

Features

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

Applications

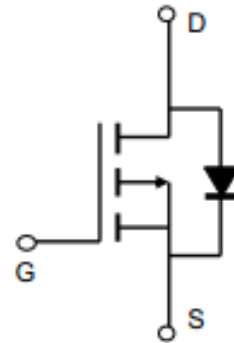
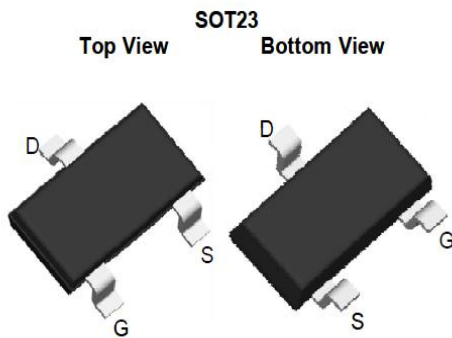
- Electrical tools
- Lithium battery protection

Product Summary

V_{DS}	-20V
$R_{DS(on)}$ typ.	33mΩ
I_D (Silicon limit)	-4.5A

100% DVDS Tested

100% Avalanche Tested



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
CRTJ380P02U2-G	380P02	SOT-23	Tape	N/A	N/A	5000pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	-20	V
Continuous drain current $T_A = 25^\circ\text{C}$ (Silicon limit) ^{a1} $T_A = 100^\circ\text{C}$ (Silicon limit)	I_D	-4.5 -3.3	A
Pulsed drain current ($T_A = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D \text{ pulse}}$	-18	A
Avalanche energy, single pulse ($L=0.5\text{mH}$)	E_{AS}	16.0	mJ
Gate-Source voltage	V_{GS}	± 12	V
Power dissipation ($T_A = 25^\circ\text{C}$)	P_{tot}	1.3	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+150	$^\circ\text{C}$
Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s)	T_{sold}	260	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Typ	Max	Unit
Thermal resistance, junction – ambient(min. footprint)	R_{thJA}^{a2}	-	90	

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

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

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	-20	-	-	V	$V_{GS}=0V, I_D=-250\mu A$
Gate threshold voltage	$V_{GS(th)}$	-0.4	-0.7	-1	V	$V_{DS}=V_{GS}, I_D=-250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	-1	μA	$V_{DS}=-20V, V_{GS}=0V$ $T_j=25^{\circ}\text{C}$
		-	-	-100		$T_j=150^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 12V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	33	38	mΩ	$T_j=25^{\circ}\text{C}$ $V_{GS}=-4.5V, I_D=-4A$
		-	47	54		$V_{GS}=-2.5V, I_D=-3A$
		-	-	-		
Transconductance	g_{fs}		16		S	$V_{DS}=-5V, I_D=-4A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	670	-	pF	$V_{GS}=0V, V_{DS}=-10V$ $f=1\text{MHz}$
Output Capacitance	C_{oss}	-	105	-		
Reverse Transfer Capacitance	C_{rss}	-	95	-		
Gate Total Charge	Q_G	-	7.9	-	nC	$V_{GS}=-4.5V, V_{DS}=-10V$ $I_D=-4A$
Gate-Source charge	Q_{gs}	-	0.8	-		
Gate-Drain charge	Q_{gd}	-	3	-		
Turn-on delay time	$t_{d(on)}$	-	5.74	-	ns	$V_{GS}=-10V,$ $V_{DS}=-10V$ $R_G=3.0\Omega,$ $I_D=-4A$
Rise time	t_r	-	3.5	-		
Turn-off delay time	$t_{d(off)}$	-	38.2	-		
Fall time	t_f	-	8	-		
Gate resistance	R_G	-	6.4	-	Ω	$V_{GS}=0V, V_{DS}=0V f=1\text{MHz}$

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	-	-	-1.2	V	$V_{GS}=0V, I_{SD}=-4A$
Body Diode Continuous Forward Current	I_S	-	-	-4.5	A	$T_C = 25^{\circ}C$
Body Diode Reverse Recovery Time	t_{rr}	-	25.33	-	ns	$I_F=-4A, dI/dt=100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{rr}	-	8.11	-	nC	

a1: Calculated continuous current based on maximum allowable junction temperature. Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements.

a2: The value of R_{thJA} is measured by placing the device in a still air box which is one cubic foot.

Typical Performance Characteristics

Fig 1: Output Characteristics

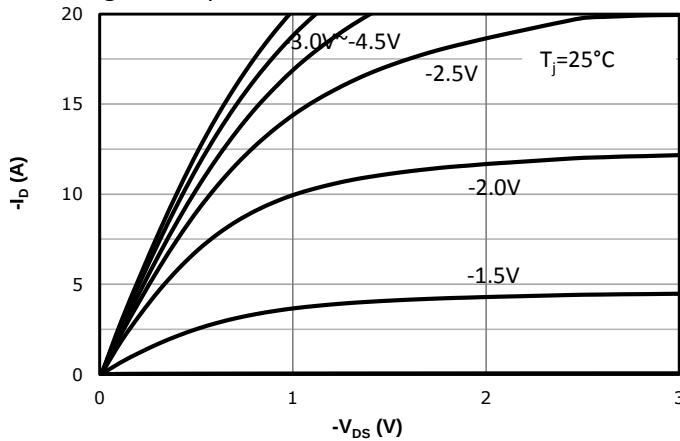


Fig 2: Transfer Characteristics

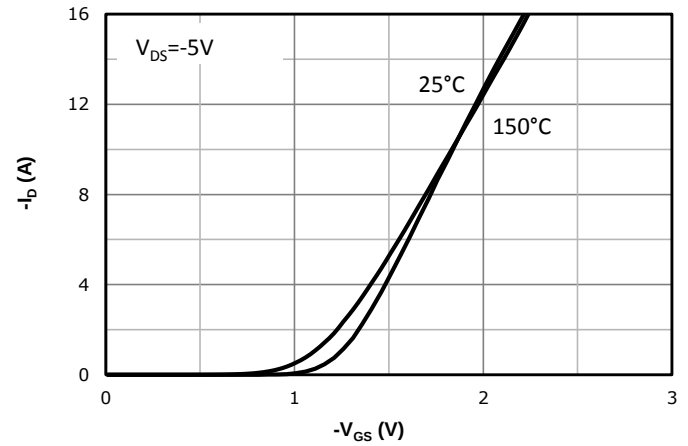


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

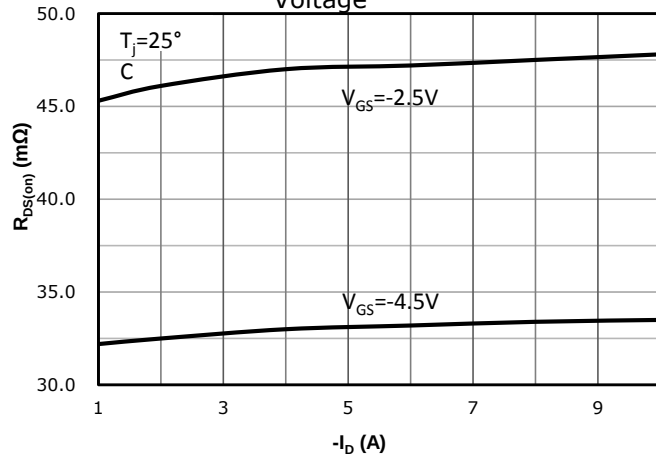


Fig 4: $R_{DS(on)}$ vs Gate Voltage

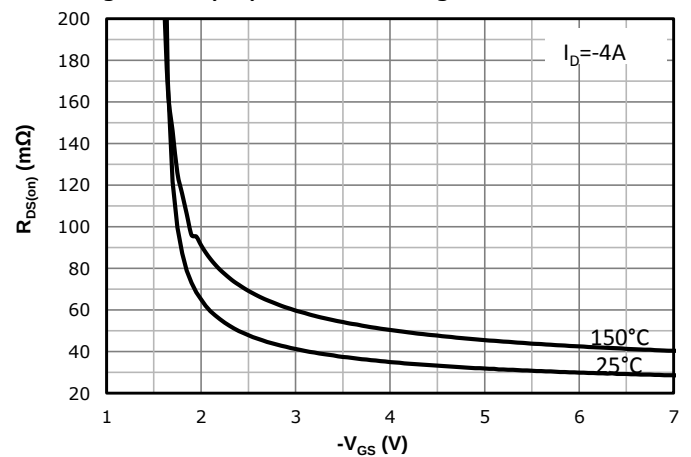


Fig 5: $R_{DS(on)}$ vs. Temperature

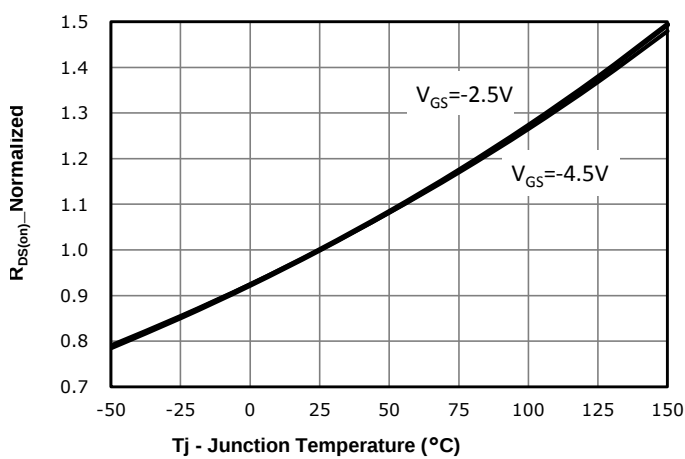


Fig 6: $V_{GS(th)}$ vs. Temperature

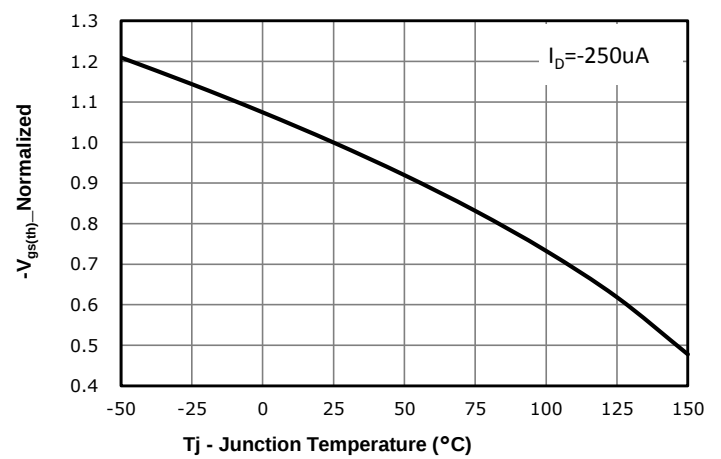


Fig 7: BVdss vs. Temperature

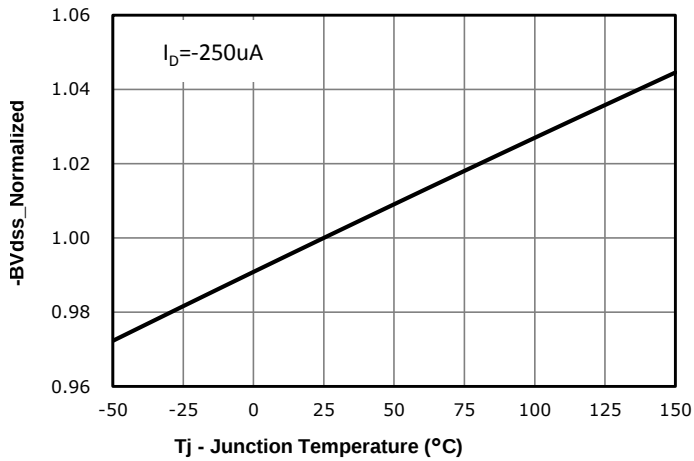


Fig 8: Body-diode Forward Characteristics

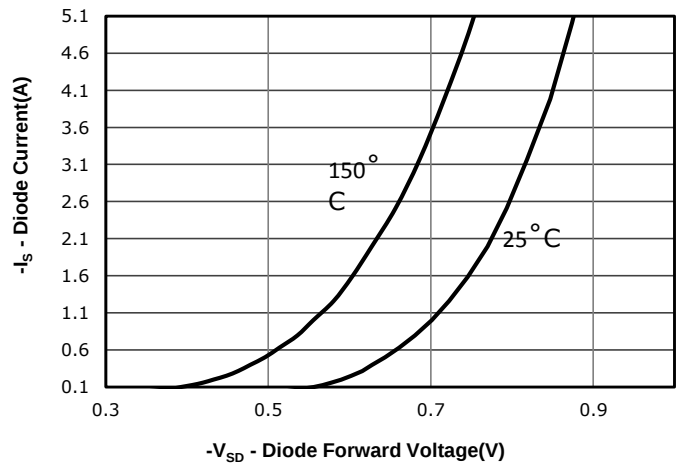


Fig 9: Gate Charge Characteristics

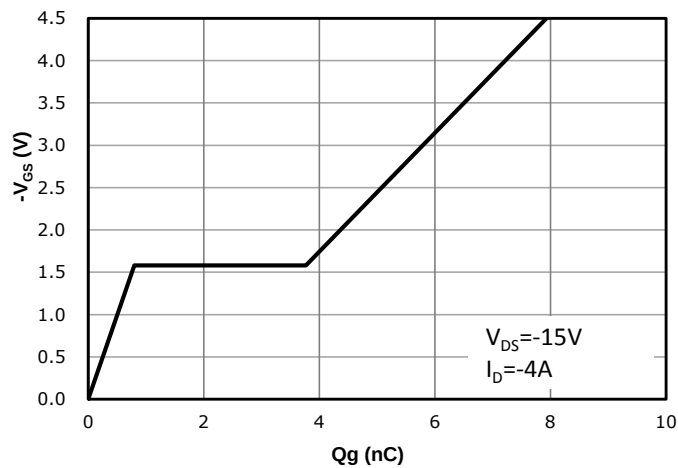


Fig 10: Capacitance Characteristics

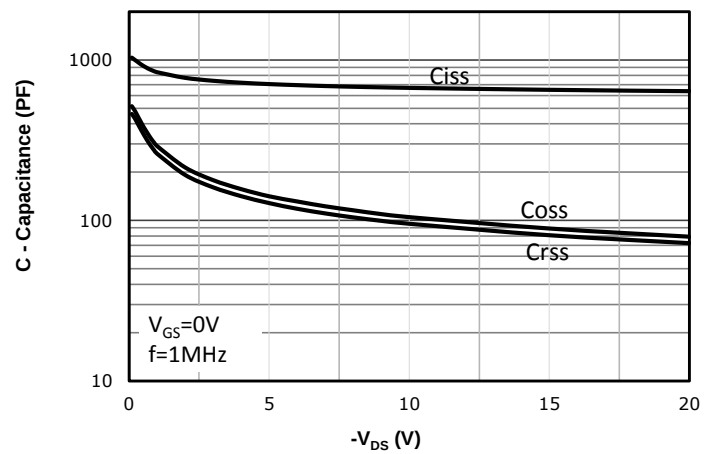


Fig 11: Drain Current Derating

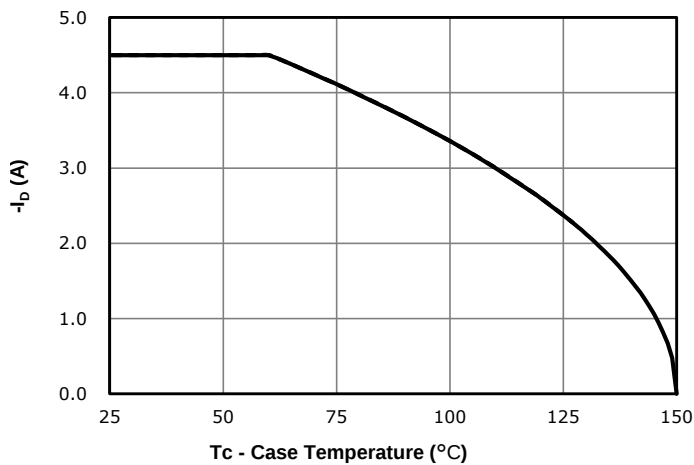


Fig 12: Power Dissipation

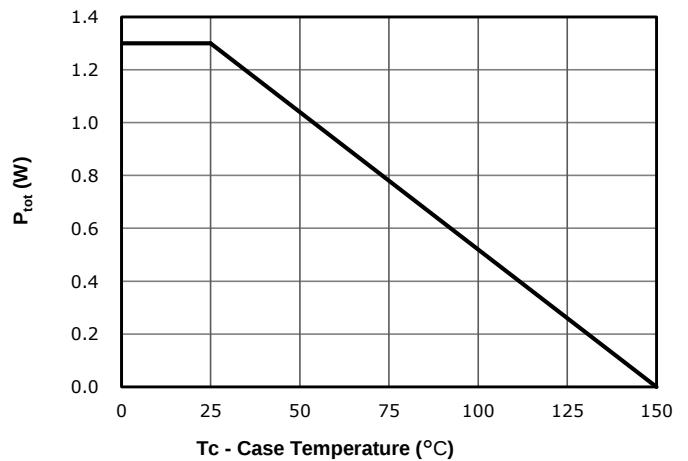


Fig 13: Safe Operating Area

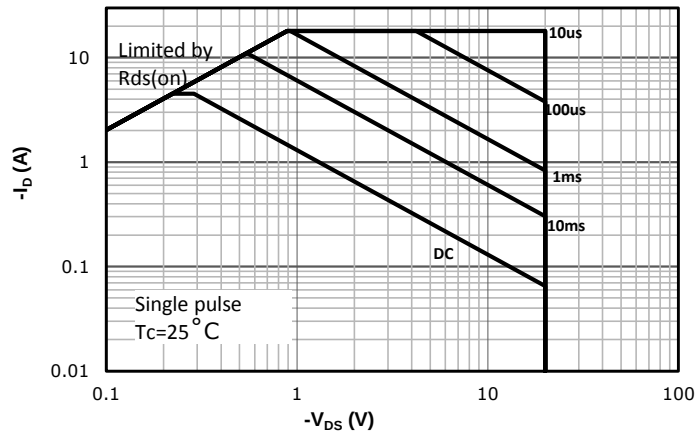
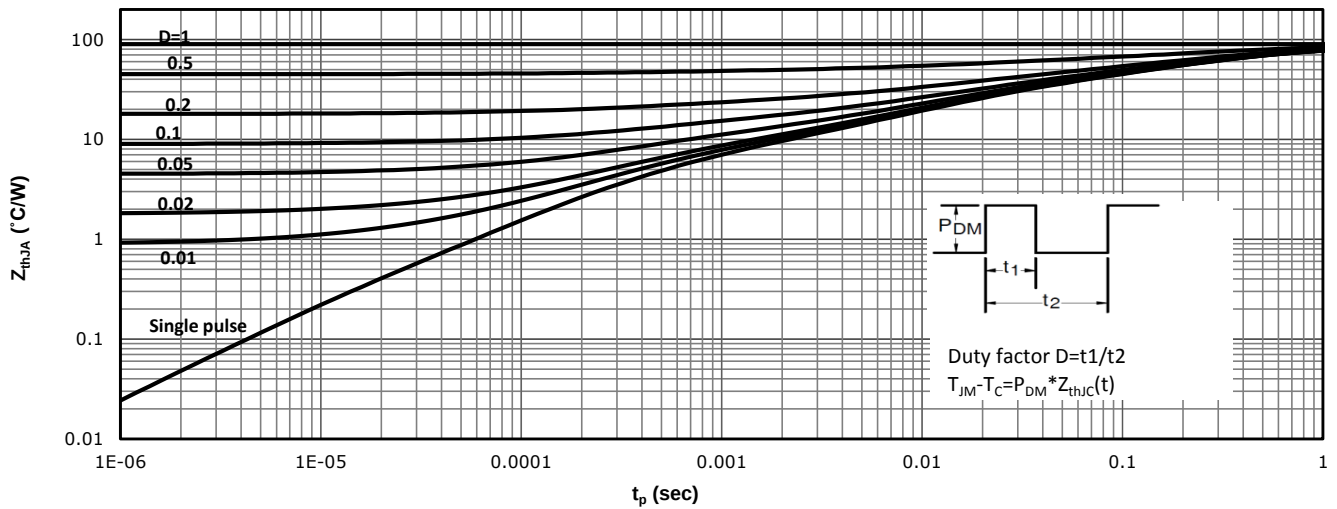
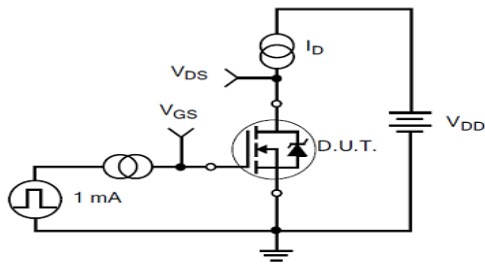


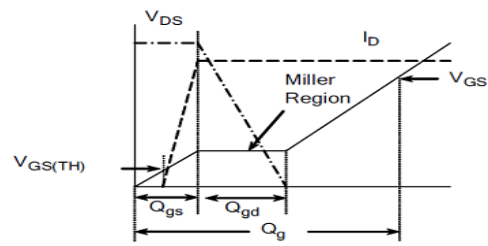
Fig 14: Max. Transient Thermal Impedance



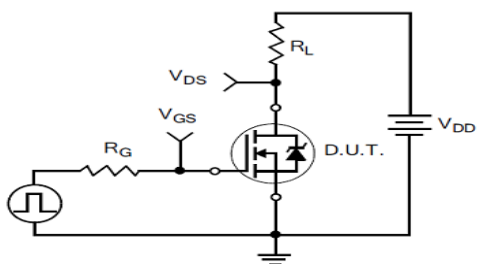
Test Circuit & Waveform



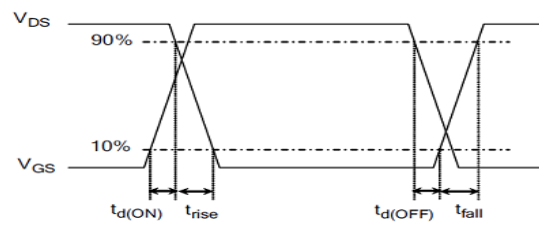
Gate Charge Test Circuit



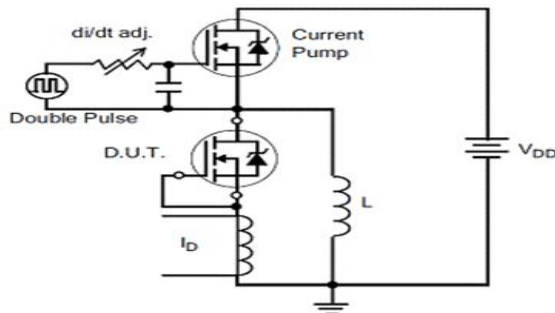
Gate Charge Waveforms



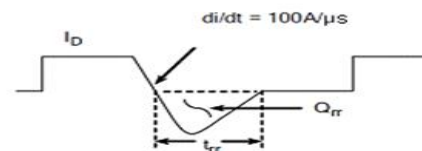
Resistive Switching Test Circuit



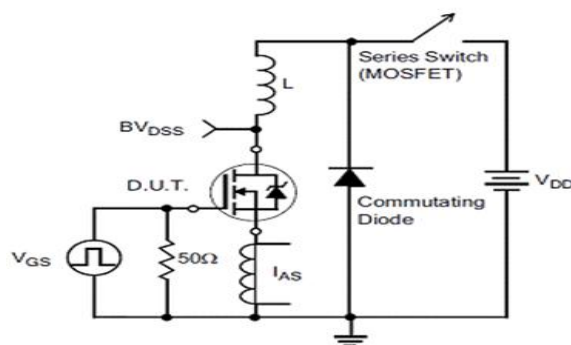
Resistive Switching Waveforms



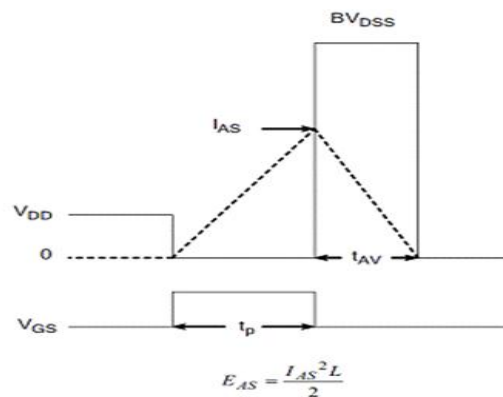
Diode Reverse Recovery Test Circuit



Diode Reverse Recovery Waveform

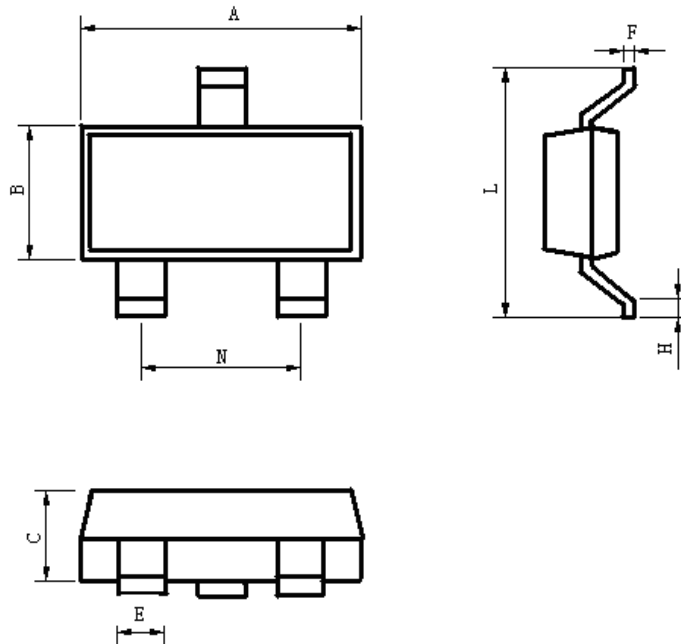


Unclamped Inductive Switching Test Circuit



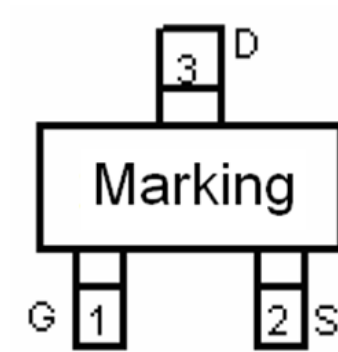
Unclamped Inductive Switching Waveform

Package Outline: SOT-23



Symbol	Values(mm)	
	Min.	Max.
A	2.70	3.10
B	1.10	1.50
C	0.90	1.10
E	0.25	0.55
F	0.07	0.23
H	0.25	0.55
L	2.20	2.60
N	1.80	2.00

Marking





Revision History

Revision	Date	Major changes
1.0	2023/5/5	Release of formal version
2.0		
3.0		

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 reserves the right to improve product design, function and reliability without notice.