

## MS23P01

### P-Channel 20-V (D-S) MOSFET

#### Description

The MS23P01 is the highest performance trench P-ch MOSFETs with extreme high cell density, which provide excellent  $R_{DS(ON)}$  and gate charge for most of the small power switching and load switch applications. The device meets the RoHS and Green Product requirement with full function reliability approved.

#### Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent  $CdV/dt$  effect decline
- Green Device Available

#### Typical Applications

- Notebook
- Load Switch
- Hand-held Instrument

Package type : SOT-23

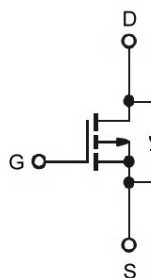
#### Packing & Order Information

3,000/Reel

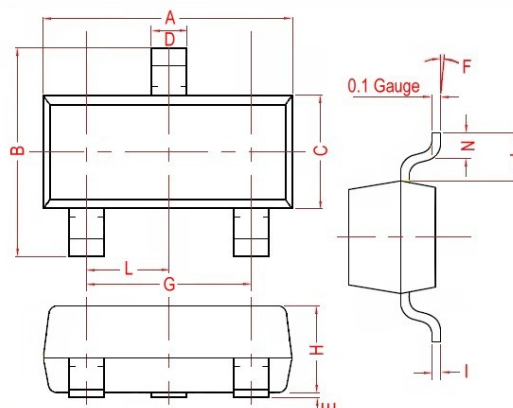


RoHS Compliant

#### Graphic Symbol

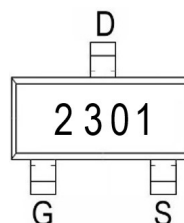


#### Package Dimension



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.70	3.10	G	1.90 Ref.	
B	2.30	3.00	H	0.90	1.30
C	1.20	1.75	I	0.05	0.21
D	0.30	0.50	J	0.58 Ref.	
E	0.01	0.15	L	0.95 Typ.	
F	0°	10°	N	0.20 Min.	

#### Marking



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#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

##### Absolute Maximum Ratings (unless otherwise specified)

Symbol	Parameter	Value	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Continuous Drain Current <sup>1</sup> ( $T_A = 25^\circ\text{C}$ )	-3.3	A
	Continuous Drain Current <sup>1</sup> ( $T_A = 70^\circ\text{C}$ )	-2.6	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup> ( $T_A = 25^\circ\text{C}$ )	-13	A
$P_D$	Power Dissipation <sup>3</sup> ( $T_A = 25^\circ\text{C}$ )	1.4	W
$T_J/T_{STG}$	Operating Junction and Storage Temperature	-55 to +150	$^\circ\text{C}$

##### Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient <sup>3</sup>	125	$^\circ\text{C/W}$

##### Electrical Characteristics( $T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	-0.45	-0.6	-1.0	V
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$	-20	-	-	V
$g_{fs}$	Forward Transconductance	$V_{DS} = -5\text{V}$ , $I_D = -3\text{A}$	-	12.2	-	S
$I_{GSS}$	Gate-Source Leakage Current	$V_{DS} = 0\text{V}$ , $V_{GS} = \pm 12\text{V}$	-	-	$\pm 100$	nA
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS} = 16\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 25^\circ\text{C}$	-	-	-1	$\mu\text{A}$
		$V_{DS} = 16\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 55^\circ\text{C}$	-	-	-5	
$R_{DS(on)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS} = -4.5\text{V}$ , $I_D = -3.0\text{A}$	-	76	100	m $\Omega$
		$V_{GS} = -2.5\text{V}$ , $I_D = -2.0\text{A}$	-	110	135	
		$V_{GS} = -1.8\text{V}$ , $I_D = -0.9\text{A}$	-	160	240	
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$I_S = -1.0\text{A}$ , $V_{GS} = 0\text{V}$ , $T_J = 25^\circ\text{C}$	-	-	-1	V
$I_S$	Continuous Source Current <sup>1,4</sup> (Diode)	$V_G = V_D = 0\text{V}$ , Force Current	-	-	-3	A
$I_{SM}$	Pulsed Source Current <sup>2,4</sup> (Diode)		-	-	-12	

#### Notes

- Surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- The power dissipation is limited by  $150^\circ\text{C}$  junction temperature.
- The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

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#### Dynamic and switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Q <sub>g</sub>	Total Gate Charge <sup>2</sup>	V <sub>DS</sub> = -15V I <sub>D</sub> = -3A V <sub>GS</sub> = -4.5V	--	10.1	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	1.21	--	
Q <sub>gd</sub>	Gate-Drain Charge		--	2.46	--	
t <sub>d(on)</sub>	Turn-On Delay Time <sup>2</sup>	V <sub>DS</sub> = -10V I <sub>D</sub> = -3A V <sub>GS</sub> = -4.5V R <sub>G</sub> = 3.3Ω	--	5.6	--	ns
t <sub>r</sub>	Rise Time		--	32.2	--	
t <sub>d(off)</sub>	Turn-Off Delay Time		--	45.6	--	
t <sub>f</sub>	Fall Time		--	29.2	--	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -15V V <sub>GS</sub> = 0V f = 1.0MHz	--	677	--	pF
C <sub>oss</sub>	Output Capacitance		--	82	--	
C <sub>rss</sub>	Reverse Transfer Capacitance		--	73	--	

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### P-Channel 20-V (D-S) MOSFET

- Typical Electrical Characteristics

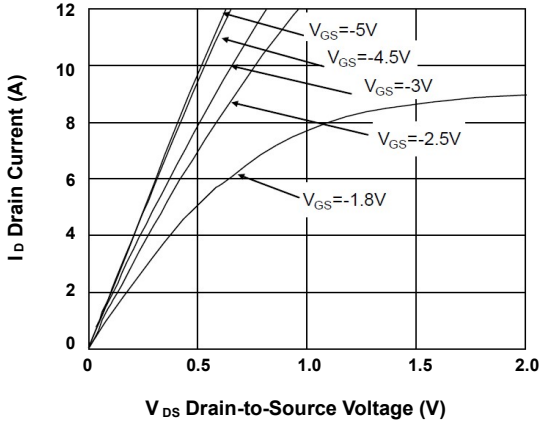


FIG.1-Typical Output Characteristics

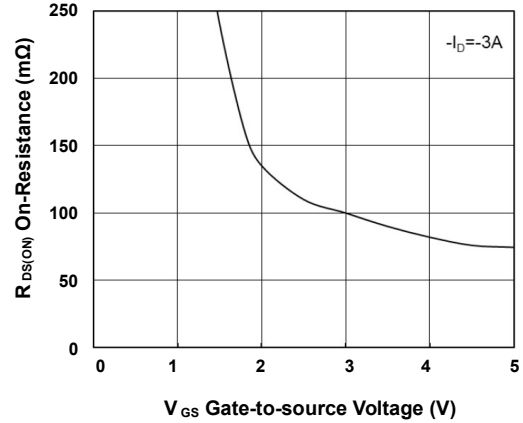


FIG.2-On-Resistance vs. G-S Voltage

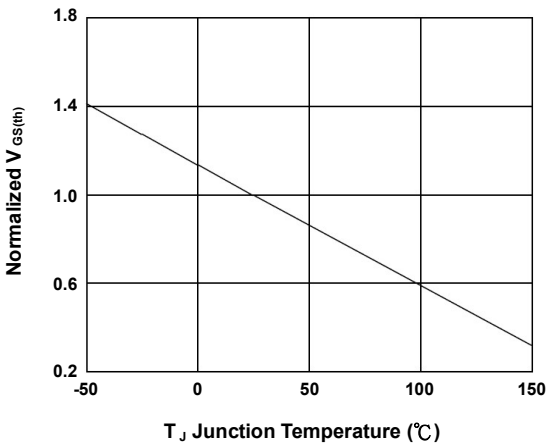


FIG.3-Normalized  $V_{GS(th)}$  vs.  $T_J$

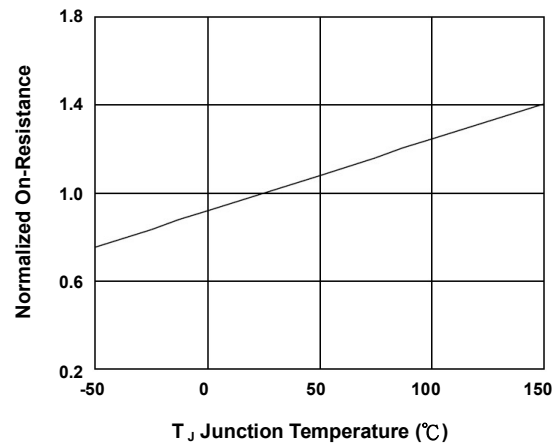


FIG.4-Normalized  $R_{DS(on)}$  vs.  $T_J$

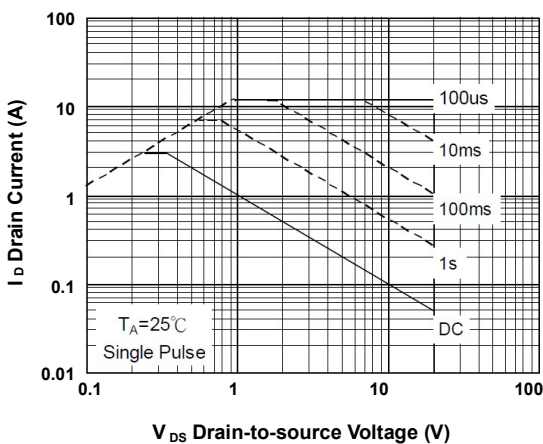


FIG.5-Safe Operating Area

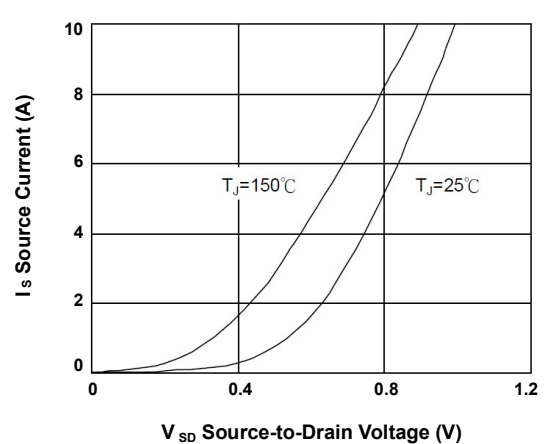


FIG.6-Forward Characteristics of Reverse

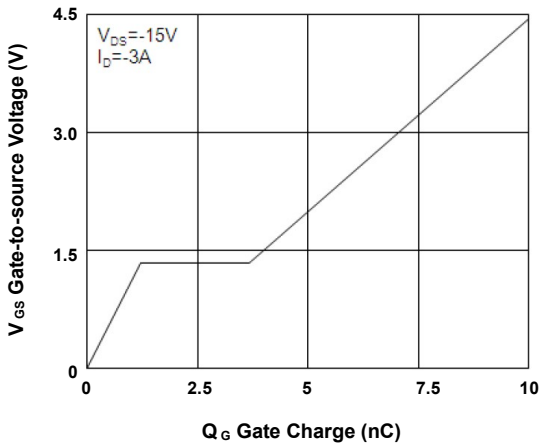


FIG.7-Gate Charge Characteristics

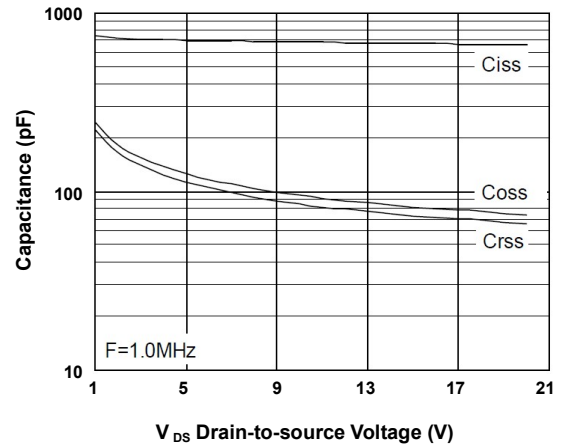


FIG.8-Capacitance Characteristics

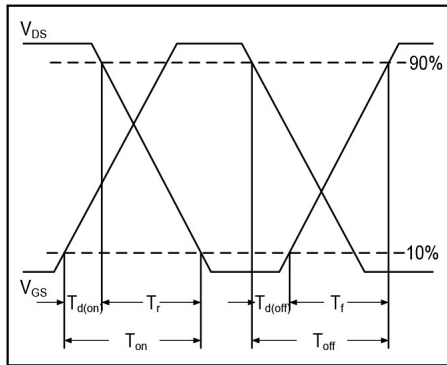


FIG.9-Switching Time Waveform

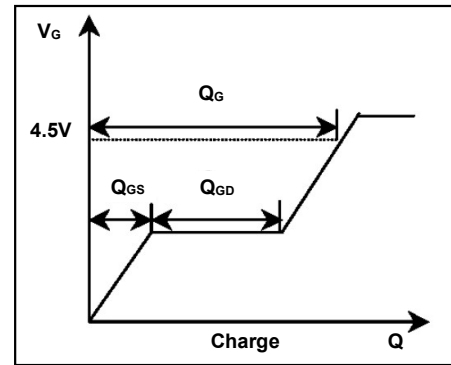


FIG.10-Gate Charge Waveform

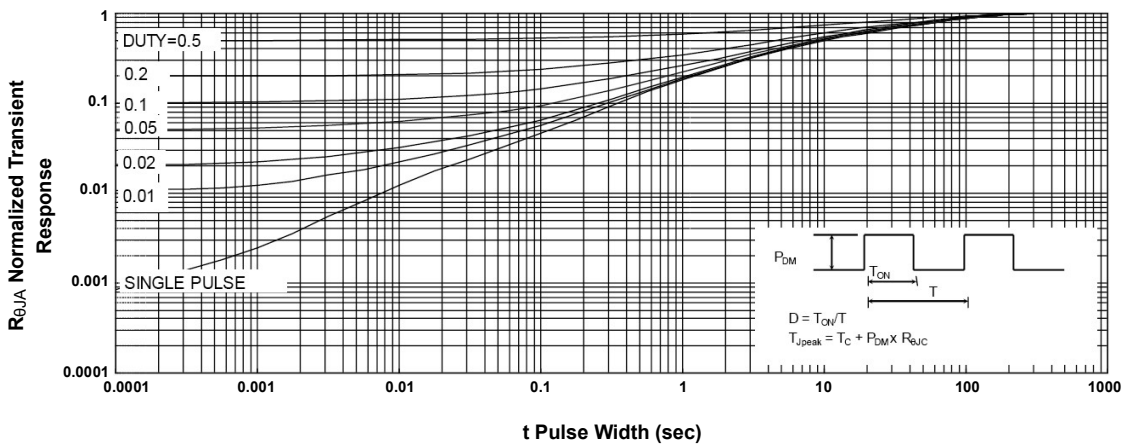


FIG.11-Normalized Maximum Transient Thermal Impedance

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