

**Features**

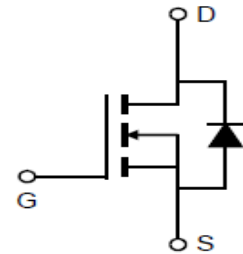
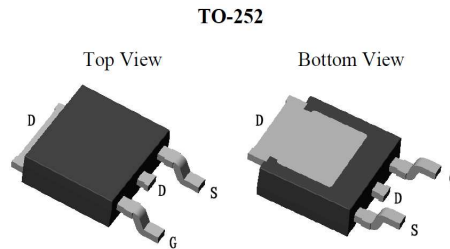
- Uses CRM(CQ) advanced SkyMOS2 technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Qualified according to JEDEC criteria

**Applications**

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

**Product Summary**

$V_{DS}$	60V
$R_{DS(on)@10V \text{ typ}}$	3.3mΩ
$I_D$	80A

**100% Avalanche Tested**

**Package Marking and Ordering Information**

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRSD046N06N2	SD046N06N2	TO-252	Tape&Reel	N/A	N/A	4000pcs

**Absolute Maximum Ratings**

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	60	V
Continuous drain current $T_C = 25^\circ\text{C}$ (Package limit) $T_C = 25^\circ\text{C}$ (Silicon limit) $T_C = 100^\circ\text{C}$ (Silicon limit)	$I_D$	80 122 77	A
Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )	$I_{D \text{ pulse}}$	320	A
Avalanche energy, single pulse ( $L=0.3\text{mH}$ , $R_g=25\Omega$ ) <sup>[1]</sup>	$E_{AS}$	144	mJ
Repeative avalanche Current ( $L=0.3\text{mH}$ ) <sup>[2]</sup>	$I_{AR}$	14	A
Repeative avalanche ( $L=0.3\text{mH}$ ) <sup>[2]</sup>	$E_{AR}$	27	mJ
Gate-Source voltage	$V_{GS}$	±20	V
Power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{tot}$	101.2	W
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+150	°C

 Notes:1.EAS was tested at  $T_j = 25^\circ\text{C}$ ,  $I_D = 31\text{A}$ .

2. Repetitive rating, pulse width limited by junction temperature  $T_J(\text{MAX})=150^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .

### Thermal Resistance

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case	$R_{\text{thJL}}$	1.24	°C/W
Thermal resistance, junction – ambient <sup>[3]</sup>	$R_{\text{thJA}}$	94	

Notes:3. Surface mounted FR-4 board by JEDEC (jesd51-7). Continuous current at  $T_C=25^\circ\text{C}$  is silicon limited

### Electrical Characteristic (at $T_j = 25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

### Static Characteristic

Drain-source breakdown voltage	$BV_{\text{DSS}}$	60	-	-	V	$V_{\text{GS}}=0\text{V}, I_{\text{D}}=250\mu\text{A}$
Gate threshold voltage	$V_{\text{GS(th)}}$	2.2	3	3.8	V	$V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=250\mu\text{A}$
Zero gate voltage drain current	$I_{\text{DSS}}$	-	0.02	1	$\mu\text{A}$	$V_{\text{DS}}=60\text{V}, V_{\text{GS}}=0\text{V}$ $T_j=25^\circ\text{C}$ $T_j=125^\circ\text{C}$
Gate-source leakage current	$I_{\text{GSS}}$	-	10	100	nA	$V_{\text{GS}}=\pm 20\text{V}, V_{\text{DS}}=0\text{V}$
Drain-source on-state resistance	$R_{\text{DS(on)}}$	-	3.3	4.1	mΩ	$V_{\text{GS}}=10\text{V}, I_{\text{D}}=30\text{A}$
Transconductance	$g_{\text{fs}}$	-	70	-	S	$V_{\text{DS}}=5\text{V}, I_{\text{D}}=30\text{A}$

### Dynamic Characteristic

Input Capacitance	$C_{\text{iss}}$	-	2583	3874.5	pF	$V_{\text{GS}}=0\text{V}, V_{\text{DS}}=30\text{V},$ $f=1\text{MHz}$
Output Capacitance	$C_{\text{oss}}$	-	1000	1500		
Reverse Transfer Capacitance	$C_{\text{rss}}$	-	45	67.5		
Gate Total Charge	$Q_{\text{G}}$	-	39.5	59.3	nC	$V_{\text{GS}}=10\text{V}, V_{\text{DS}}=30\text{V},$ $I_{\text{D}}=30\text{A}, f=1\text{MHz}$
Gate-Source charge	$Q_{\text{gs}}$	-	14	35		
Gate-Drain charge	$Q_{\text{gd}}$	-	8.5	21.3		
Turn-on delay time	$t_{\text{d(on)}}$	-	17	34	ns	$V_{\text{GS}}=10\text{V}, V_{\text{DD}}=30\text{V},$ $R_{\text{G_ext}}=2.7\Omega$
Rise time	$t_{\text{r}}$	-	96	192		
Turn-off delay time	$t_{\text{d(off)}}$	-	30	60		
Fall time	$t_{\text{f}}$	-	109	218		

Gate resistance	$R_G$	-	2.1	4	$\Omega$	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$
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**Body Diode Characteristic**

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	-	0.83	1.3	V	$V_{GS}=0V, I_{SD}=3A$
Body Diode Reverse Recovery Time	$t_{rr}$	-	60	120	ns	$I_F=30A, dI/dt=100A/\mu$ S
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	72	144	nC	

## Typical Performance Characteristics

Fig 1: Output Characteristics

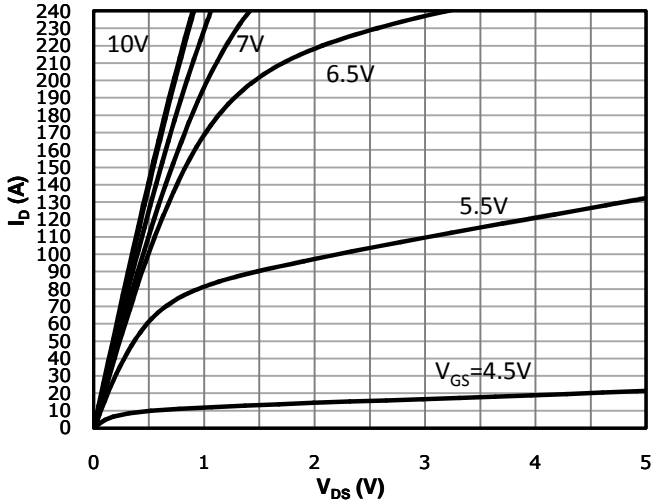


Fig 2: Transfer Characteristics

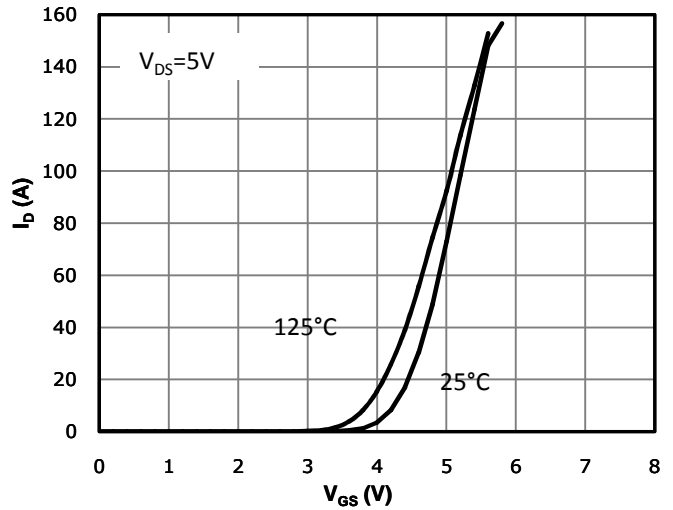


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

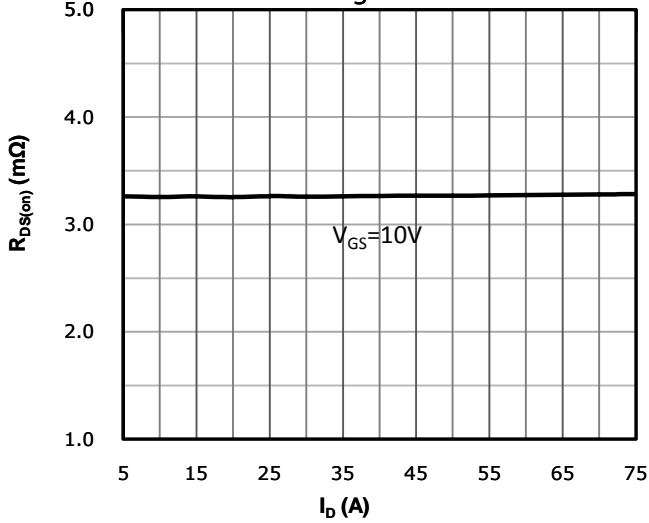


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

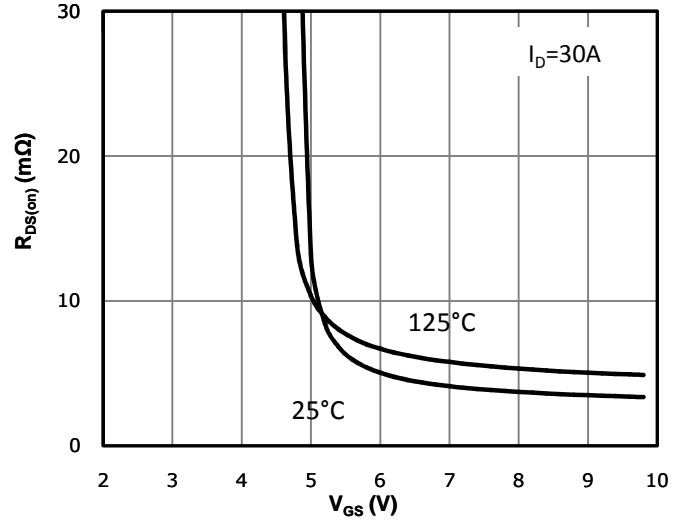


Fig 5:  $R_{DS(on)}$  vs. Temperature

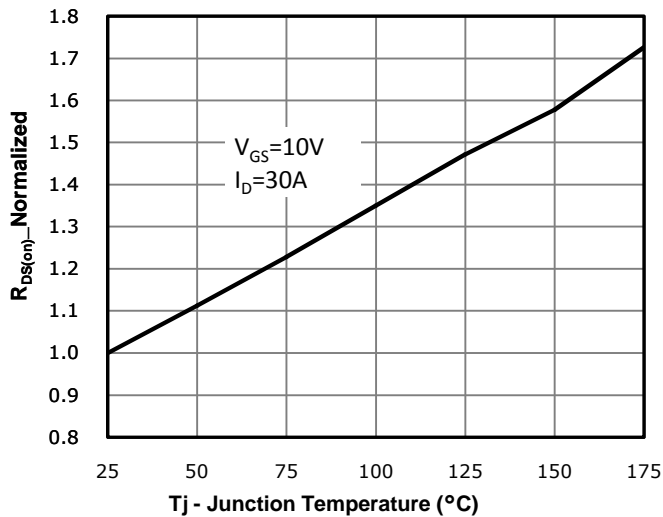


Fig 6: Capacitance Characteristics

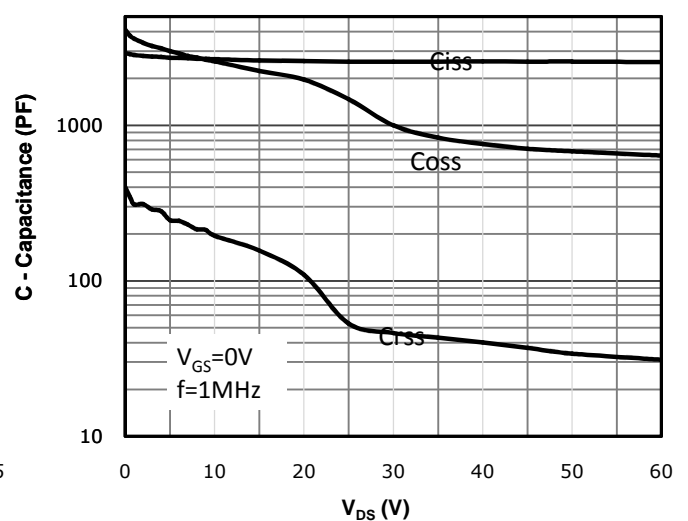


Fig 7: Gate Charge Characteristics

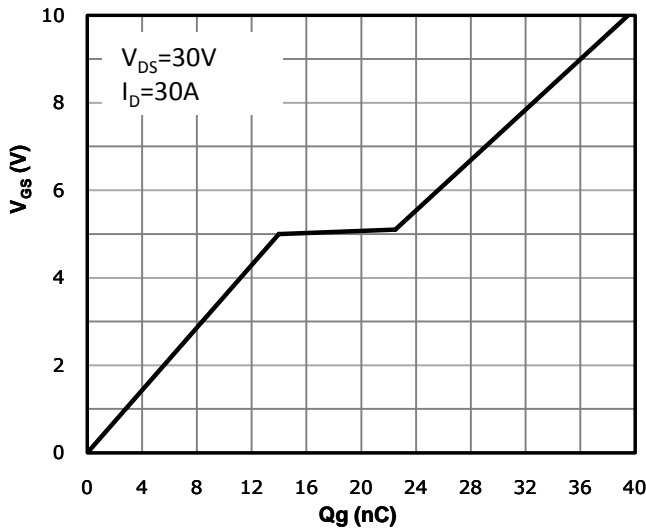


Fig 8: Body-diode Forward Characteristics

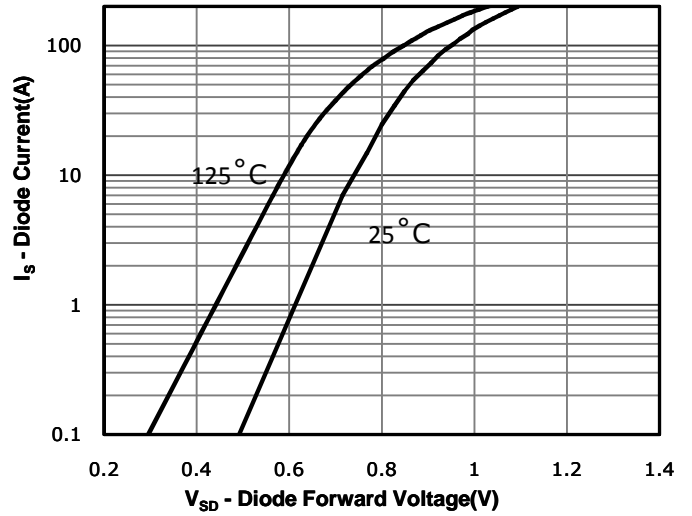


Fig 9: Power Dissipation

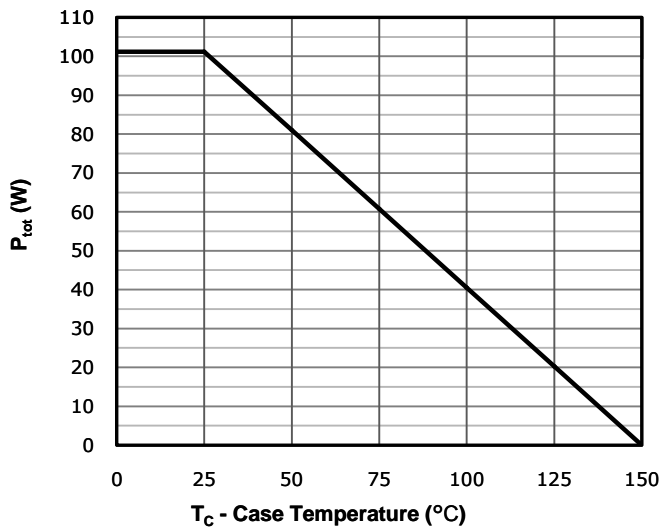


Fig 10: Drain Current Derating

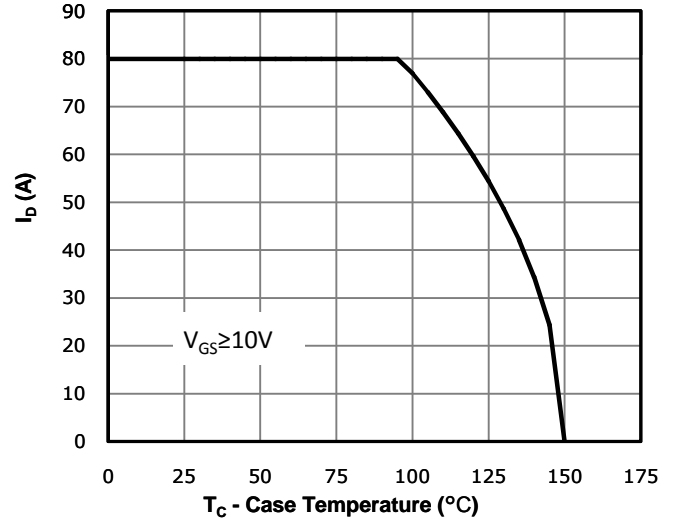


Fig 11: Safe Operating Area

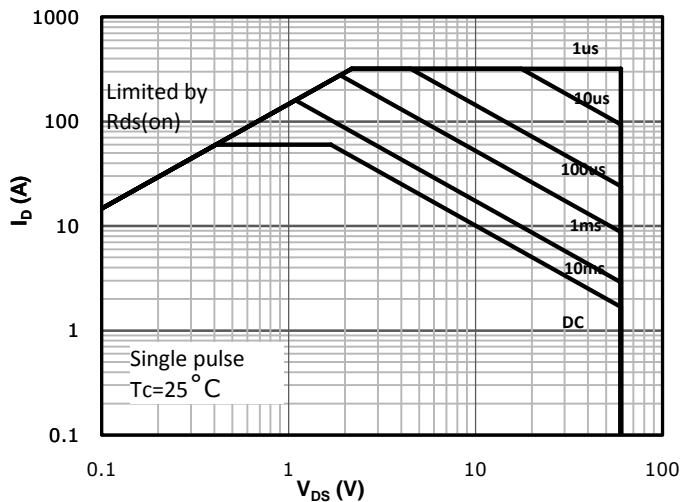
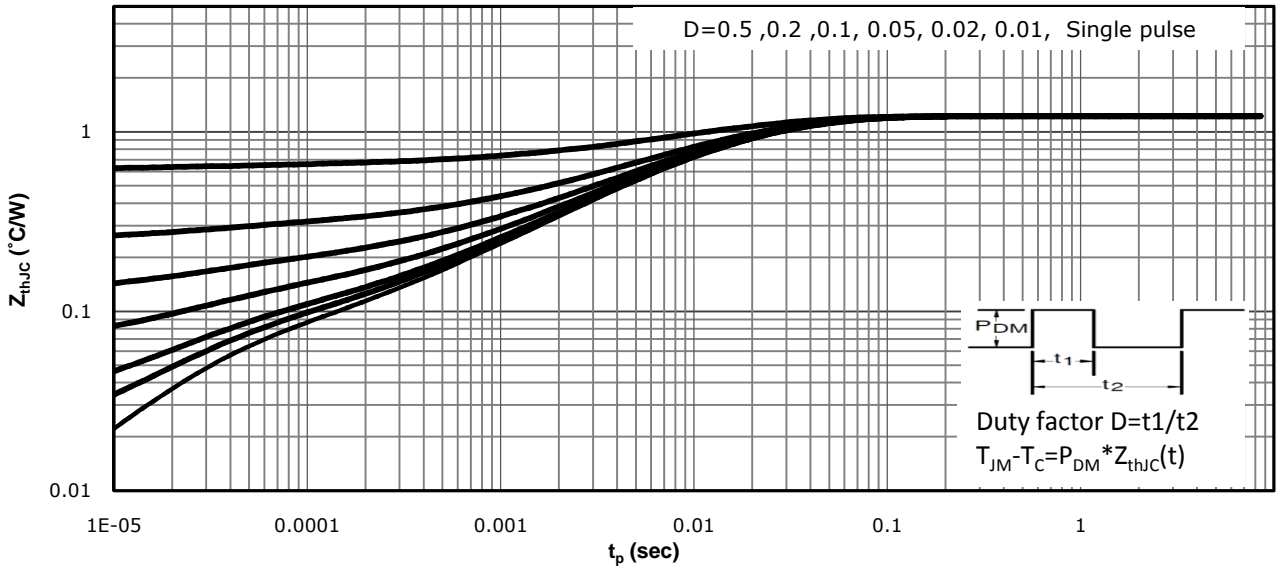
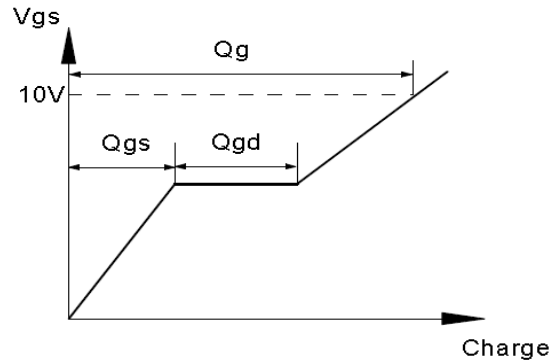
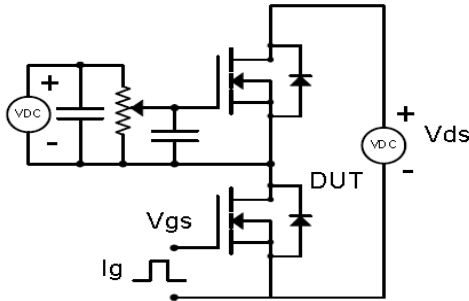


Fig 12: Max. Transient Thermal Impedance

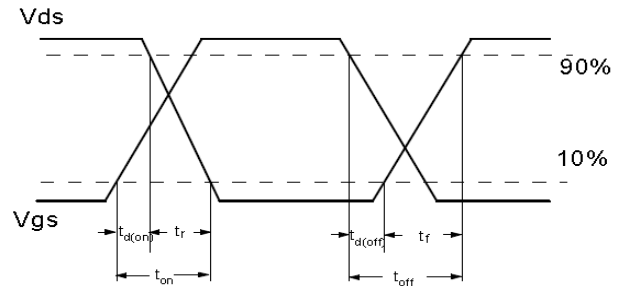
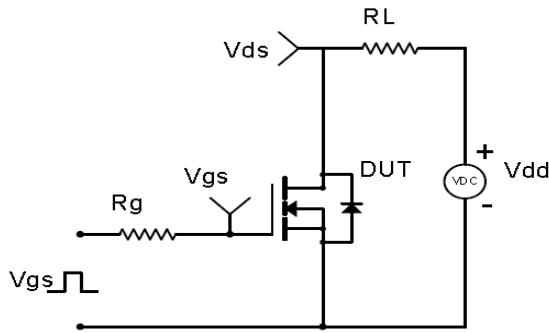


### Test Circuit & Waveform

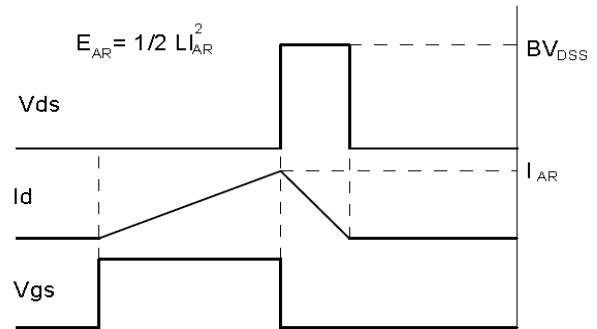
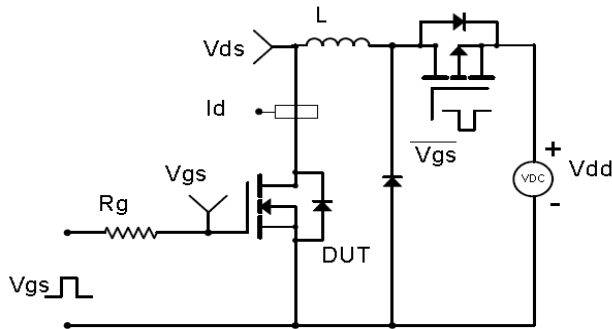
Gate Charge Test Circuit & Waveform



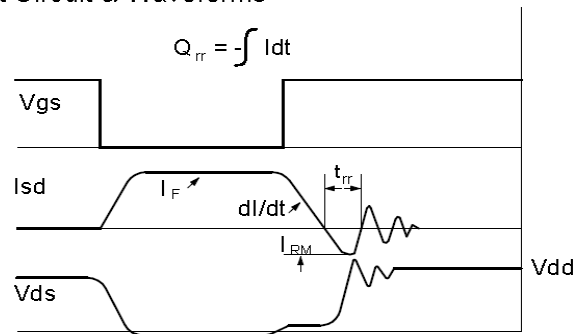
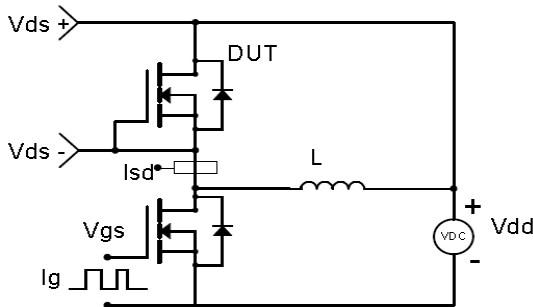
Resistive Switching Test Circuit & Waveforms



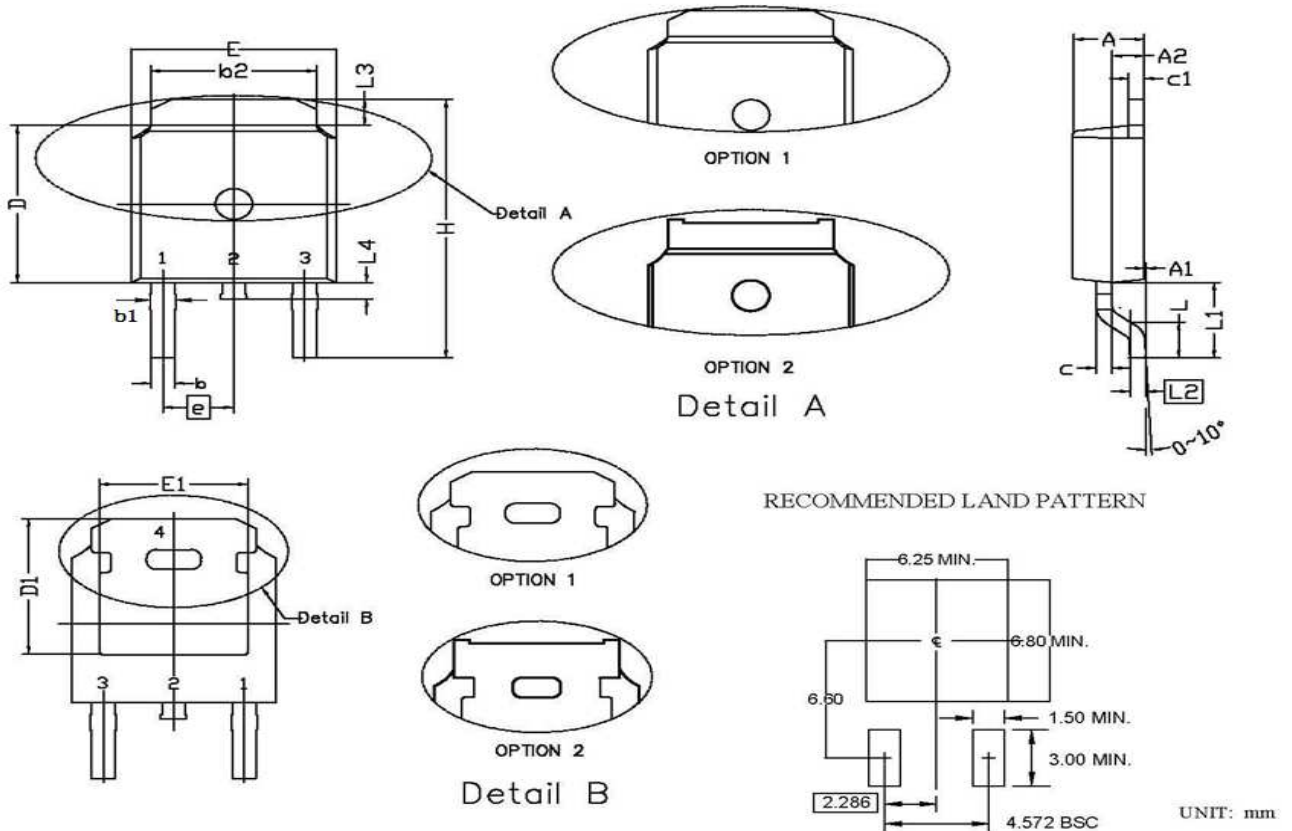
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: TO-252-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.15	2.45	0.085	0.096
A1	0.00	0.15	0.000	0.006
A2	0.76	1.36	0.030	0.054
b	0.60	0.91	0.024	0.036
b1	0.65	1.15	0.026	0.045
b2	5.00	5.64	0.197	0.222
c	0.45	0.61	0.018	0.024
c1	0.36	0.66	0.014	0.026
D	5.80	6.30	0.228	0.248
D1	5.00	6.00	0.197	0.236
e	2.29 BSC.		0.090 BSC.	
E	6.30	6.90	0.248	0.272
E1	4.55	5.30	0.179	0.209
H	9.40	10.48	0.370	0.413
L	1.18	1.70	0.046	0.067
L1	2.92 REF		0.115 REF	
L2	0.36	0.66	0.014	0.026
L3	0.72	1.35	0.028	0.053
L4	0.60	1.20	0.024	0.047



## Revision History

Revision	Date	Major changes
1.0	2019-1-18	Release of formal version.
2.0	2019-6-25	Supplement package outline info.

## 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.

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