
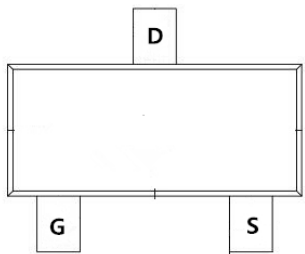


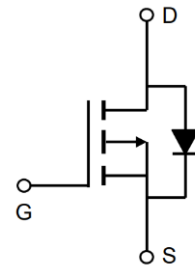
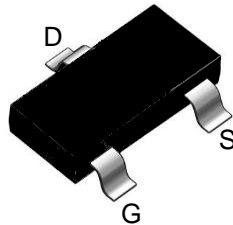
**TM02P02I**

**P-Channel Enhancement Mosfet**

<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>• Low <math>R_{DS(ON)}</math></li> <li>• RoHS and Halogen-Free Compliant</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>• Load switch</li> <li>• PWM</li> </ul>	<p><b>General Features</b></p> <p><math>V_{DS} = -20V</math> <math>I_D = -2.3A</math>  <math>R_{DS(ON)} = 90m\Omega</math> (typ.) @ <math>V_{GS} = -4.5V</math></p> <p>100% UIS Tested                  100% <math>R_g</math> Tested</p> 
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I:SOT-23



Marking:2301 OR A1SHB

**Absolute Maximum Ratings ( $T_c=25^\circ C$  unless otherwise noted)**

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current-Continuous	-2.3	A
$I_{DM}$	Drain Current -Pulsed <sup>(Note 1)</sup>	-10	A
$P_D$	Maximum Power Dissipation	0.7	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup>	178	$^\circ C/W$



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

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20		-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-20V, V_{GS}=0V$	-	-	-1	$\mu A$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.5	-1.0	-1.5	V
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=-4.5V, I_D=-2 A$	-	90	102	m $\Omega$
		$V_{GS}=-2.5V, I_D=-1.8A$	-	103	135	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=-5V, I_D=-2A$	4	-	-	S
$C_{iss}$	Input Capacitance	$V_{DS}=-10V, V_{GS}=0V,$ $F=1.0MHz$	-	290	-	PF
$C_{oss}$	Output Capacitance		-	60	-	PF
$C_{rss}$	Reverse Transfer Capacitance		-	34	-	PF
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=-10V, R_L=5\Omega, V_{GS}=-$ $4.5V, R_{GEN}=3\Omega$	-	10	-	nS
$t_r$	Turn-on Rise Time		-	5.0	-	nS
$t_{d(off)}$	Turn-Off Delay Time		-	21	-	nS
$t_f$	Turn-Off Fall Time		-	7	-	nS
$Q_g$	Total Gate Charge	$V_{DS}=-10V, I_D=-2A,$ $V_{GS}=-4.5V$	-	3.0	-	nC
$Q_{gs}$	Gate-Source Charge		-	0.5	-	nC
$Q_{gd}$	Gate-Drain Charge		-	0.8	-	nC
$V_{SD}$	Diode Forward Voltage <sup>(Note 3)</sup>	$V_{GS}=0V, I_S=-2A$	-	-	-1.2	V

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

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Typical Characteristics

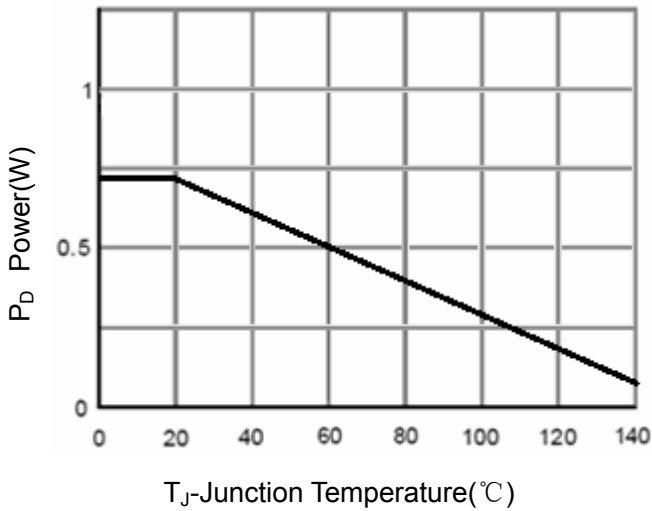


Figure 1 Power Dissipation

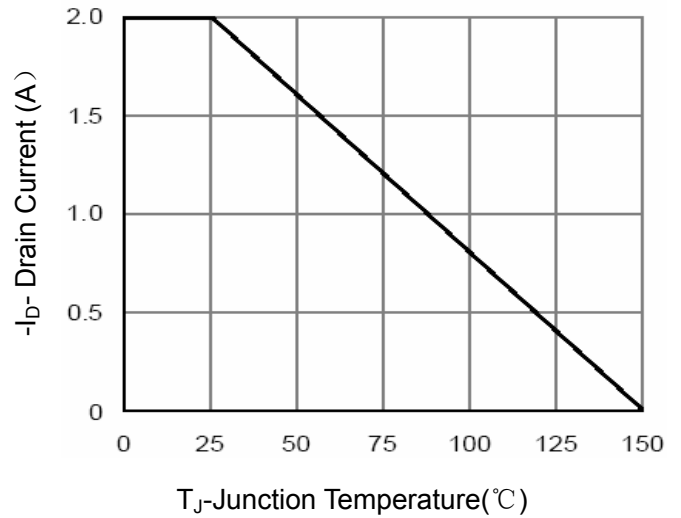


Figure 2 Drain Current

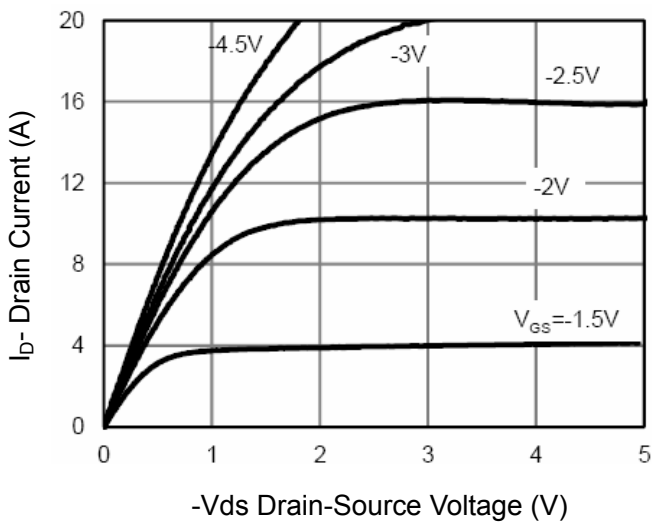


Figure 3 Output Characteristics

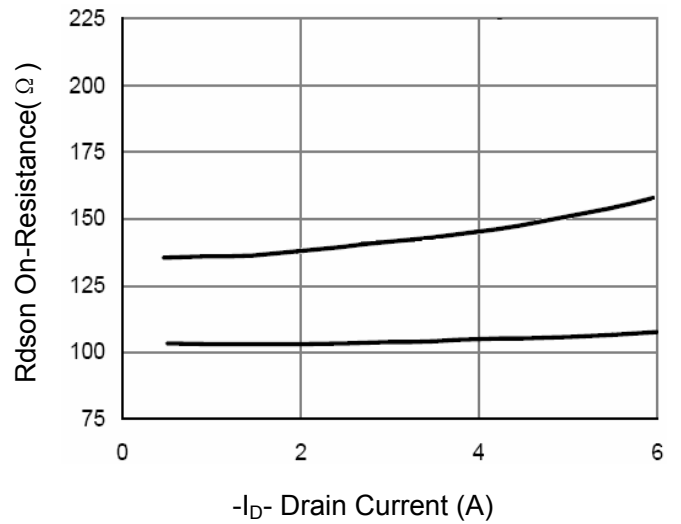


Figure 4 Drain-Source On-Resistance

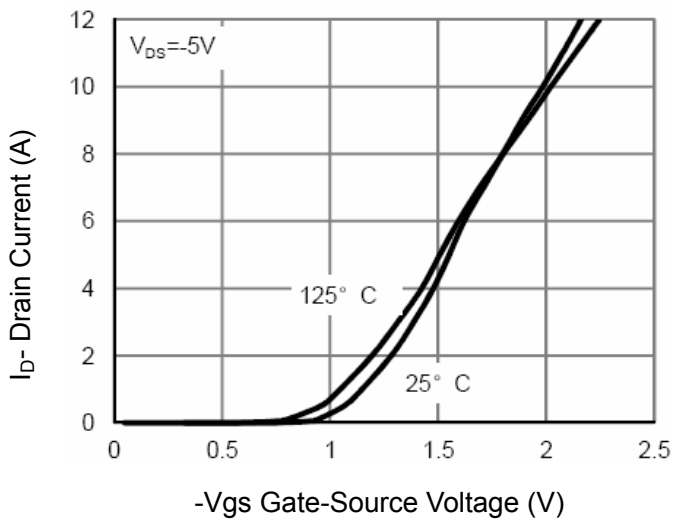


Figure 5 Transfer Characteristics

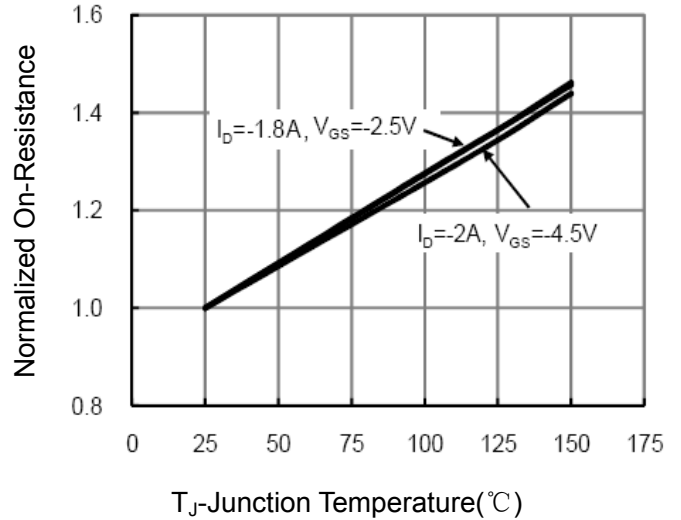


Figure 6 Drain-Source On-Resistance

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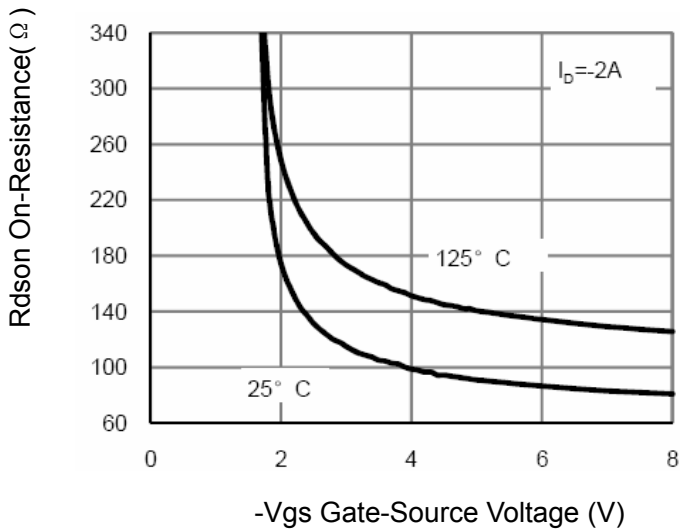


Figure 7 Rds(on) vs Vgs

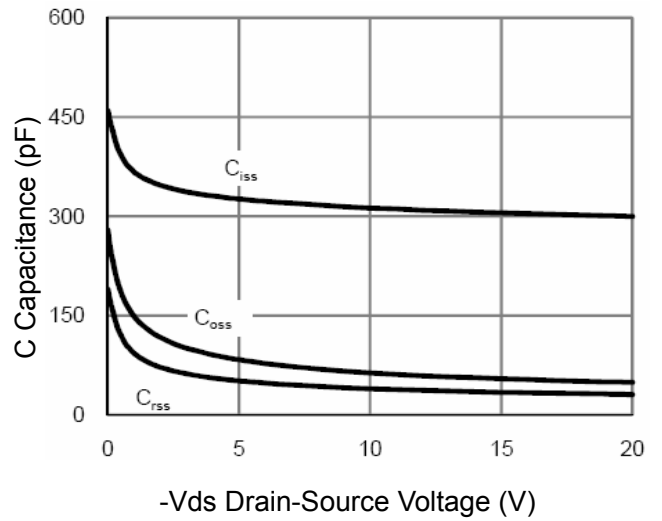


Figure 8 Capacitance vs Vds

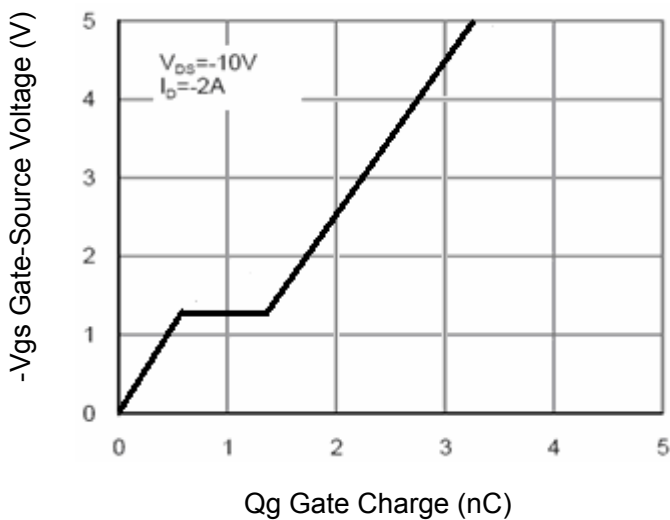


Figure 9 Gate Charge

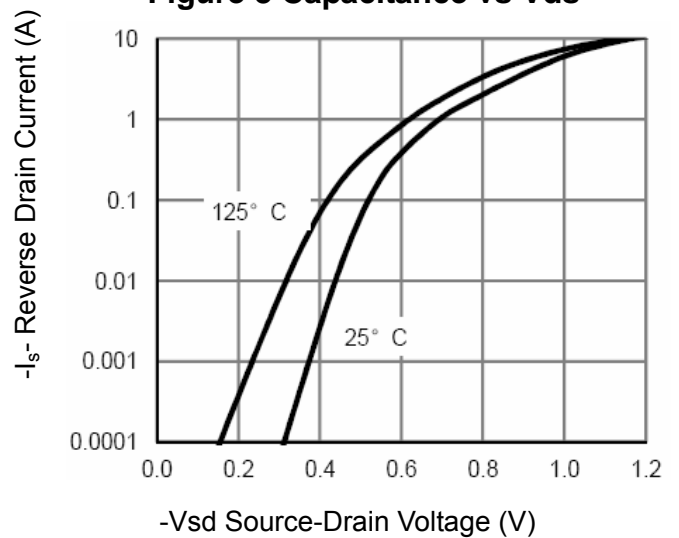


Figure 10 Source-Drain Diode Forward

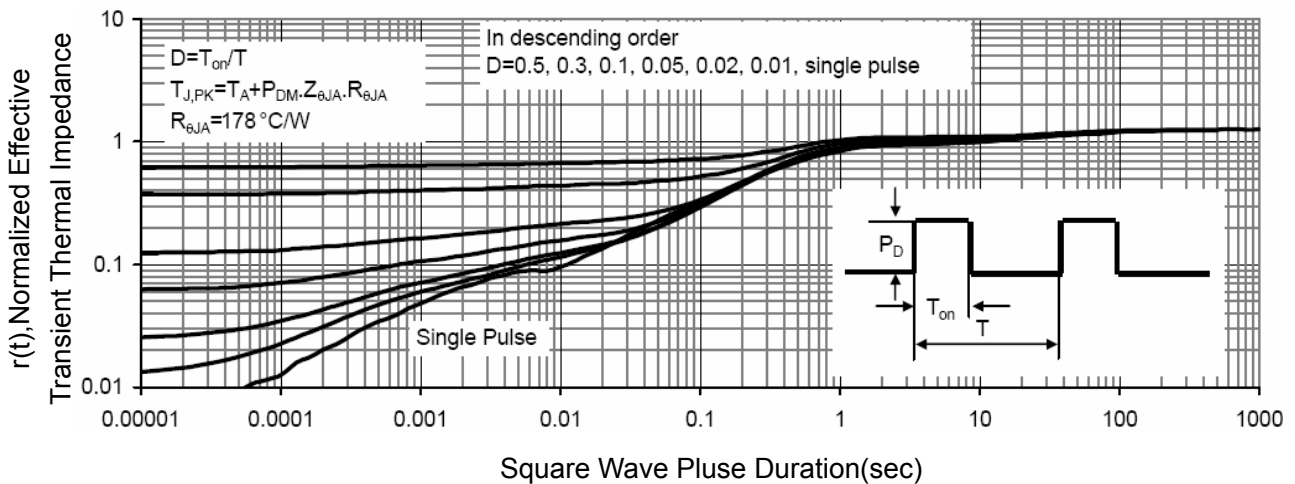
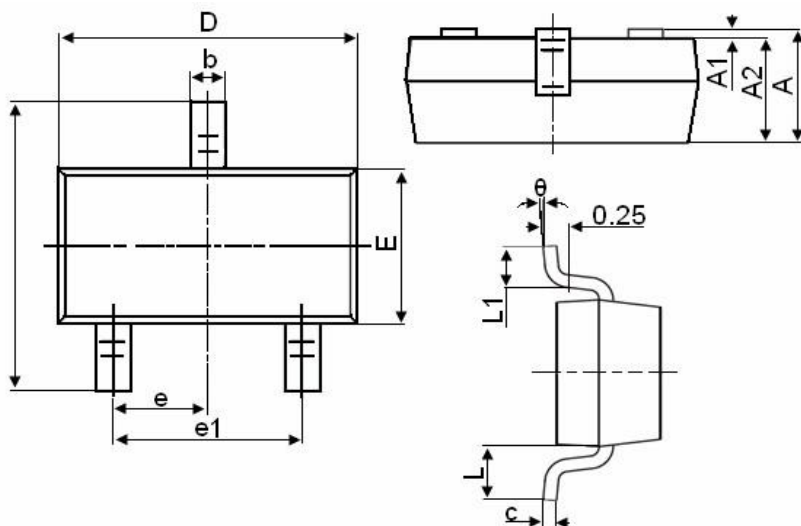


Figure 11 Normalized Maximum Transient Thermal Impedance

## Package Mechanical Data:SOT-23



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°