### **Description**

#### **N-channel Enhancement Mode Power MOSFET**

#### **Features**

• 20V, 6.8A

 $R_{DS(ON)}$  Typ= 16m $\Omega$  @  $V_{GS}$  = 4.5V  $R_{DS(ON)}$  Typ= 20m $\Omega$  @  $V_{GS}$  = 2.5V

- Advanced Trench Technology
- Excellent R<sub>DS(ON)</sub> and Low Gate Charge
- Lead Free

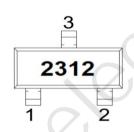
#### **Applications**

- Load Switch
- PWM Application
- Power Management

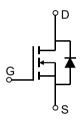




**SOT-23** 



**Marking and Pin Assignment** 



**Schematic Diagram** 

#### Package Marking and Ordering Information

Device Marking	Device	Outline	Package	Reel Size	Reel(pcs)	Per Carton (pcs)
2312	CRMLTU2312A	TAPING	SOT-23	7"	3000	120000

#### Absolute Maximum Ratings (@ T<sub>J</sub> = 25°C unless otherwise specified)

Symbol	Parameter		Value	Units	
V <sub>DS</sub>	Drain-to-Source Voltage		20	V	
$V_{GS}$	Gate-to-Source Voltage		±12	V	
	Continuous Drain Current	T <sub>A</sub> = 25°C	6.8	^	
I <sub>D</sub>		T <sub>A</sub> = 100°C	4	А	
I <sub>DM</sub>	Pulsed Drain Current (1)		27.2	Α	
$P_{D}$	Power Dissipation	T <sub>A</sub> = 25°C	1.3	W	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>(2)</sup>		97	°C/W	
$T_J$ , $T_{STG}$	Junction & Storage Temperature Range		-55 to 150	°C	



#### **Electrical Characteristics** (T<sub>J</sub> = 25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
Off Cha	racteristics					
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$	20	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	$V_{DS} = 20V, V_{GS} = 0V$	-	-	1.0	μА
I <sub>GSS</sub>	Gate-Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 12V$	-	-	±100	nA
On Cha	racteristics					
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	0.5	0.75	- 1.0	V
	G	V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A	-	16	21	mΩ
$R_{DS(ON)}$	Static Drain-Source ON-Resistance <sup>(3)</sup>	V <sub>GS</sub> =2.5V, I <sub>D</sub> = 3A	-	20	30	mΩ
Dynam	ic Characteristics					
C <sub>iss</sub>	Input Capacitance		- 1	712	- 1	pF
C <sub>oss</sub>	Output Capacitance	$I_{D} = 250 \mu A, V_{GS} = 0V$ $V_{DS} = 20V, V_{GS} = 0V$ $V_{DS} = 0V, V_{GS} = \pm 12V$ $V_{DS} = V_{GS}, I_{D} = 250 \mu A$ $V_{GS} = 4.5V, I_{D} = 4A$ $V_{GS} = 2.5V, I_{D} = 3A$ $V_{GS} = 0 \text{ to } 4.5V$ $V_{DS} = 10V, I_{D} = 3A$ $V_{GS} = 10V, I_{D} = 3A$ $V_{GS} = 0 \text{ to } 4.5V$ $V_{DS} = 10V, I_{D} = 3A$ $V_{GS} = 0 \text{ to } 4.5V$ $V_{DS} = 10V, I_{D} = 3A$ $V_{GS} = 0 \text{ to } 4.5V$ $V_{DS} = 10V, I_{D} = 3A$ $V_{GS} = 0 \text{ to } 4.5V$ $V_{DS} = 10V, I_{D} = 3A$ $V_{GS} = 0 \text{ to } 4.5V$ $V_{DS} = 10V, I_{D} = 3A$ $V_{GS} = 0 \text{ to } 4.5V$ $V_{DS} = 10V, I_{D} = 3A$ $V_{GS} = 0 \text{ to } 4.5V$ $V_{DS} = 10V, I_{D} = 3A$	(	116	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		X-\	103	-	pF
$Q_g$	Total Gate Charge			9	-	nC
$Q_{gs}$	Gate Source Charge	**	)-	1.5	-	nC
$Q_{gd}$	Gate Drain("Miller") Charge	V <sub>DS</sub> - 10V, I <sub>D</sub> - 3A	-	2.5	-	nC
Switchi	ing Characteristics					
$\mathbf{t}_{d(on)}$	Turn-On DelayTime		-	5	-	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{GS} = 4.5 \text{V}, V_{DD} = 10 \text{V}$	-	16	-	ns
$t_{\text{d(off)}}$	Turn-Off DelayTime	$I_D = 3A$ , $R_{GEN} = 3\Omega$	-	23	-	ns
$t_{f}$	Turn-Off Fall Time	)	-	7	-	ns
Drain-S	Source Diode Characteristics and N	Max Ratings				
Is	Maximum Continuous Drain to Source Diode Forward Current		-	-	6.8	Α
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	27.2	Α
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	$V_{GS} = 0V, I_{S} = 6.8A$	-	-	1.2	V
trr	Body Diode Reverse Recovery Time	1 - 00 - 41/-14 - 4000 /	-	7	-	ns
Qrr	Body Diode Reverse Recovery Charge	$I_F = 3A$ , al/dt = 100A/us	-	2	-	nC

Notes:

<sup>1.</sup> Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

<sup>2.</sup>  $R_{\theta JA}$  is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB

<sup>3.</sup> Pulse Test: Pulse Width  $\leq$  300  $\mu$ s, Duty Cycle  $\leq$  0.5%.

### **Typical Performance Characteristics**

Figure 1: Output Characteristics

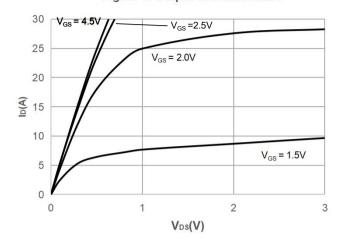


Figure 2: Typical Transfer Characteristics

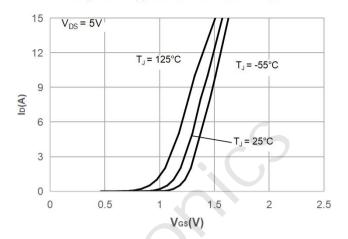


Figure 3: On-resistance vs. Drain Current

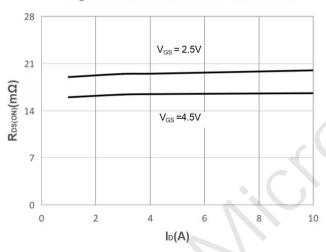


Figure 4: Body Diode Characteristics

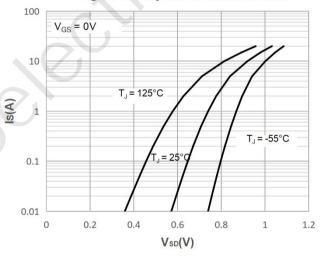


Figure 5: Gate Charge Characteristics

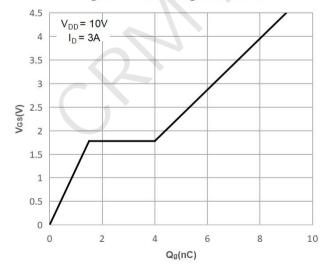
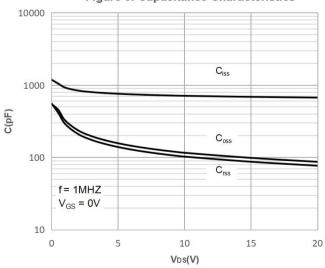


Figure 6: Capacitance Characteristics





### **Typical Performance Characteristics**

Figure 7: Normalized Breakdown voltage vs.
Junction Temperature

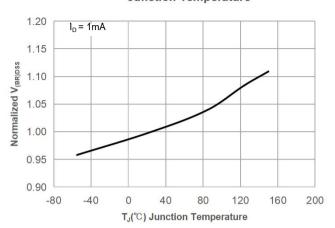


Figure 9: Maximum Safe Operating Area

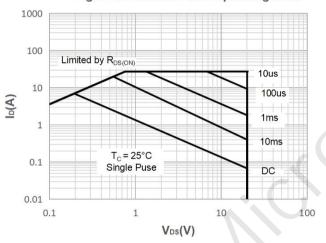


Figure 11: Normalized Maximum Transient
Thermal Impedance

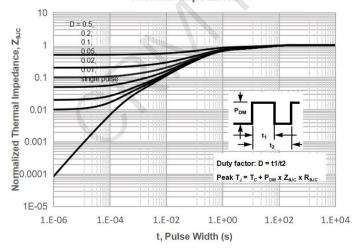


Figure 8: Normalized on Resistance vs. Junction Temperature

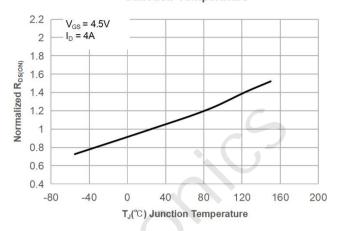


Figure 10: Maximum Continuous Drian Current vs. Case Temperature

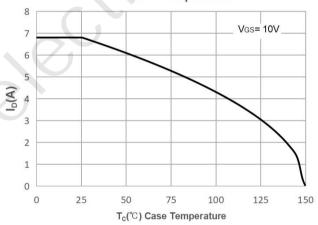
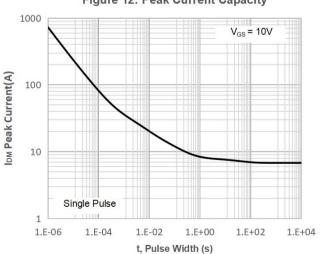


Figure 12: Peak Current Capacity





#### **Test Circuit**

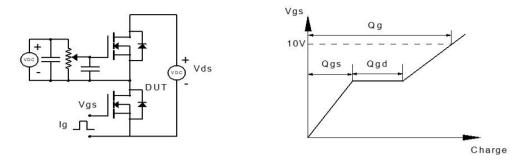


Figure 1: Gate Charge Test Circuit & Waveform

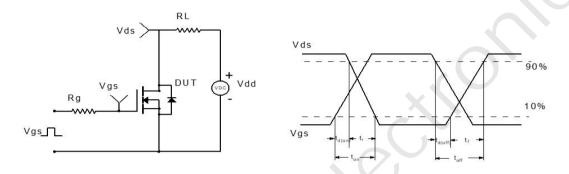


Figure 2: Resistive Switching Test Circuit & Waveform

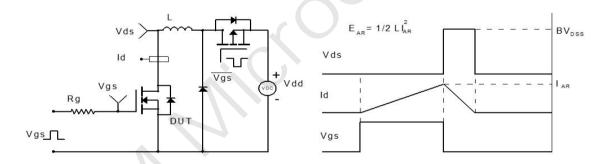


Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

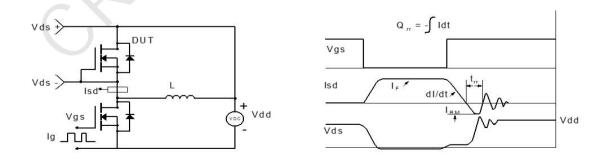
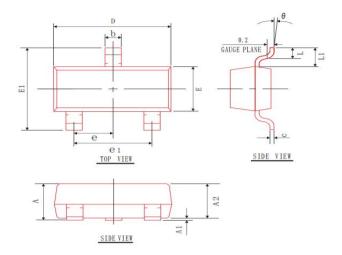


Figure 4: Diode Recovery Test Circuit & Waveform



### Package Mechanical Data(SOT-23)



COMMON DIMENSIONS (UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	0.90	1.05	1.20
A1	0.00	0.05	0.10
A2	0.90	1.00	1.10
b	0.30	0.40	0. 50
C	0.08	0.10	0.15
D	2.80	2.90	3.00
E	1.20	1.30	1.40
E1	2. 30	2.40	2.50
L	0.30	0.40	0.50
θ	0°	5°	10°
L1	0. 55 REF 0. 95 BSC 1. 90 REF		
e			
e1			

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