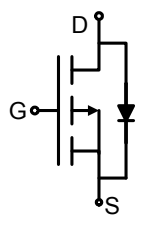
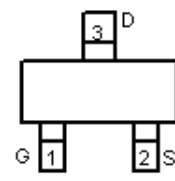
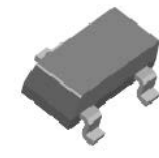


## P-Channel Enhancement Mode Power MOSFET

<p><b>Description</b></p> <p>The MS23P01S uses advanced trench technology to provide excellent <math>R_{DS(ON)}</math>, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.</p> <p><b>General Features</b></p> <ul style="list-style-type: none"> <li>● <math>V_{DS} = -20V, I_D = -2.6A</math></li> <li>● <math>R_{DS(ON)} &lt; 160m\Omega @ V_{GS} = -2.5V</math></li> <li>● <math>R_{DS(ON)} &lt; 120m\Omega @ V_{GS} = -4.5V</math></li> <li>● High power and current handling capability</li> <li>● Lead free product is acquired</li> <li>● Surface mount package</li> </ul> <p><b>Application</b></p> <ul style="list-style-type: none"> <li>● PWM applications</li> <li>● Load switch</li> </ul>	<div style="text-align: center;">  <p><b>Schematic diagram</b></p>  <p><b>Marking and pin assignment</b></p>  <p><b>SC70-3/ SOT-323 top view</b></p> </div>
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### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
A1SHB	MS23P01S	SOT-23	Ø180mm	8 mm	3000 units

### Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	-2.6	A
Drain Current -Pulsed <sup>(Note 1)</sup>	$I_{DM}$	-13	A
Maximum Power Dissipation	$P_D$	0.9	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	138	$^\circ C/W$
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### Electrical Characteristics ( $T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-20		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -20V, V_{GS} = 0V$	-	-	-1	$\mu A$

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> <small>(Note 3)</small>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.4	-0.7	-1	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-2A$	-	78	120	m $\Omega$
		$V_{GS}=-2.5V, I_D=-1.8A$	-	102	160	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-1A$	6	-	-	S
<b>Dynamic Characteristics</b> <small>(Note 4)</small>						
Input Capacitance	$C_{iss}$	$V_{DS}=-10V, V_{GS}=0V,$ $F=1.0MHz$	-	325	-	PF
Output Capacitance	$C_{oss}$		-	63	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	37	-	PF
<b>Switching Characteristics</b> <small>(Note 4)</small>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-10V, R_L=5\Omega$ $V_{GS}=-4.5V, R_{GEN}=3\Omega$	-	11	-	nS
Turn-on Rise Time	$t_r$		-	5.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	22	-	nS
Turn-Off Fall Time	$t_f$		-	8	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-10V, I_D=-2A,$ $V_{GS}=-4.5V$	-	3.2	-	nC
Gate-Source Charge	$Q_{gs}$		-	0.6	-	nC
Gate-Drain Charge	$Q_{gd}$		-	0.9	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <small>(Note 3)</small>	$V_{SD}$	$V_{GS}=0V, I_S=2A$	-	-	-1.2	V
Diode Forward Current <small>(Note 2)</small>	$I_S$		-	-	-2.6	A

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

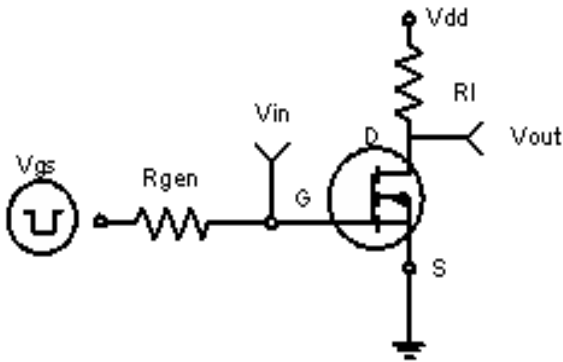


Figure 1: Switching Test Circuit

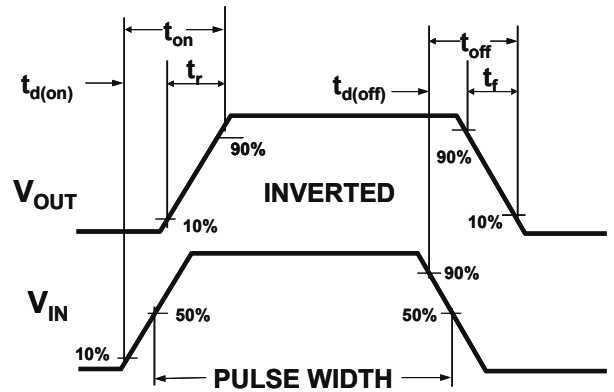


Figure 2: Switching Waveforms

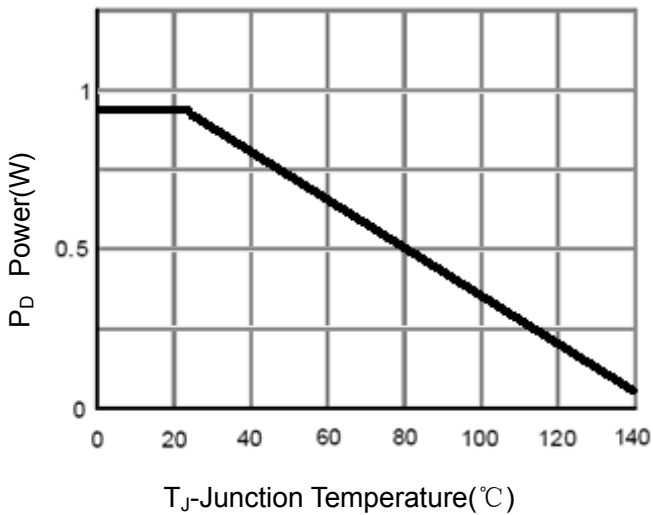


Figure 3 Power Dissipation

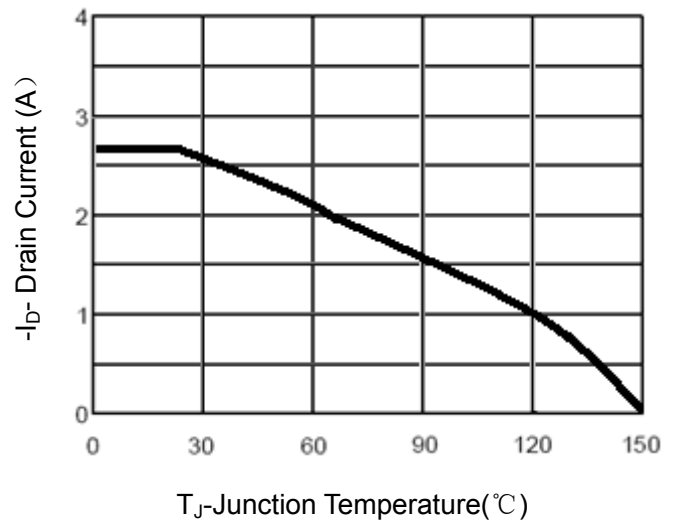


Figure 4 Drain Current

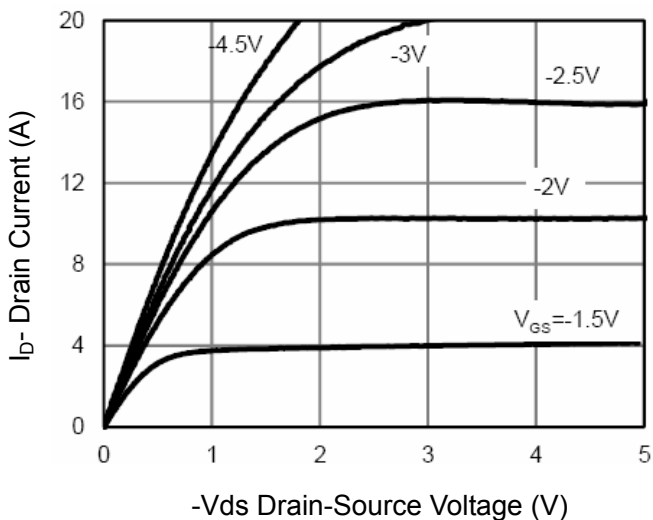


Figure 5 Output Characteristics

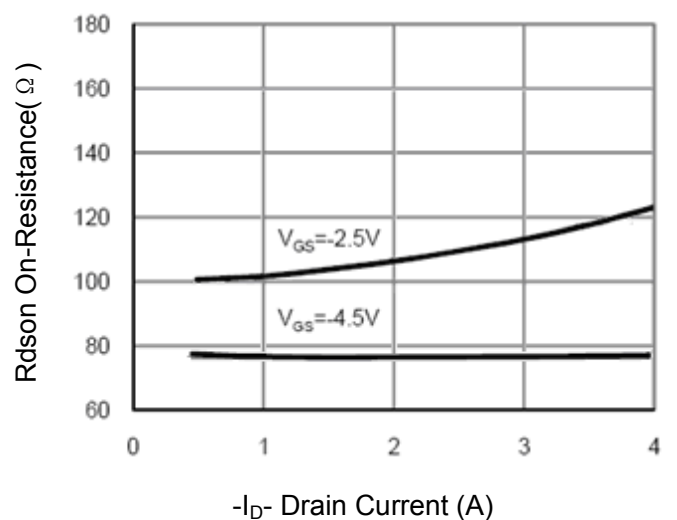
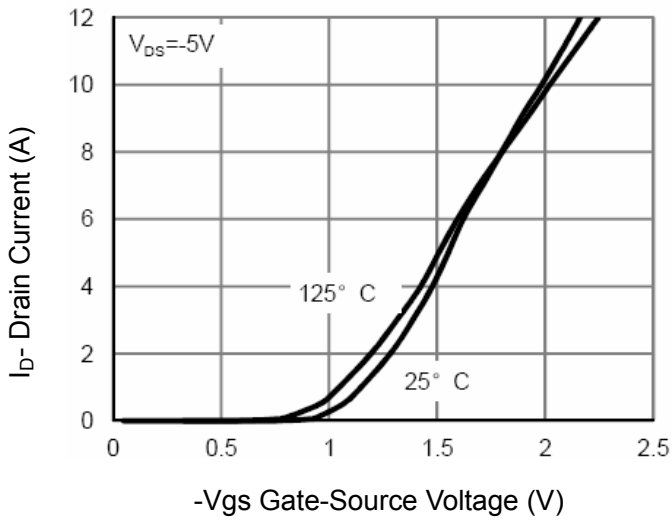
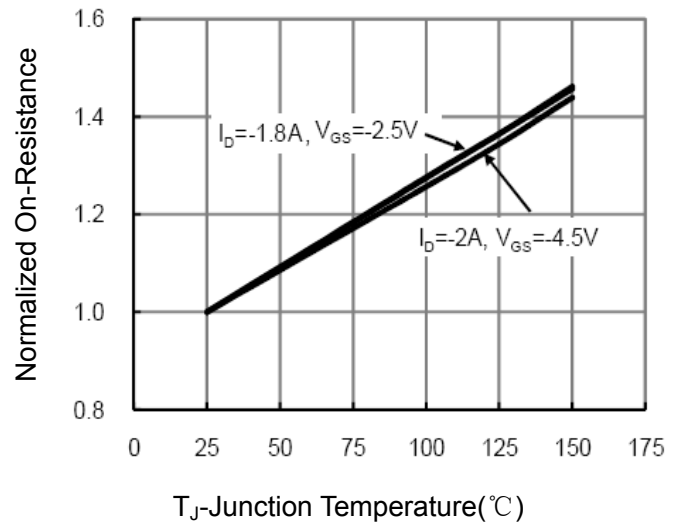


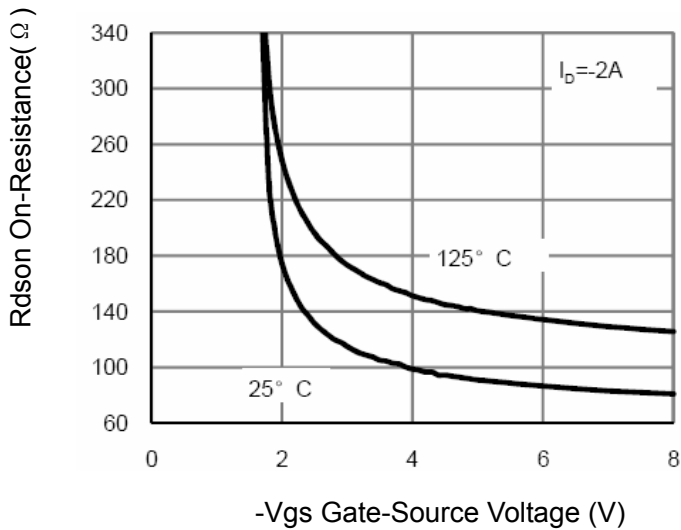
Figure 6 Drain-Source On-Resistance



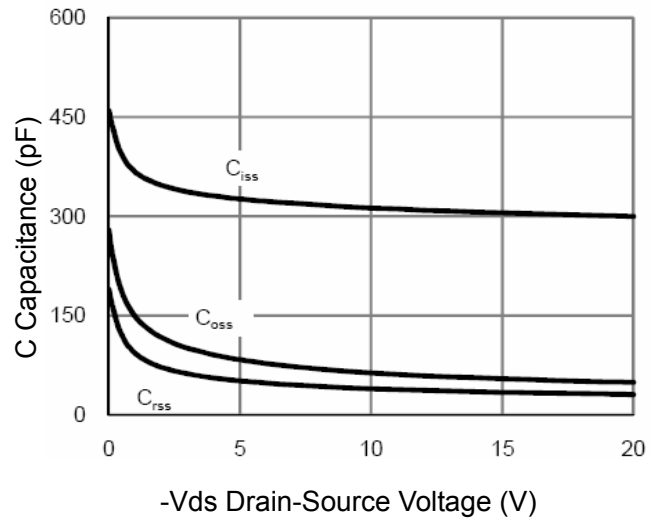
**Figure 7 Transfer Characteristics**



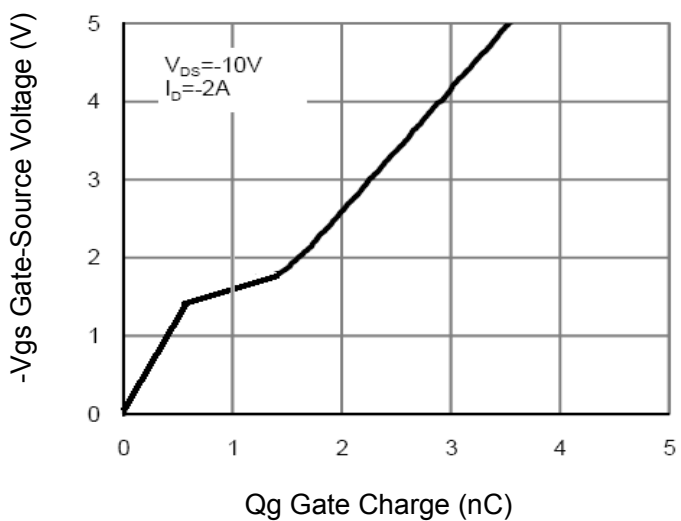
**Figure 8 Drain-Source On-Resistance**



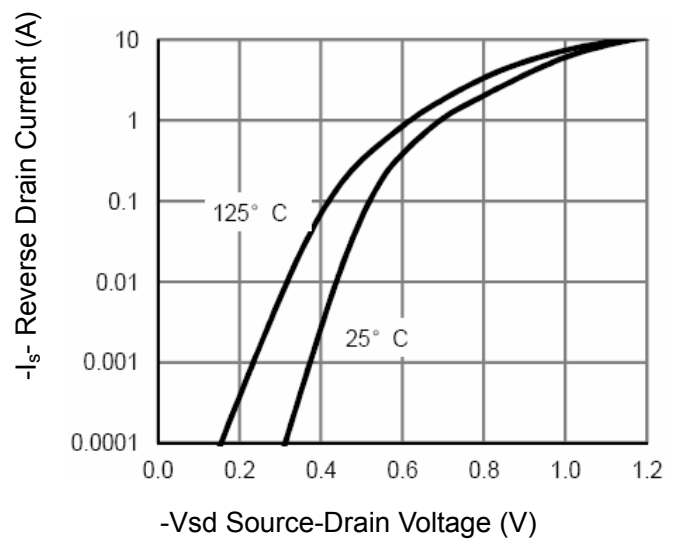
**Figure 9 Rdson vs Vgs**



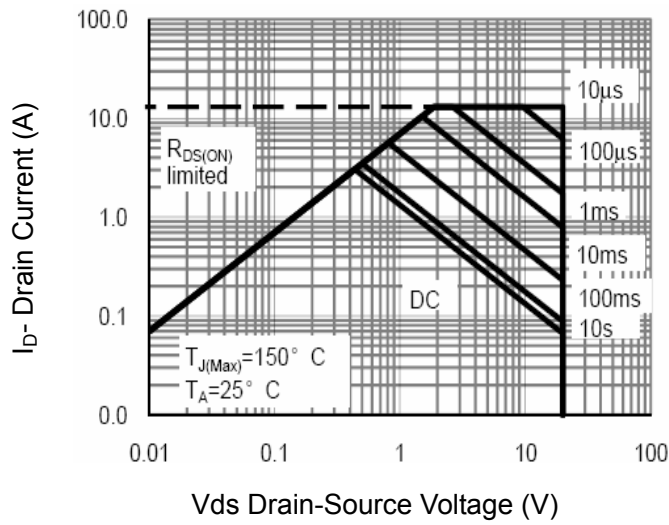
**Figure 10 Capacitance vs Vds**



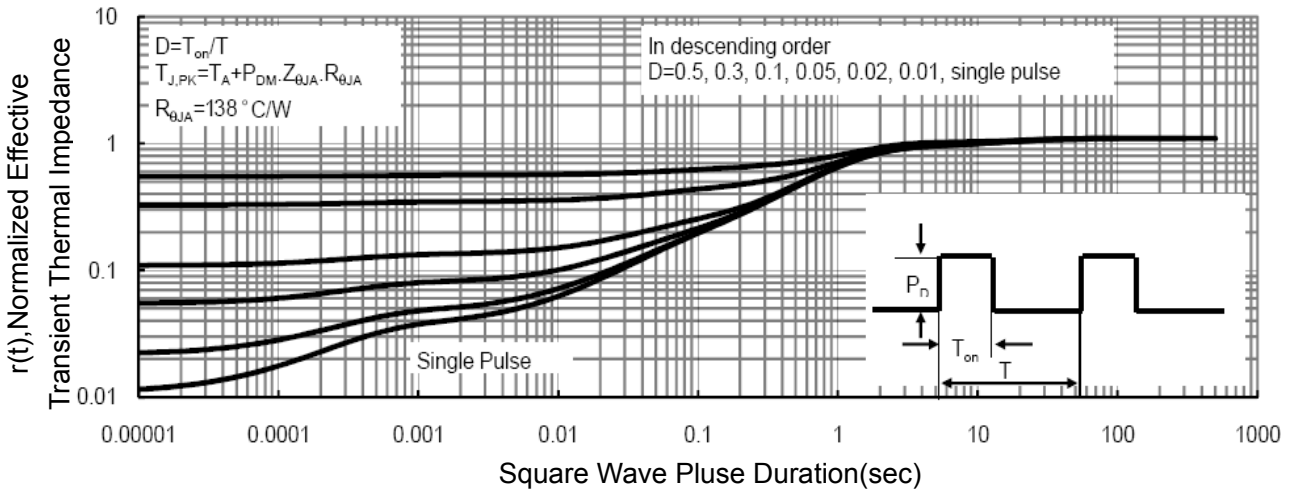
**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**

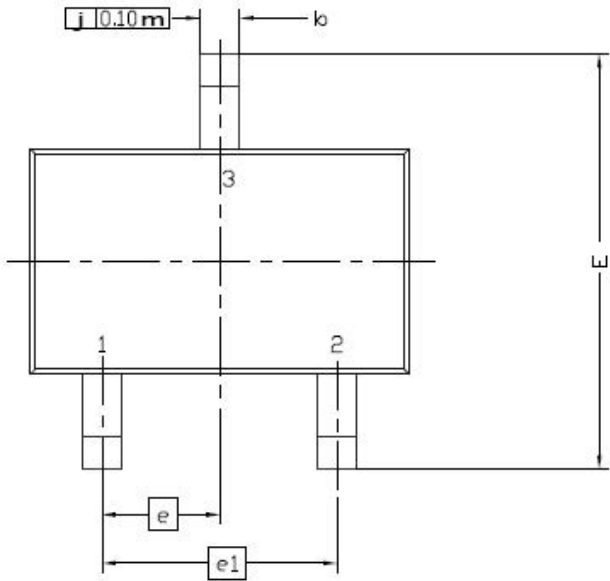


**Figure 13 Safe Operation Area**



**Figure 14 Normalized Maximum Transient Thermal Impedance**

## SC70-3 Package Information



DIM.	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0,900	0,95	1,10	0,035	0,037	0,043
A1	0,00	---	0,10	0,000	---	0,004
A2	0,70	0,90	1,00	0,028	0,035	0,039
k	0,15	0,22	0,30	0,006	0,016	0,012
c	0,08	0,127	0,20	0,003	0,005	0,008
D	2,10 BSC			0,083 BSC		
E	2,30 BSC			0,091 BSC		
E1	1,30 BSC			0,051 BSC		
e	0,65 BSC			0,026 BSC		
e1	1,30 BSC			0,051 BSC		
L	0,26	0,40	0,46	0,010	0,015	0,018
L2	0,254 BSC			0,010 BSC		
R	0,10	---	---	0,004	---	---
$\theta$	0°	4°	8°	0°	4°	8°
$\theta1$	7°NOM			7°NOM		

