华润微电子(重庆)有限公司

# CRSM220N10N4Q

SkyMOS4 N-MOSFET 100V, 17.5mΩ, 30A

## Features

- Uses CRM(CQ) advanced SkyMOS4 technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g$x$R_{DS(on)}$ product(FOM)
- AEC-Q101 Qualified

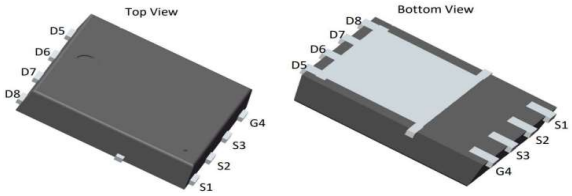
## Product Summary

| | |
|---|---|
| $V_{DS}$ | 100V |
| $R_{DS(on).typ}$ | 17.5mΩ |
| $I_D$ | 30A |

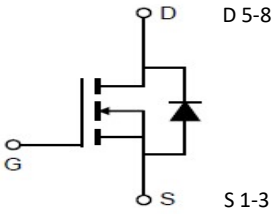
***100% DVDS Tested***
***100% Avalanche Tested***

## Applications

- DCDC Converter
- Switching applications
- UPS (Uninterrupible Power Supplies)




CRSM220N10N4Q




## Package Marking and Ordering Information

| Part # | Marking | Package | Packing | Reel Size | Tape Width | Qty |
|---|---|---|---|---|---|---|
| CRSM220N10N4Q | 220N10N4Q | PDFN5x6 | Tape&reel | N/A | N/A | 4000pcs |

## Absolute Maximum Ratings

| **Parameter** | **Symbol** | **Value** | **Unit** |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 100 | V |
| Continuous drain current<br>$T_C$ = 25°C (Silicon limit)<br>$T_C$ = 100°C (Silicon limit) | $I_D$ | <br>30<br>21 | A |
| Pulsed drain current ($T_C$ = 25°C, $t_p$ limited by $T_{jmax}$) | $I_{D\ pulse}$ | 120 | A |
| Avalanche energy, single pulse (IAS = 9A, Rg=50Ω)[1] | $E_{AS}$ | 12 | mJ |
| Gate-Source voltage | $V_{GS}$ | ±20 | V |
| Power dissipation ($T_C$ = 25°C) | $P_{tot}$ | 38 | 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:
EAS is tested at starting Tj = 25℃, L = 0.3mH, IAS =9A, VGS = 10V.


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## Thermal Resistance

| Parameter | Symbol | Max | Unit |
|---|---|---|---|
| Thermal resistance, junction – case (junction-heat spreader) | $R_{thJC}$ | 3.9 | °C/W |
| Thermal resistance, junction – ambient(min. footprint) | $R_{thJA}$ | 52 | |

## Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

| Parameter | Symbol | Value | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| **Static Characteristic** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | 100 | - | - | V | $V_{GS}$=0V, $I_D$=250uA |
| | | 100 | - | - | V | $V_{GS}$=0V, $I_D$=1mA |
| Gate threshold voltage | $V_{GS(th)}$ | 1.2 | 1.6 | 2.1 | V | $V_{DS}$=$V_{GS}$,$I_D$=250uA |
| Zero gate voltage drain current | $I_{DSS}$ | -<br>- | -<br>- | 1<br>100 | μA | $V_{DS}$=100V,$V_{GS}$=0V<br>$T_j$=25°C<br>$T_j$=125°C |
| Gate-source leakage current | $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±20V,$V_{DS}$=0V |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 17.5 | 22.0 | mΩ | VGS=10V, ID=15A<br>$T_j$=25°C |
| | | | 20.0 | 25.0 | mΩ | VGS=5V, ID=15A<br>$T_j$=25°C |
| Transconductance | $g_{fs}$ | - | 40 | - | S | VDS=5V,ID=15A |
| **Dynamic Characteristic** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 815 | - | pF | $V_{GS}$=0V, $V_{DS}$=50V, f=1MHz |
| Output Capacitance | $C_{oss}$ | - | 137 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 7 | - | | |
| Gate Total Charge | $Q_G$ | - | 16 | - | nC | $V_{GS}$=10V, $V_{DS}$=50V, $I_D$=15A,,f=1MHz |
| Gate-Source charge | $Q_{gs}$ | - | 4 | - | | |
| Gate-Drain charge | $Q_{gd}$ | - | 3 | - | | |
| Turn-on delay time | $t_{d(on)}$ | - | 5 | - | ns | $V_{GS}$=10V, $V_{DD}$=50V, $R_{G_ext}$=3Ω, ID=15A |
| Rise time | $t_r$ | - | 28 | - | | |
| Turn-off delay time | $t_{d(off)}$ | - | 15 | - | | |
| Fall time | $t_f$ | - | 8 | - | | |
| Gate resistance | $R_G$ | - | 0.8 | - | 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 | - | - | 30 | A | Tc = 25°C |
| Diode pulse current | Is pulse | - | - | 120 | A | Tc = 25°C |
| Body Diode Forward Voltage | $V_{SD}$ | - | 0.9 | 1.4 | V | $V_{GS}$=0V,$I_{SD}$=15A |
| Body Diode Reverse Recovery Time | $t_{rr}$ | - | 40 | - | ns | Vds=25V，$I_F$=15A, dI/dt=100A/μs |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | - | 40 | - | nC | |


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## Typical Performance Characteristics

Fig 1: Output Characteristics

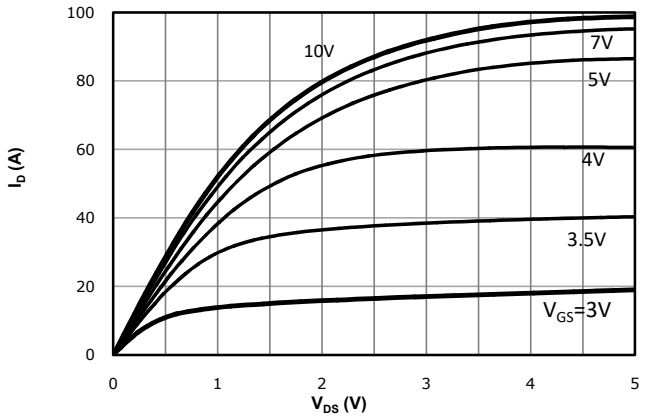



Fig 2: Transfer Characteristics

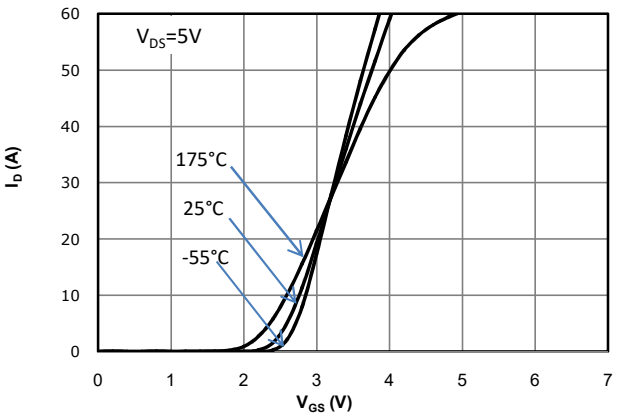



Fig 3: Rds(on) vs Drain Current and Gate Voltage

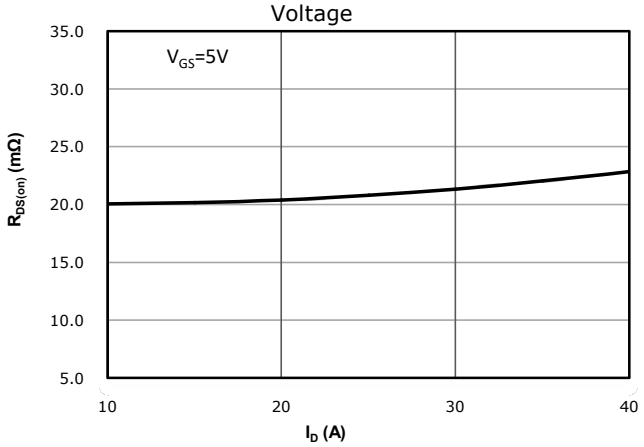



Fig 4: Rds(on) vs Gate Voltage

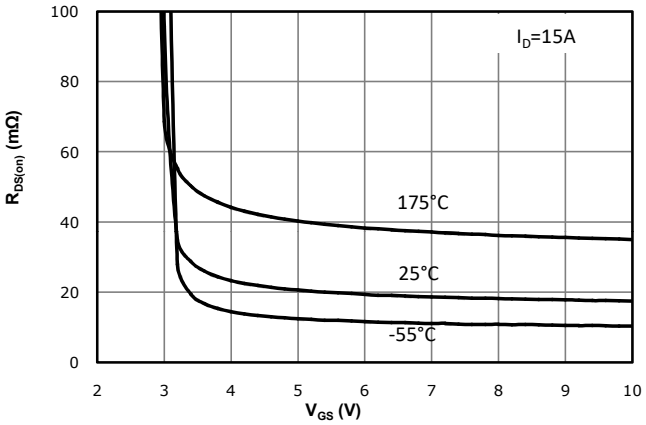



Fig 5: Rds(on) vs. Temperature

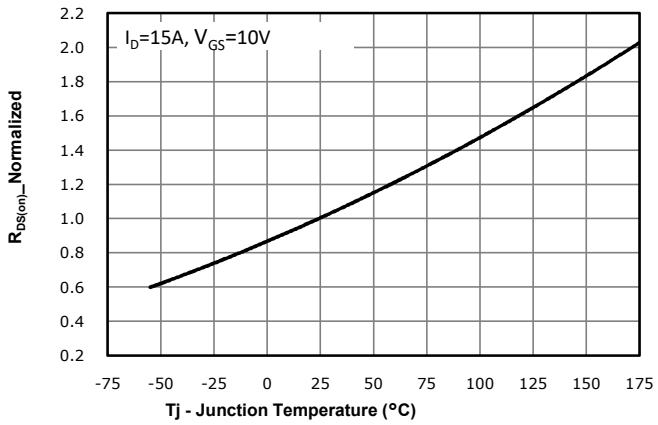
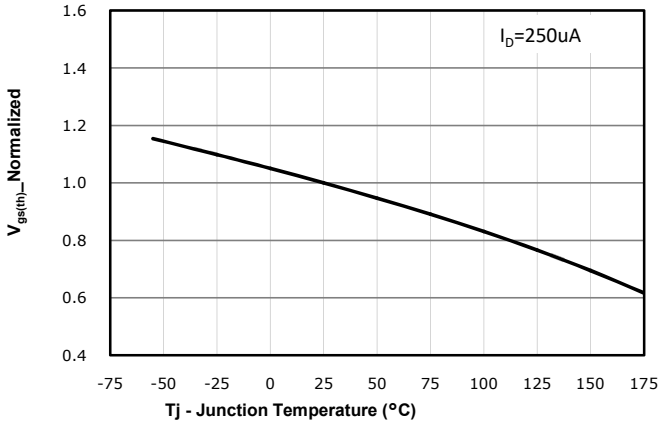



Fig 6: Vgs(th) vs. Temperature





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Fig 7: BVdss vs. Temperature

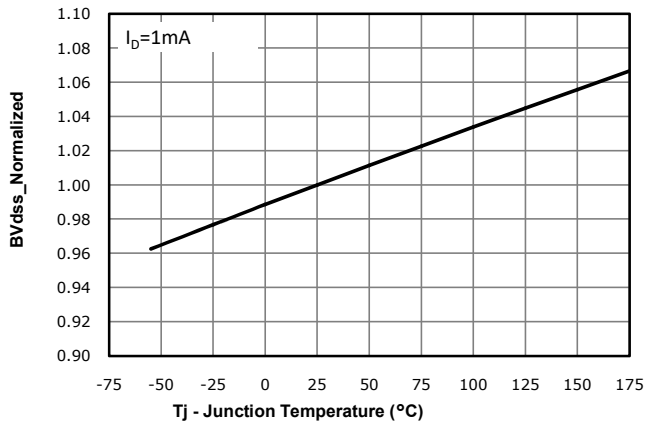



Fig 8: Capacitance Characteristics

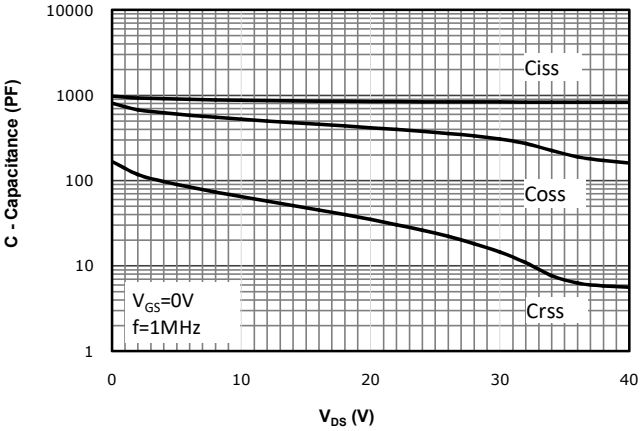



Fig 9: Gate Charge Characteristics

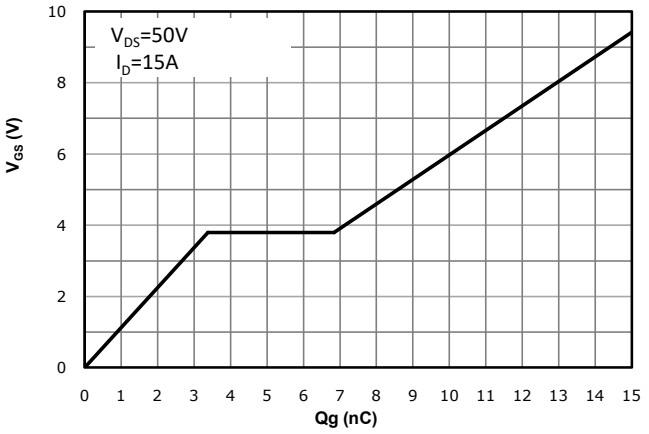



Fig 10: Body-diode Forward Characteristics

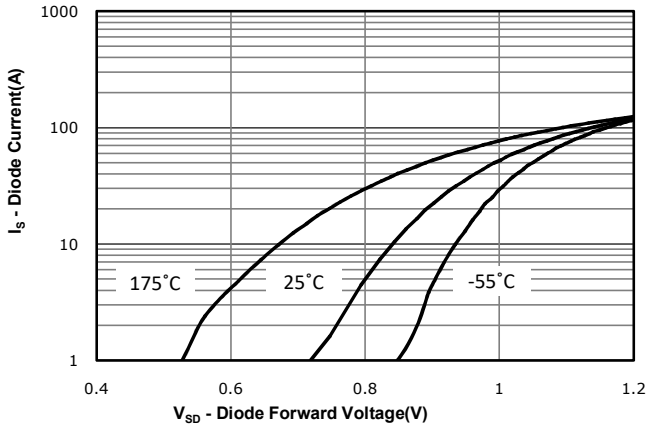



Fig 11: Power Dissipation

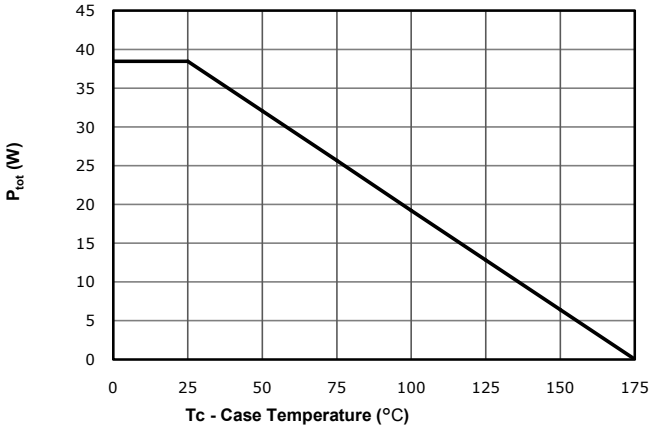
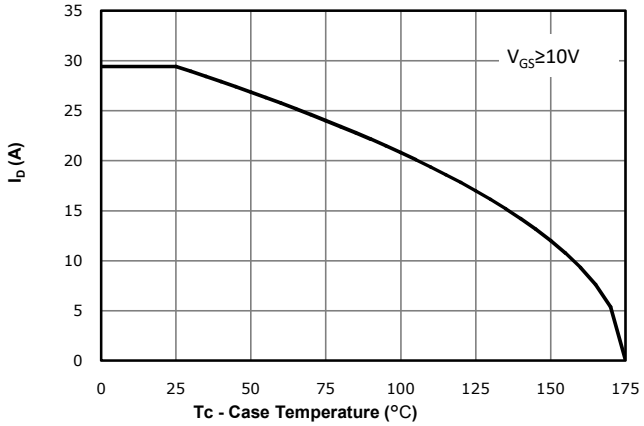



Fig 12: Drain Current Derating





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Fig 13: Safe Operating Area

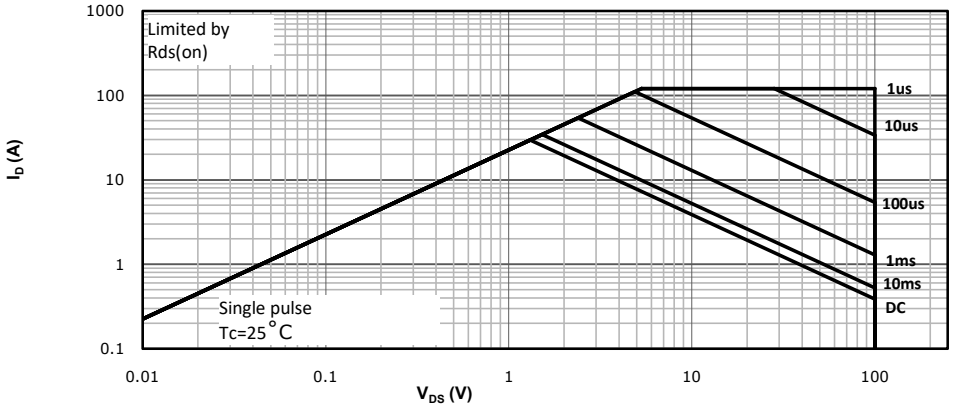
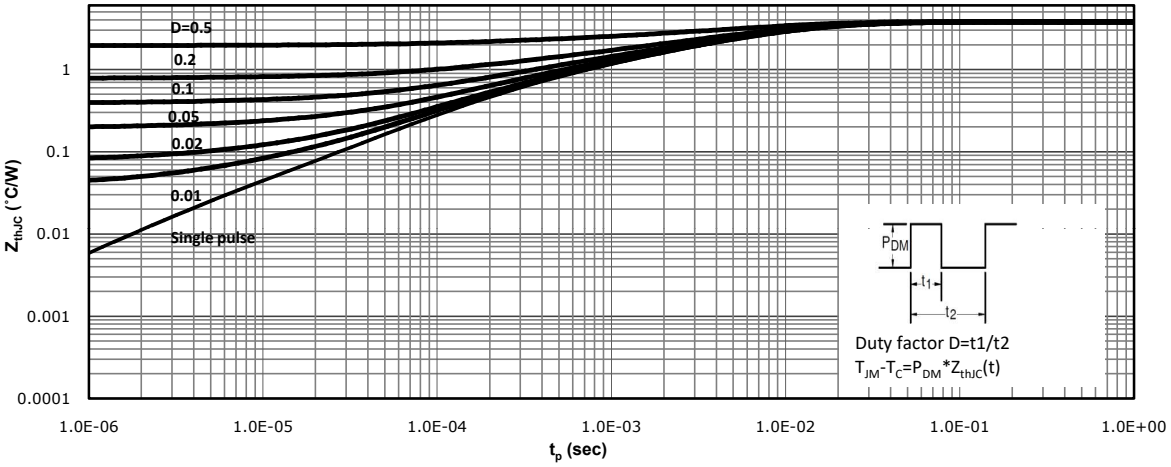



Fig 14: Max. Transient Thermal Impedance

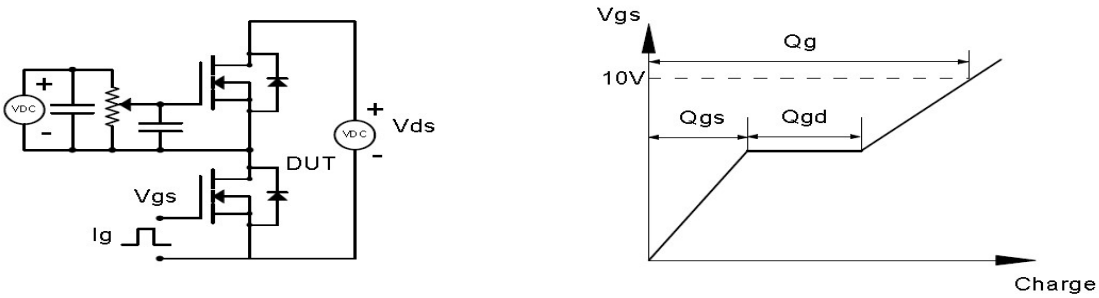




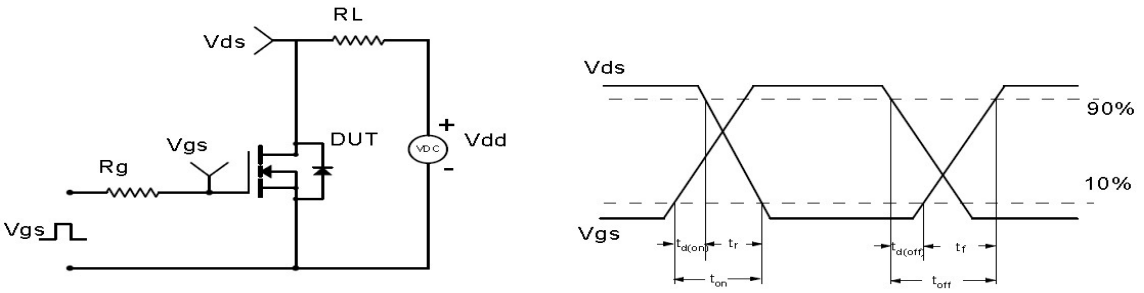
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## Test Circuit & Waveform

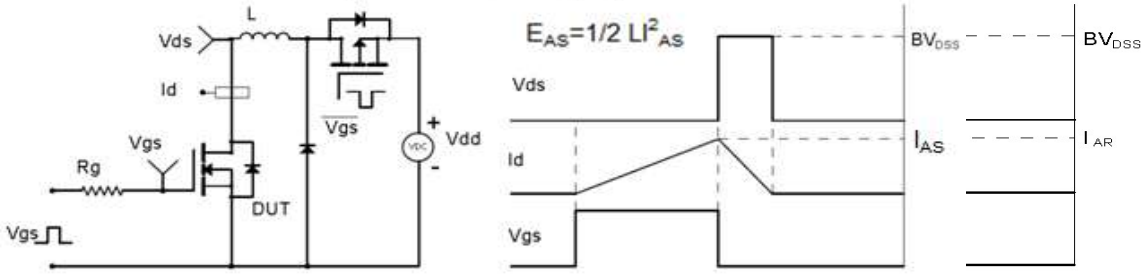
Gate Charge Test Circuit & Waveform



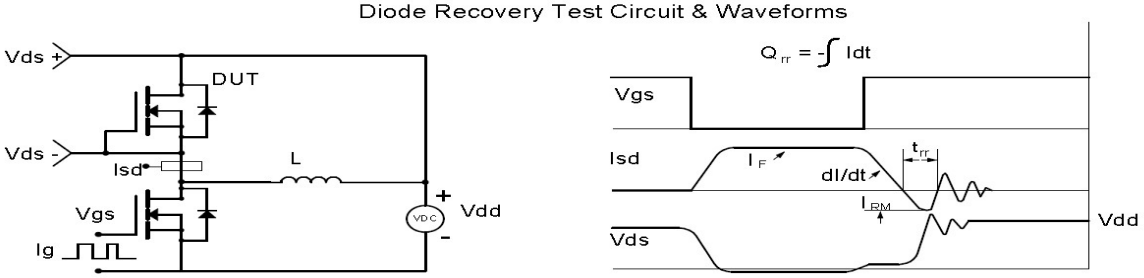

Resistive Switching Test Circuit & Waveforms




Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



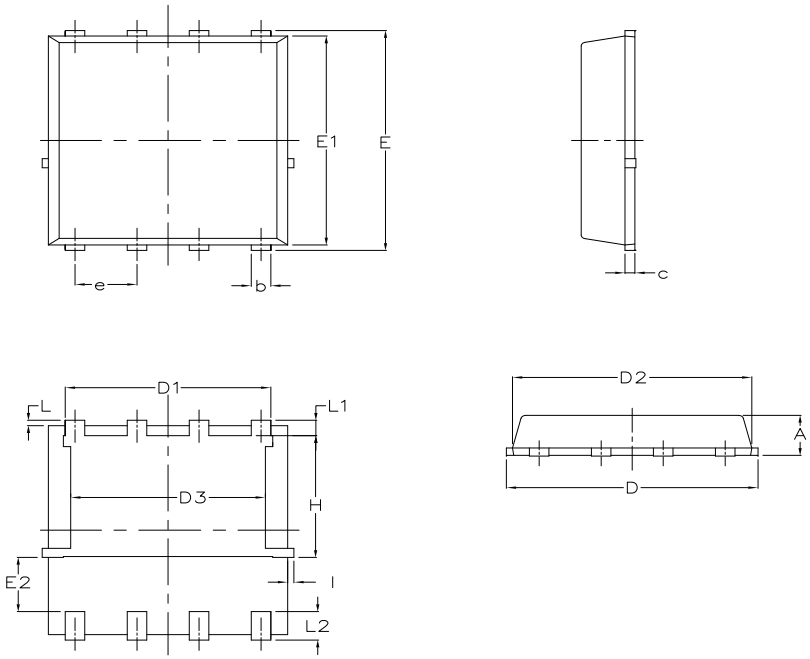

Diode Recovery Test Circuit & Waveforms





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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
X —Assembly location code
AAAAAAA —Assembly lot NO. last 7 digits
Y —Bin code


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## Revision History

| Revision | Date | Major changes |
|---|---|---|
| 1.0 | 2024/7/3 | Release of preliminary version. |
| 1.1 | 2025/3/17 | 1.Update package name.<br>2.Delete 25°C Package limit.<br>3.Update Fig2/5/6/7.<br>4.Delete Dynamic Characteristic parameters spec. |

## Disclaimer

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