华润微电子(重庆)有限公司

# CRJS140N65G2F

SJMOS N-MOSFET 650V, 110mΩ, 24A

## Features

- CRM(CQ) Super_Junction technology
- Much lower Ron*A performance for On-state efficiency
- Better efficiency due to very low FOM
- Ultra-fast body diode
- Qualified for industrial grade applications according to JEDEC

## Product Summary

| | |
|---|---|
| $V_{DS,min}$ | 650V |
| $R_{DS(on),typ}$ | 110mΩ |
| $I_D$ | 24A |

## Applications

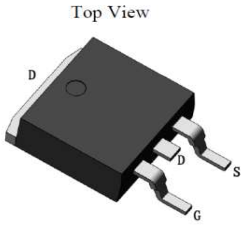
- LED/LCD/PDP TV and monitor Lighting
- Solar/Renewable/UPS-Micro Inverter System
- Charger
- Power Supply

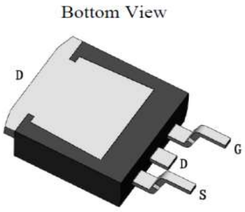
***100% DVDS Tested***

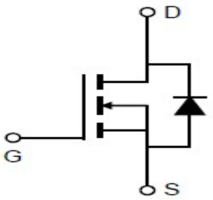
***100% Avalanche Tested***

RoHS

H F







## Package Marking and Ordering Information

| Part # | Marking | Package | Packing | Reel Size | Tape Width | Qty |
|---|---|---|---|---|---|---|
| CRJS140N65G2F | CRJS140N65G2F | TO-263 | Tape&Reel | N/A | N/A | 1000pcs |

## Absolute Maximum Ratings

| **Parameter** | **Symbol** | **Value** | **Unit** |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 650 | V |
| Continuous drain current 1) | $I_D$ | | A |
| $T_C$ = 25°C | | 24 | |
| $T_C$ = 100°C | | 15 | |
| Pulsed drain current 2)($T_C$ = 25°C, $t_p$ limited by $T_{j,max}$) | $I_{D,pulse}$ | 73 | A |
| Avalanche energy, single pulse (L=30mH) | $E_{AS}$ | 300 | mJ |
| MOSFET dv/dt ruggedness | dv/dt | 50 | V/ns |
| Gate-Source voltage | $V_{GS}$ | ±30 | V |
| Power dissipation ($T_C$ = 25°C) | $P_{tot}$ | 198 | W |
| Continuous diode forward current($T_C$ = 25°C) | $I_S$ | 24 | A |
| Diode pulse current 2) ($T_C$ = 25°C) | $I_{S,pulse}$ | 73 | A |
| Recovery diode dv/dt 3) | dv/dt | 50 | V/ns |
| Operating junction and storage temperature | $T_j$ , $T_{stg}$ | -55...+150 | °C |

1) Limited by Tj,max. Maximum Duty Cycle D = 0.50

2) Pulse width $t_p$ limited by $T_{j,max}$

3) Identical low side and high side switch with identical $R_g$

## Thermal Resistance

| Parameter | Symbol | Value | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| Thermal resistance, junction – case | $R_{thJC}$ | - | 0.45 | 0.63 | °C/W | |
| Thermal resistance, junction – ambient | $R_{thJA}$ | - | - | 97 | °C/W | |

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

| Parameter | Symbol | Value | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| **Static Characteristic** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | 650 | - | - | V | $V_{GS}$=0V,$I_D$=250μA |
| Gate threshold voltage | $V_{GS(th)}$ | 3.2 | - | 4.6 | V | $V_{DS}$=$V_{GS}$,$I_D$=250μA |
| Zero gate voltage drain current | $I_{DSS}$ | - | - | 5 | μA | $V_{DS}$=650V,$V_{GS}$=0V<br>$T_j$=25°C |
| | | - | 220 | - | | $T_j$=150°C |
| Gate-source leakage current | $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±30V,$V_{DS}$=0V |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 110 | 140 | mΩ | $V_{GS}$=10V,$I_D$=11A,<br>$T_j$=25°C |
| | | - | 250 | - | | $T_j$=150°C |
| Transconductance | $g_{fs}$ | - | 16.5 | - | S | $V_{DS}$=20V,$I_D$=11A |
| **Dynamic Characteristic** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 1595 | - | pF | $V_{GS}$=0V, $V_{DS}$=100V, f=1MHz |
| Output Capacitance | $C_{oss}$ | - | 90 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 1.6 | - | | |
| Gate Total Charge | $Q_g$ | - | 46 | - | nC | $V_{GS}$=10V, $V_{DS}$=480V, $I_D$=11A |
| Gate-Source charge | $Q_{gs}$ | - | 14 | - | | |
| Gate-Drain charge | $Q_{gd}$ | - | 24 | - | | |
| Gate plateau voltage | $V_{plateau}$ | - | 7.7 | - | V | |
| Turn-on delay time | $t_{d(on)}$ | - | 60 | - | ns | $V_{GS}$=10V, $I_D$=11A, $V_{DS}$=400V, $R_g$=27Ω |
| Rise time | $t_r$ | - | 61 | - | | |
| Turn-off delay time | $t_{d(off)}$ | - | 140 | - | | |
| Fall time | $t_f$ | - | 31 | - | | |
| Gate resistance | $R_{g,int}$ | - | 10 | - | Ω | f=1MHz |

## Body Diode Characteristic

| Parameter | Symbol | Value | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| Body Diode Forward Voltage | $V_{SD}$ | 0.7 | 0.86 | 1.1 | V | $V_{GS}$=0V,$I_{SD}$=11A |
| Body Diode Reverse Recovery Time | $t_{rr}$ | - | 120 | - | ns | $I_{SD}$=11A<br>$di_F/dt$=100A/μs<br>$V_{DS}$=400V |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | - | 0.63 | - | μC | |

## Typical Performance Characteristics

**Fig 1. Output Characteristics ($T_j$=25℃)**

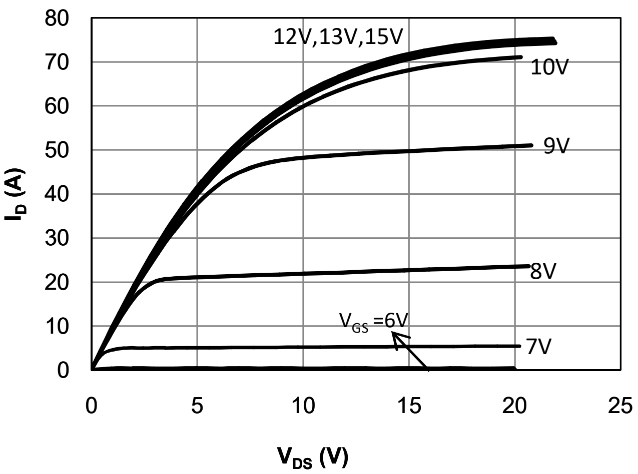


**Fig 2. Output Characteristics ($T_j$=150℃)**

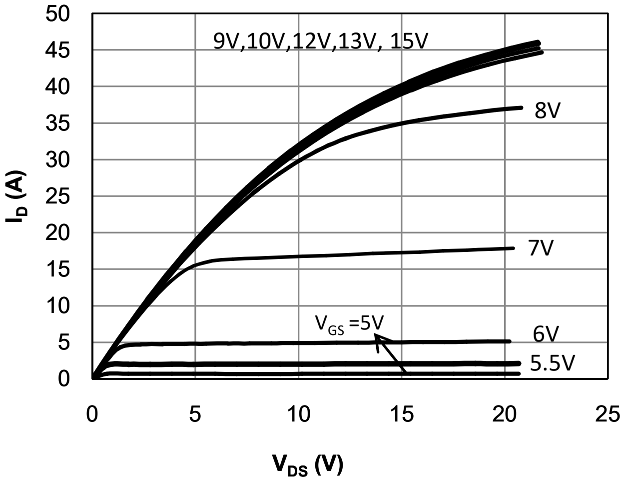


**Fig 3: Transfer Characteristics**

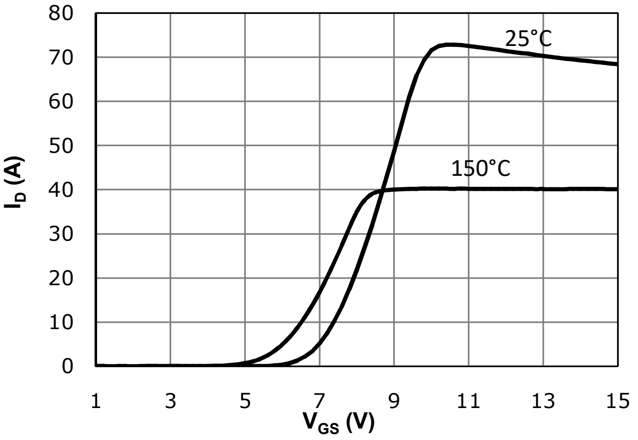


**Fig 4: $V_{TH}$ vs. $T_j$ Temperature Characteristics**

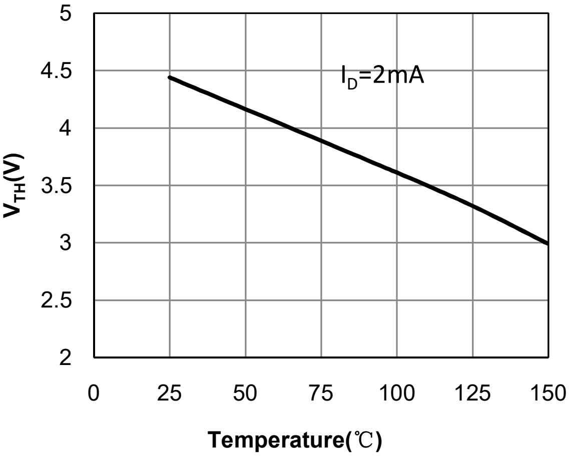


**Fig 5: $R_{DS(on)}$ vs. $I_{DS}$ Characteristics($T_j$=25℃)**

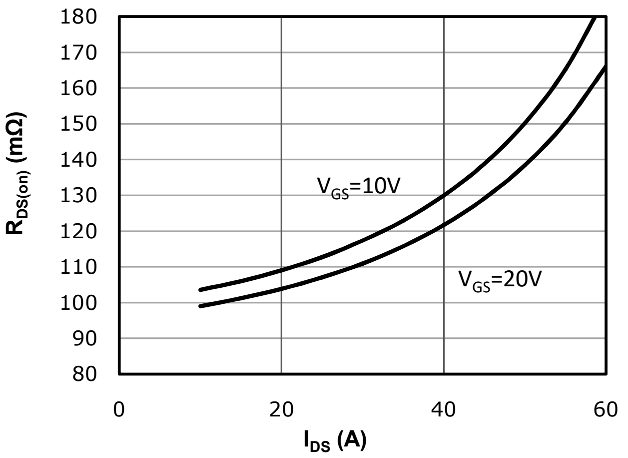


**Fig 6: $R_{DS(on)}$ vs. Temperature**

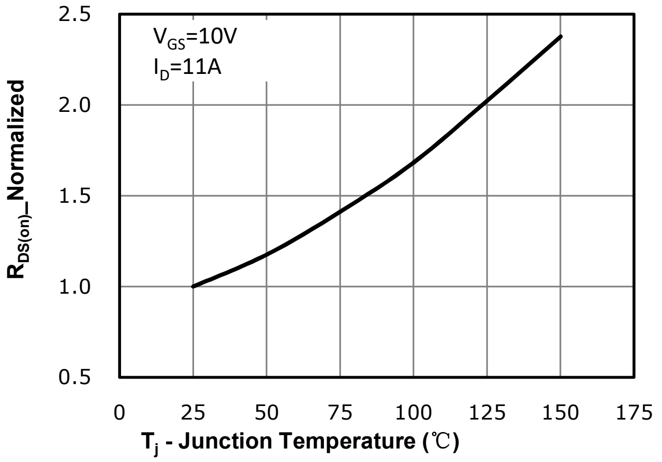


**Fig 7: $BV_{DSS}$ vs. Temperature**

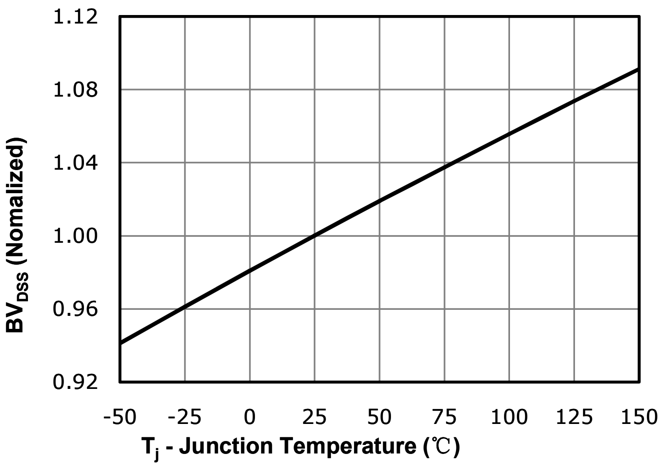


**Fig 8: $R_{DS(on)}$ vs. Gate Voltage**

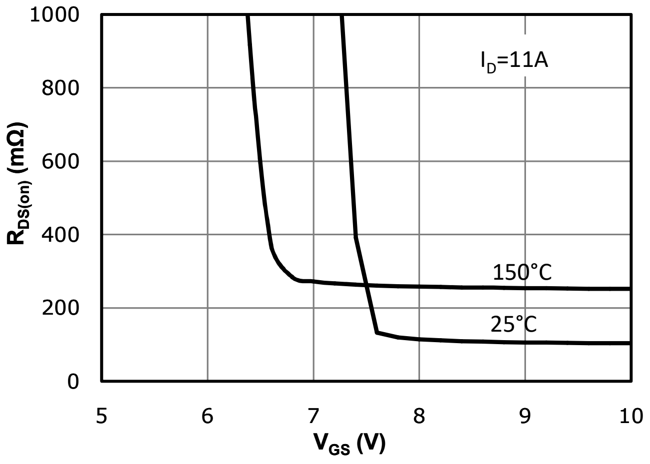


**Fig 9: Body-diode Forward Characteristics**

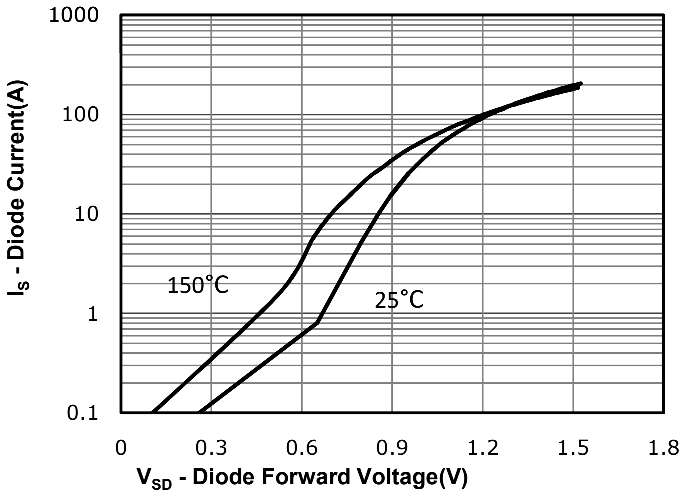


**Fig 10: Gate Charge Characteristics**

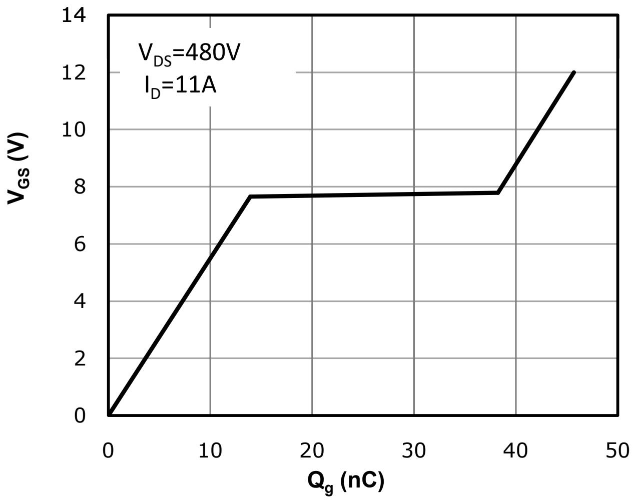


**Fig 11: Capacitance Characteristics**

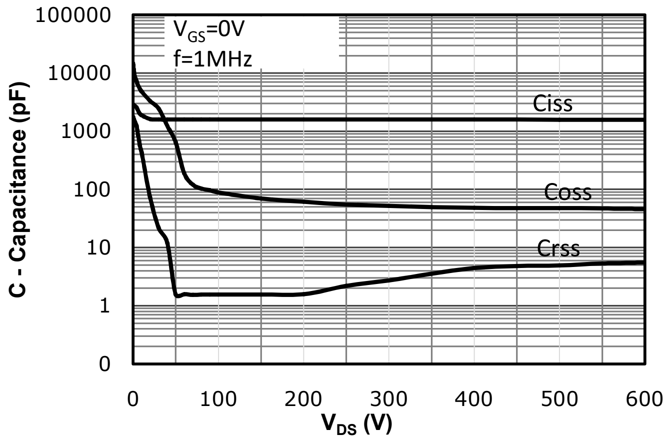


**Fig 12: Safe Operating Area**

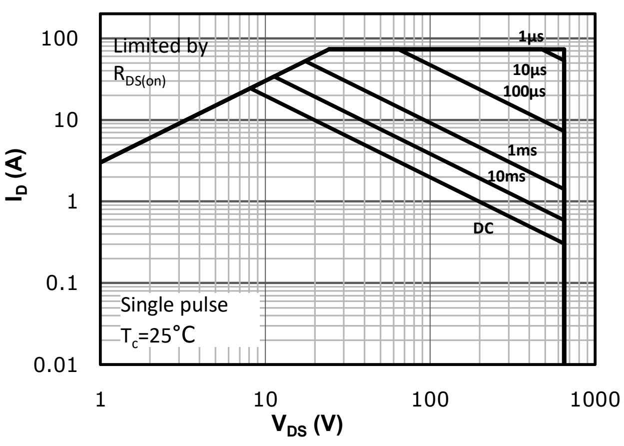
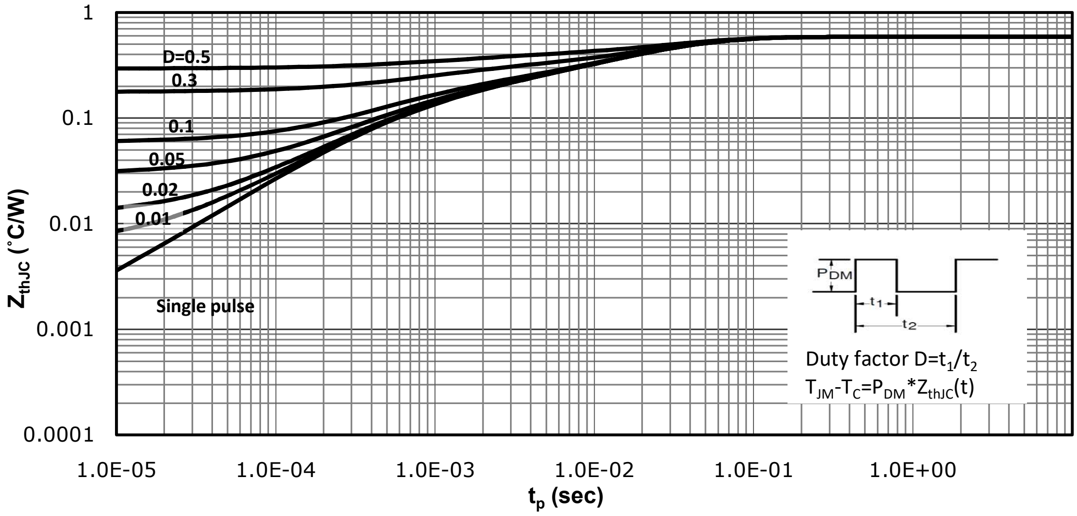
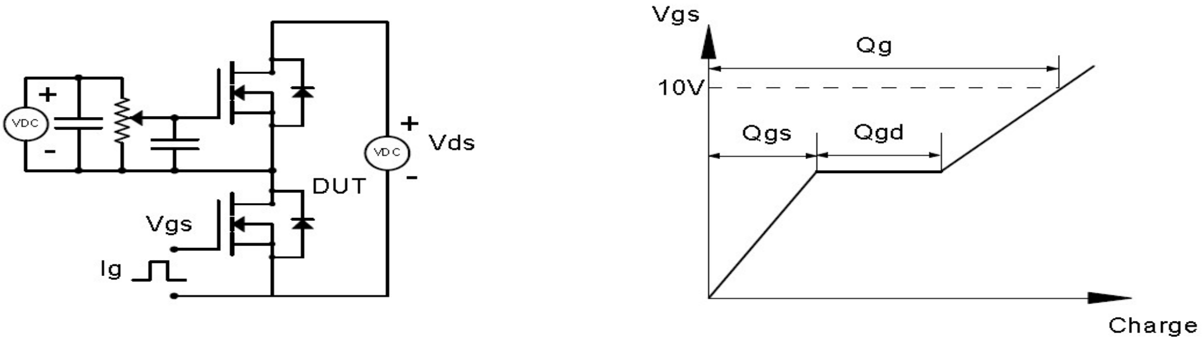


**Fig 13: Max. Transient Thermal Impedance**

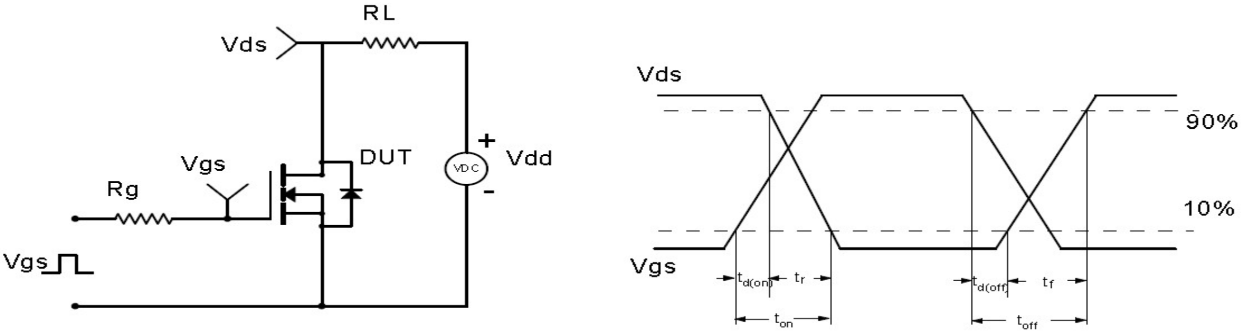


## Test Circuit & Waveform

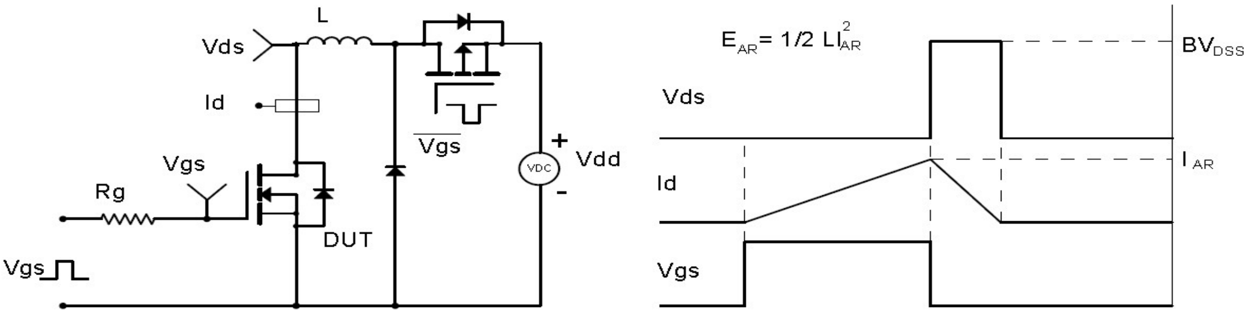
Gate Charge Test Circuit & Waveform



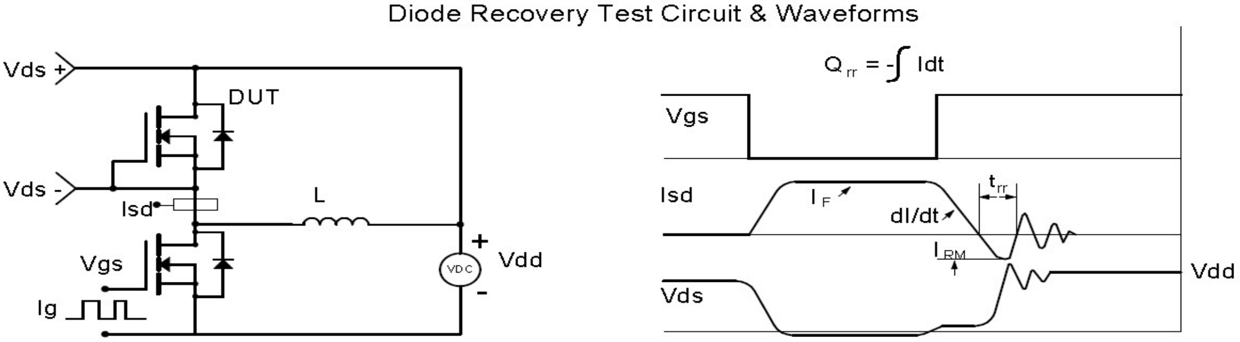
Resistive Switching Test Circuit & Waveforms



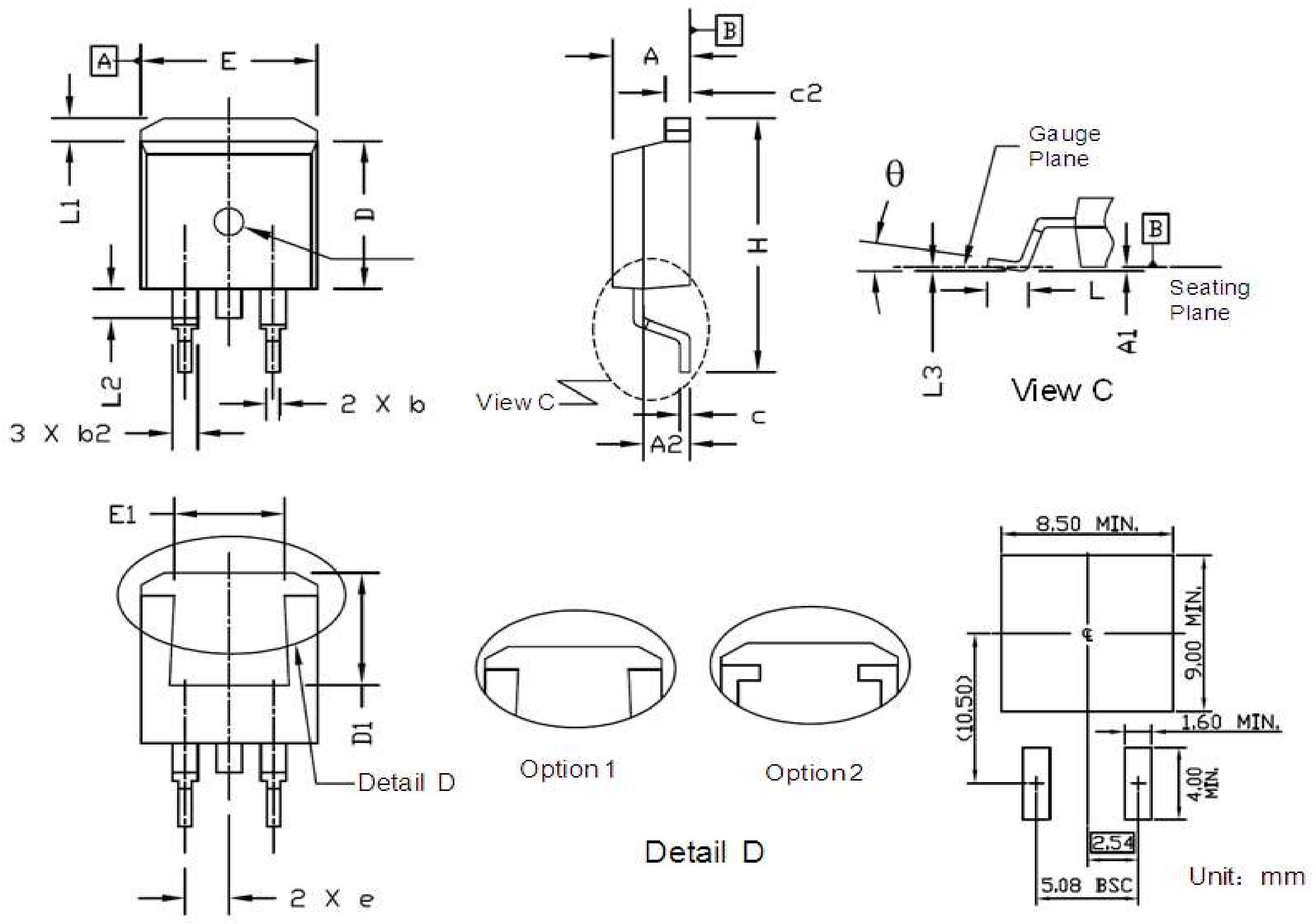
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Outline: TO-263



| Symbol | Dimensions In Millimeters |  | Dimensions In Inches |  |
|---|---|---|---|---|
|  | Min. | Max. | Min. | Max. |
| A | 4.30 | 4.86 | 0.169 | 0.191 |
| A1 | 0.00 | 0.25 | 0.000 | 0.010 |
| A2 | 2.20 | 2.90 | 0.087 | 0.114 |
| b | 0.68 | 0.94 | 0.027 | 0.037 |
| b2 | 1.14 | 1.78 | 0.045 | 0.070 |
| c | 0.33 | 0.65 | 0.013 | 0.026 |
| c2 | 1.17 | 1.40 | 0.046 | 0.055 |
| D | 8.38 | 9.45 | 0.330 | 0.372 |
| D1 | 6.90 | 8.17 | 0.272 | 0.322 |
| e | 2.54 BSC. |  | 0.100 BSC. |  |
| E | 9.78 | 10.50 | 0.385 | 0.413 |
| E1 | 6.50 | 8.60 | 0.256 | 0.339 |
| H | 14.61 | 15.88 | 0.575 | 0.625 |
| L | 1.78 | 2.79 | 0.070 | 0.110 |
| L1 | 0.70 | 1.60 | 0.028 | 0.063 |
| L2 | 1.00 | 1.78 | 0.039 | 0.070 |
| L3 | 0.25 BSC. |  | 0.010 BSC. |  |
| θ Option A | -8° | 0° | -8° | 0° |
| θ Option B | 0° | 8° | 0° | 8° |

## Marking

NOTE:
NXBBAAAA
N —WB code (Usually omitted)
X —Assembly location code
BB —Fab code
AAAA —Lot code

## Revision History

| Revison | Date | Major changes |
|---|---|---|
| 2.1 | 2023/7/9 | Update marking |

## 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.

CRM(CQ) reserves the right to improve product design, function and reliability without notice.