- | 0.13 | ---- | ---- | 0.005 | ---- |
| E | 3.20 | 3.30 | 3.40 | 0.126 | 0.130 | 0.134 |
| E1 | 3.00 | 3.15 | 3.20 | 0.118 | 0.124 | 0.126 |
| E2 | 2.39 | 2.49 | 2.59 | 0.094 | 0.098 | 0.102 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| H | 0.30 | 0.39 | 0.50 | 0.012 | 0.015 | 0.020 |
| L | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| L1 | | 0.13 | | ---- | 0.005 | ---- |
| K | 0.30 | ---- | ---- | 0.012 | ---- | ---- |
| θ | 0° | ---- | 12° | 0° | ---- | 12° |
| M | ---- | ---- | 0.15 | ---- | ---- | 0.006 |

Note:

1. All Dimension Are In mm.
2. Package Body Sizes Exclude Mold Flash,Protrusion Or Gate Burrs.
   Mold Flash,Protrusion Or Gate Burrs Shall Not Exceed 0.10 mm Per Side.
3. Package Body Sizes Determined At The Outermost Extremes Of The Plastic Body
   Exclusive Of Mold Flash,Tie Bar Burrs,Gate Burrs And Interlead Flash,
   But Including Any Mismatch Between The Top And Bottom Of The Plastic Body.

## Revision History

| Revison | Date | Major changes |
|---|---|---|
| 2.1 | 2022/12/19 | Release of formal version |

## 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.

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.