华润微电子（重庆）有限公司

# CRSM060N06L2

SkyMOS2 N-MOSFET 63V, 5.3mΩ, 60A

## Features

- Uses CRM(CQ) advanced SkyMOS2 technology
- Extremely low on-resistance $R_{DS(on)}$
- Excellent $Q_g$x$R_{DS(on)}$ product(FOM)
- Qualified according to JEDEC criteria

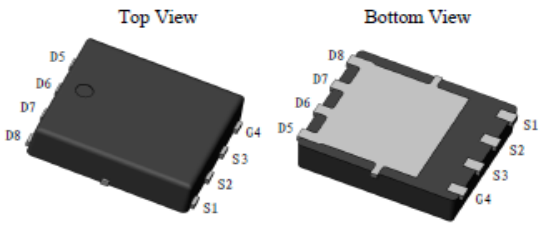
## Product Summary

| | |
|---|---|
| $V_{DS}$ | 63V |
| $R_{DS(on)@10V\ typ}$ | 5.3mΩ |
| $R_{DS(on)@4.5V\ typ}$ | 7.3mΩ |
| $I_D$ | 60A |

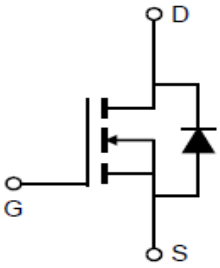
## Applications

- Synchronous Rectification for AC/DC Quick Charger
- Battery management
- UPS (Uninterrupible Power Supplies)

***100% Avalanche Tested***




CRSM060N06L2




## Package Marking and Ordering Information

| Part # | Marking | Package | Packing | Reel Size | Tape Width | Qty |
|---|---|---|---|---|---|---|
| CRSM060N06L2 | SM060N06L2 | DFN5X6 | Tape&Reel | N/A | N/A | 5000pcs |

## Absolute Maximum Ratings

| **Parameter** | **Symbol** | **Value** | **Unit** |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 63 | V |
| Continuous drain current<br>$T_C$ = 25°C (Package limit)<br>$T_C$ = 25°C (Silicon limit)<br>$T_C$ = 100°C (Silicon limit) | $I_D$ | <br>60<br>86<br>55 | A |
| Pulsed drain current ($T_C$ = 25°C, $t_p$ limited by $T_{jmax}$) | $I_{D\ pulse}$ | 240 | A |
| Avalanche energy, single pulse (L=0.3mH, Rg=25Ω)[1] | $E_{AS}$ | 63 | mJ |
| Gate-Source voltage | $V_{GS}$ | ±20 | V |
| Power dissipation ($T_C$ = 25°C ) | $P_{tot}$ | 78.1 | W |
| Operating junction and storage temperature | $T_j$ , $T_{stg}$ | -55...+150 | °C |

Notes:1.EAS was tested at Tj = 25℃, ID = 20.5A.

## Thermal Resistance

| Parameter | Symbol | Max | Unit |
|---|---|---|---|
| Thermal resistance, junction – case | $R_{thJC}$ | 1.60 | °C/W |
| Thermal resistance, junction – ambient | $R_{thJA}$ | 47.0 | |

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

| Parameter | Symbol | Value | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| **Static Characteristic** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | 63 | - | - | V | $V_{GS}$=0V, $I_D$=250μA |
| Gate threshold voltage | $V_{GS(th)}$ | 1.2 | 1.7 | 2.2 | V | $V_{DS}$=$V_{GS}$,$I_D$=250μA |
| Zero gate voltage drain current | $I_{DSS}$ | -<br>- | 0.02<br>- | 1<br>10 | μA | $V_{DS}$=60V,$V_{GS}$=0V<br>$T_j$=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 | $R_{DS(on)}$ | - | 5.3 | 6.4 | mΩ | $V_{GS}$=10V, $I_D$=30A |
| | | - | 7.3 | - | | $V_{GS}$=4.5V, $I_D$=24A |
| | | | 7.3 | 9.1 | | $V_{GS}$=5V, $I_D$=24A |
| Transconductance | $g_{fs}$ | - | 98 | - | S | $V_{DS}$=5V,$I_D$=30A |
| **Dynamic Characteristic** | | | | | | |
| Thermal change induce D-S voltage shift | DVDS | 40 | - | 100 | mV | $V_{DS}$=20V IM=10mA, ID=0.72A PT=10ms, DT=50μs |
| Input Capacitance | $C_{iss}$ | - | 1666 | - | pF | $V_{GS}$=0V, $V_{DS}$=30V, f=1MHz |
| Output Capacitance | $C_{oss}$ | - | 510 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 34 | - | | |
| Gate Total Charge | $Q_G$ | - | 28 | - | nC | $V_{GS}$=10V, $V_{DS}$=30V, $I_D$=30A, f=1MHz |
| Gate-Source charge | $Q_{gs}$ | - | 7.1 | - | | |
| Gate-Drain charge | $Q_{gd}$ | - | 4.3 | - | | |
| Turn-on delay time | $t_{d(on)}$ | - | 9.7 | - | ns | $V_{GS}$=10V, $V_{DD}$=30V, $R_{G\_ext}$=2.7Ω |
| Rise time | $t_r$ | - | 72 | - | | |
| Turn-off delay time | $t_{d(off)}$ | - | 24.8 | - | | |
| Fall time | $t_f$ | - | 87 | - | | |
| Gate resistance | $R_G$ | - | 2 | - | 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 | V | $V_{GS}$=0V,$I_{SD}$=30A |
| Body Diode Reverse Recovery Time | $t_{rr}$ | - | 27 | - | ns | $I_F$=30A, dI/dt=300A/μs |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | - | 49 | - | nC | |

## Typical Performance Characteristics

Fig 1: Output Characteristics

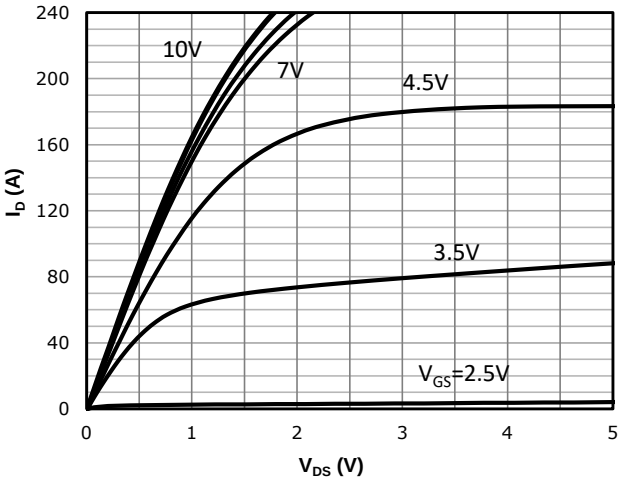



Fig 2: Transfer Characteristics

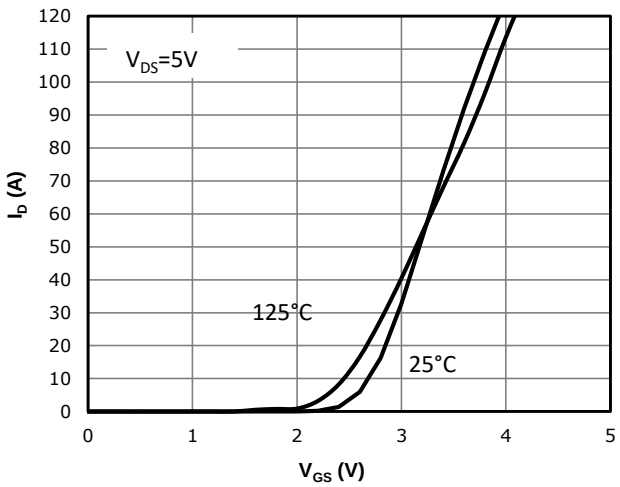



Fig 3: Rds(on) vs Drain Current and Gate Voltage

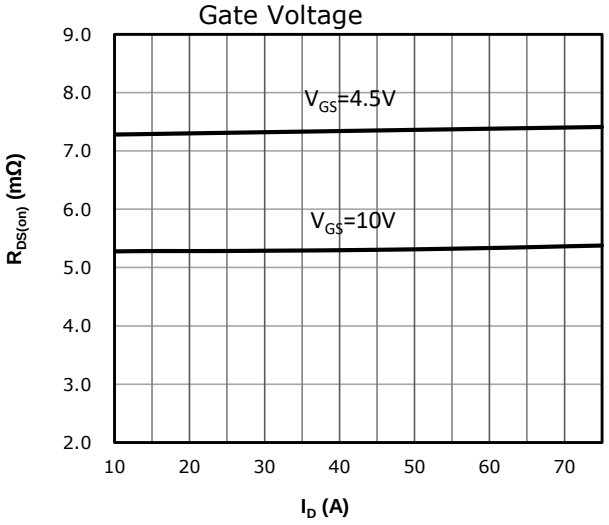



Fig 4: Rds(on) vs Gate Voltage

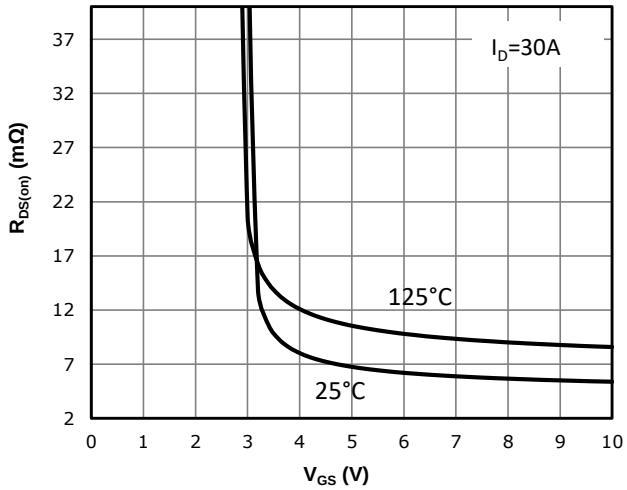



Fig 5: Rds(on) vs. Temperature

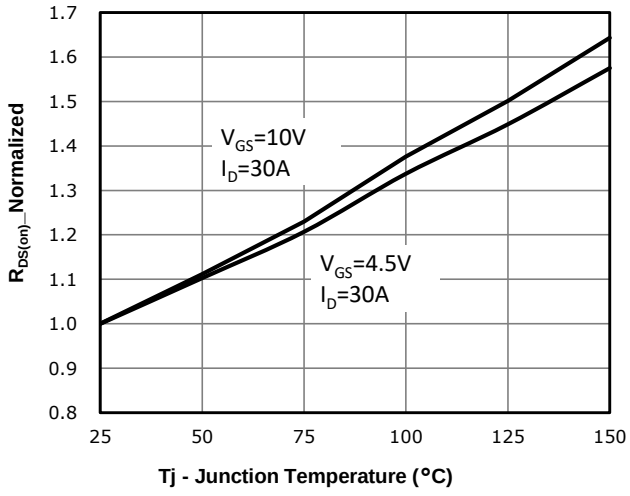



Fig 6: Capacitance Characteristics

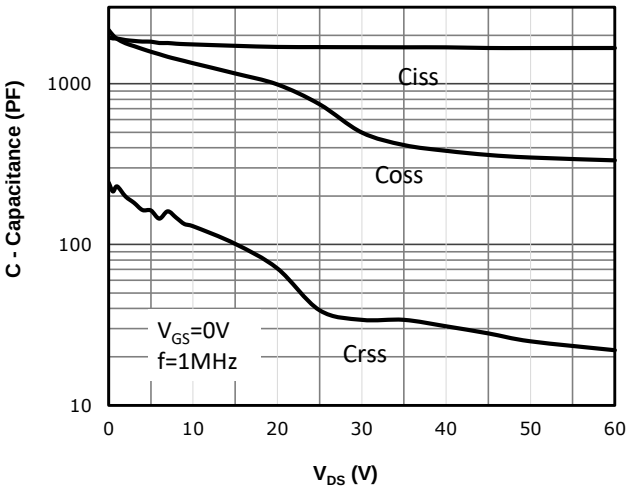


Fig 7: Gate Charge Characteristics

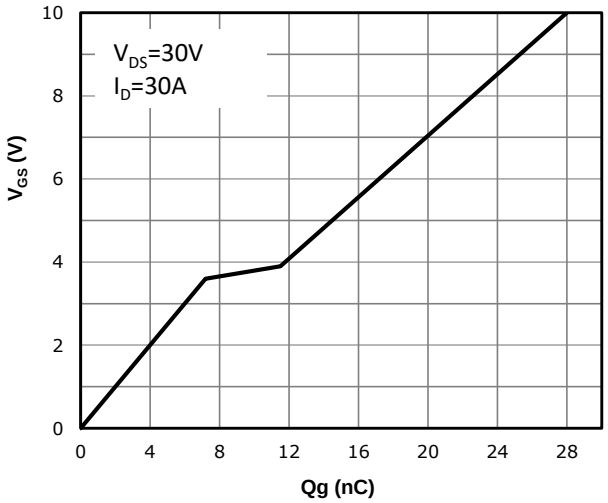



Fig 8: Body-diode Forward Characteristics

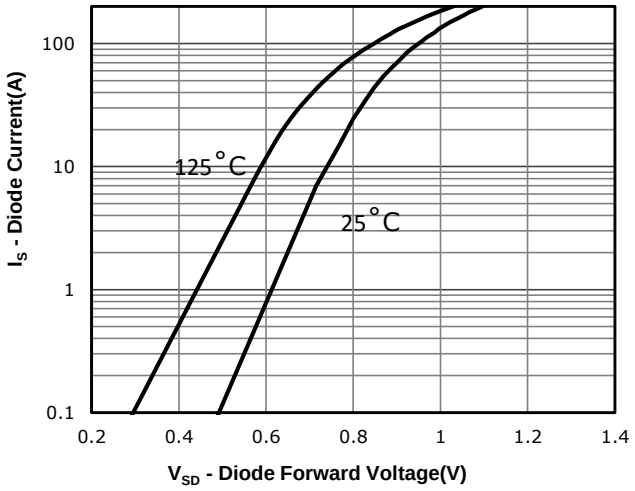



Fig 9: Power Dissipation

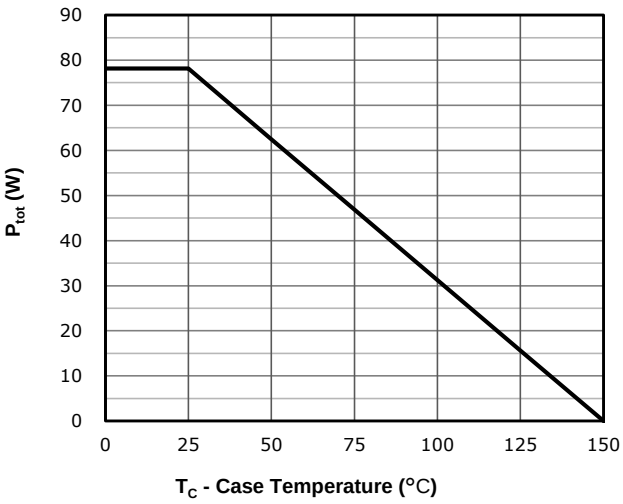



Fig 10: Drain Current Derating

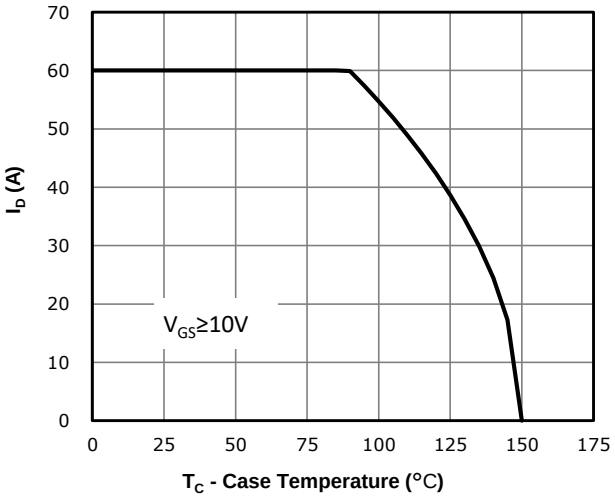



Fig 11: Safe Operating Area

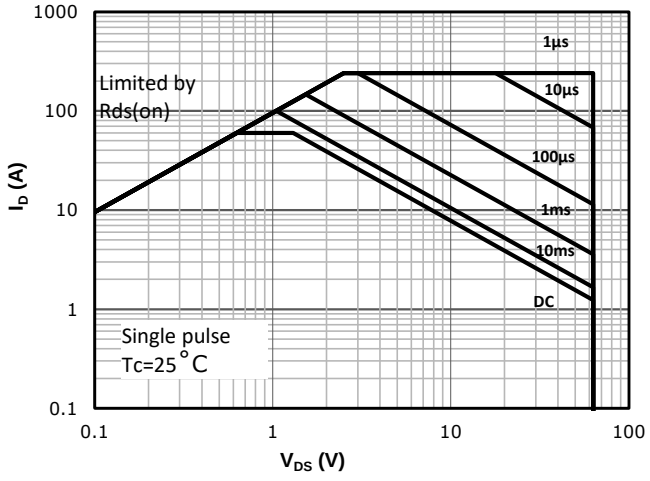



Fig 12: Vgs(th) vs. Temperature

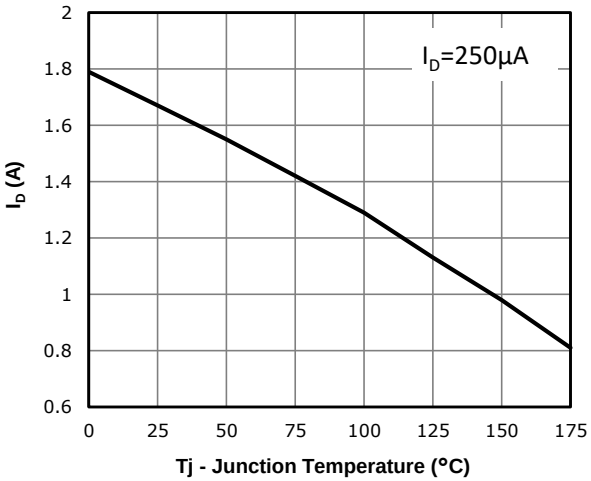
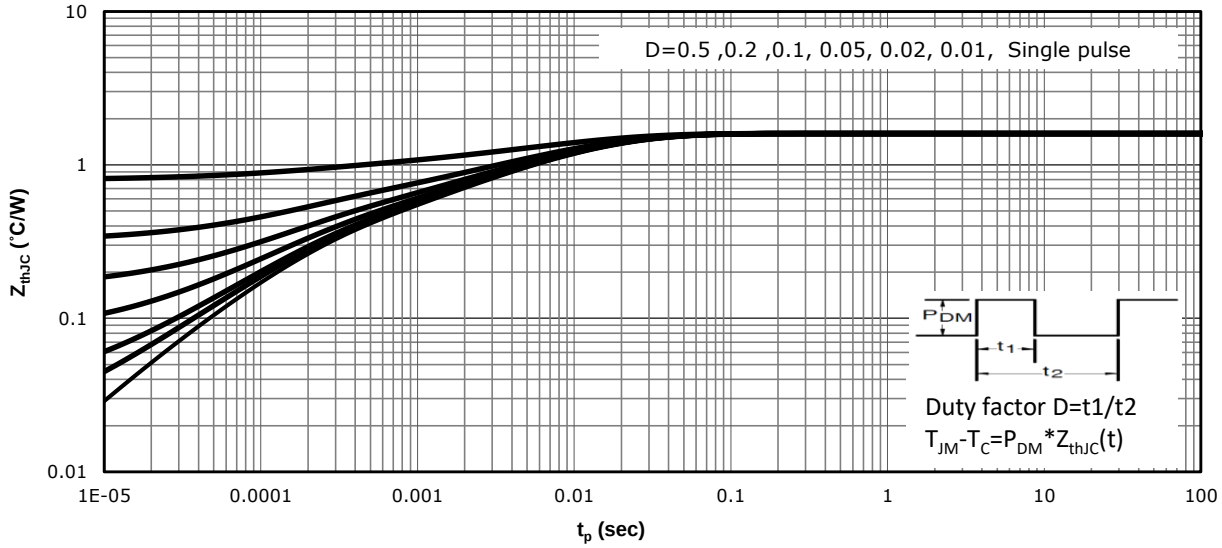
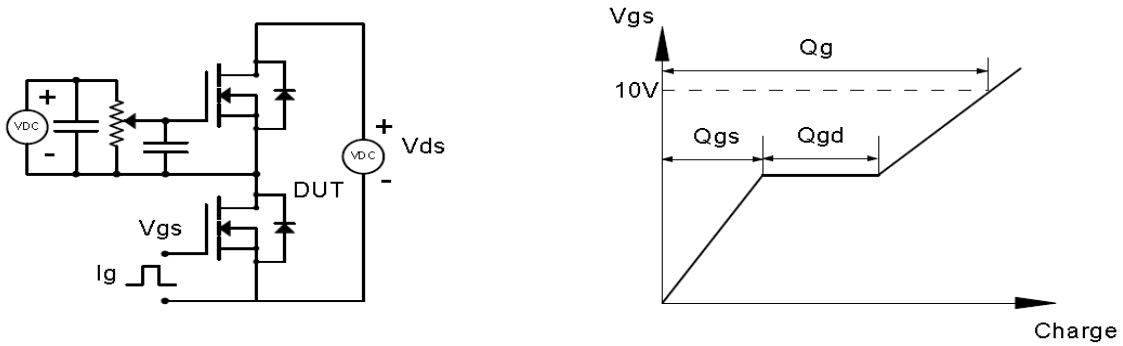


Fig 12: Max. Transient Thermal Impedance

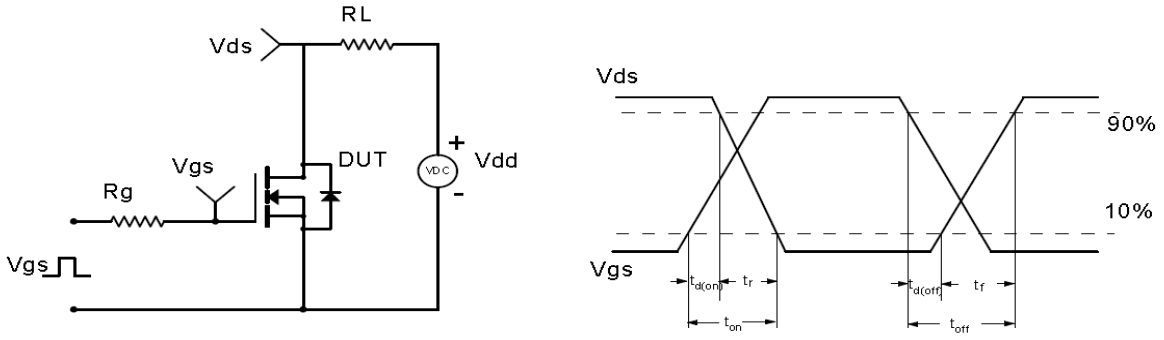


## Test Circuit & Waveform

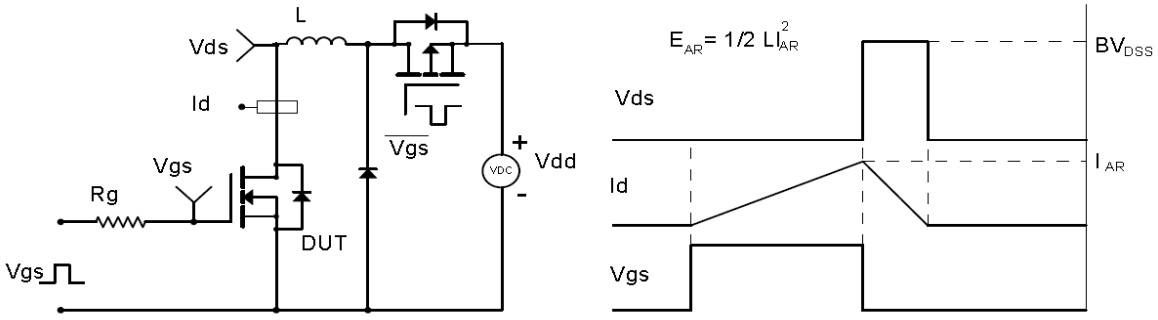
Gate Charge Test Circuit & Waveform



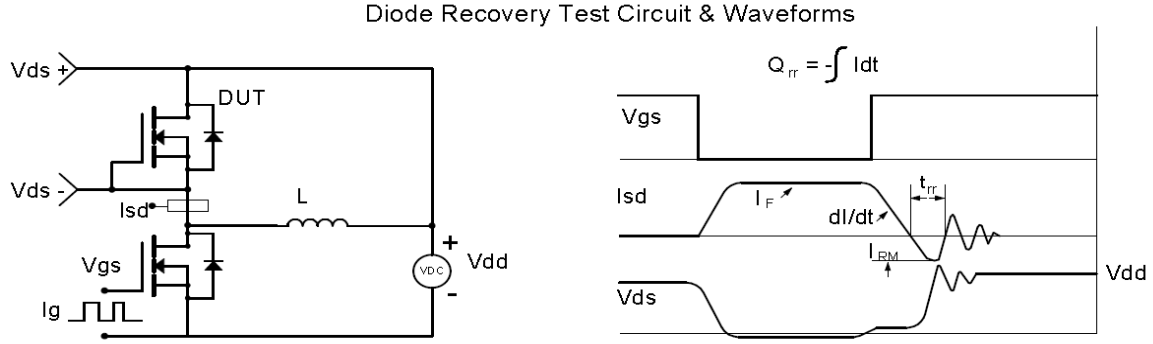

Resistive Switching Test Circuit & Waveforms



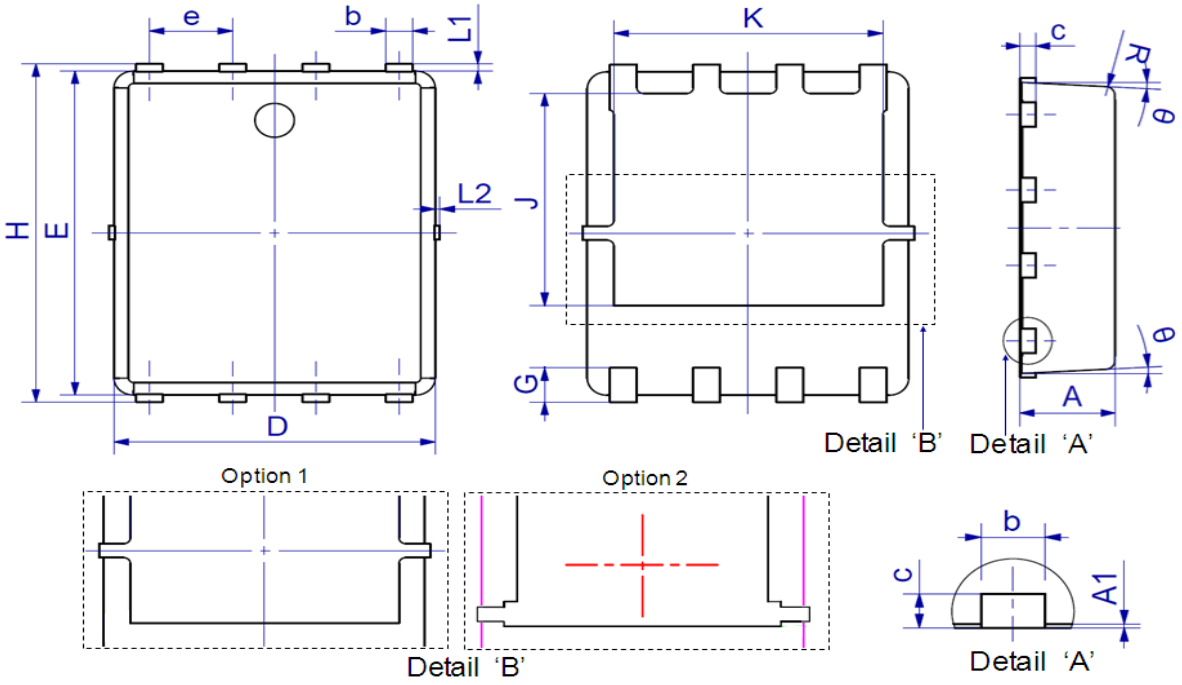

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



Package Outline: DFN5X6




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.80 | 1.20 | 0.031 | 0.047 |
| A1 | 0.00 | 0.05 | 0.000 | 0.002 |
| b | 0.30 | 0.51 | 0.012 | 0.020 |
| c | 0.15 | 0.35 | 0.006 | 0.014 |
| D | 4.80 | 5.40 | 0.189 | 0.213 |
| e | 1.27 BSC | | 0.050 BSC | |
| E | 5.66 | 6.06 | 0.223 | 0.239 |
| G | 0.30 | 0.71 | 0.012 | 0.028 |
| H | 5.90 | 6.35 | 0.232 | 0.250 |
| J | 3.32 | 3.92 | 0.131 | 0.154 |
| K | 3.61 | 4.25 | 0.142 | 0.167 |
| L1 | 0.05 | 0.25 | 0.002 | 0.010 |
| L2 | 0.00 | 0.15 | 0.000 | 0.006 |
| R | 0.25 REF | | 0.010 REF | |
| θ | 0° | 12° | 0° | 12° |

## Revision History

| Revison | Date | Major changes |
|---|---|---|
| 1.0 | 2019/1/3 | Release of formal version. |
| 1.1 | 2019/5/13 | BVDS minimum value change & outline size revise |
| 2.0 | 2019/6/25 | Igss ± Supplement |
| 3.0 | 2023/6/30 | Add DVDS&RDS$_{(on)}$@5V,RthJL modified to RthJC |
| 4.0 | 2024/9/5 | Add Fig 12: Vgs(th) vs. Temperature |

## 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.