

# AP2301

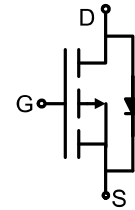
## P-Channel Enhancement Mosfet

# AIPOWER

## DATA SHEET

### Feature

- -20V,-3A  
 $R_{DS(ON)} < 75m\Omega @ V_{GS} = -10V$  TYP: 58 m $\Omega$   
 $R_{DS(ON)} < 95m\Omega @ V_{GS} = -4.5V$  TYP: 74 m $\Omega$
- Advanced Trench Technology
- Lead free product is acquired



Schematic diagram

### Application

- Interfacing Switching
- Load Switching
- Power management



SOT-23 top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
2301	AP2301	Sot-23	7 inch	-	3000

### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current ( $T_a = 25^\circ\text{C}$ )	$I_D$	-3	A
Continuous Drain Current ( $T_a = 70^\circ\text{C}$ )	$I_D$	-2	A
Pulsed Drain Current	$I_{DM}$	-12	A
Power Dissipation	$P_D$	1	W
Thermal Resistance from Junction to Ambient <sup>(4)</sup>	$R_{\theta JA}$	125	$^\circ\text{C/W}$
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55~ +150	$^\circ\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS( $T_a=25^{\circ}\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-20	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = -20V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate-body leakage current	$I_{GSS}$	$V_{GS} = \pm 12V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate threshold voltage <sup>(3)</sup>	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-0.5	-0.7	-1.0	V
Drain-source on-resistance <sup>(3)</sup>	$R_{DS(on)}$	$V_{GS} = -4.5V, I_D = -3A$	-	57	75	m $\Omega$
		$V_{GS} = -2.5V, I_D = -2A$	-	74	95	
<b>Dynamic characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -10V, V_{GS} = 0V, f = 1MHz$	-	503	-	pF
Output Capacitance	$C_{oss}$		-	67	-	
Reverse Transfer Capacitance	$C_{rss}$		-	58	-	
<b>Switching characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -10V, I_D = -3A,$ $V_{GS} = -4.5V, R_G = 3\Omega$	-	11	-	ns
Turn-on rise time	$t_r$		-	52	-	
Turn-off delay time	$t_{d(off)}$		-	16	-	
Turn-off fall time	$t_f$		-	10	-	
Total Gate Charge	$Q_g$	$V_{DS} = -10V, I_D = -2A,$ $V_{GS} = -4.5V$	-	4.1	-	nC
Gate-Source Charge	$Q_{gs}$		-	0.8	-	
Gate-Drain Charge	$Q_{gd}$		-	1.1	-	
<b>Source-Drain Diode characteristics</b>						
Diode Forward voltage <sup>(3)</sup>	$V_{DS}$	$V_{GS} = 0V, I_S = -3A$	-	-	1.2	V
Diode Forward current <sup>(4)</sup>	$I_S$		-	-	-3	A

**Notes:**

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
3. Surface Mounted on FR4 Board,  $t_s \leq 10$  sec

**Test Circuit**

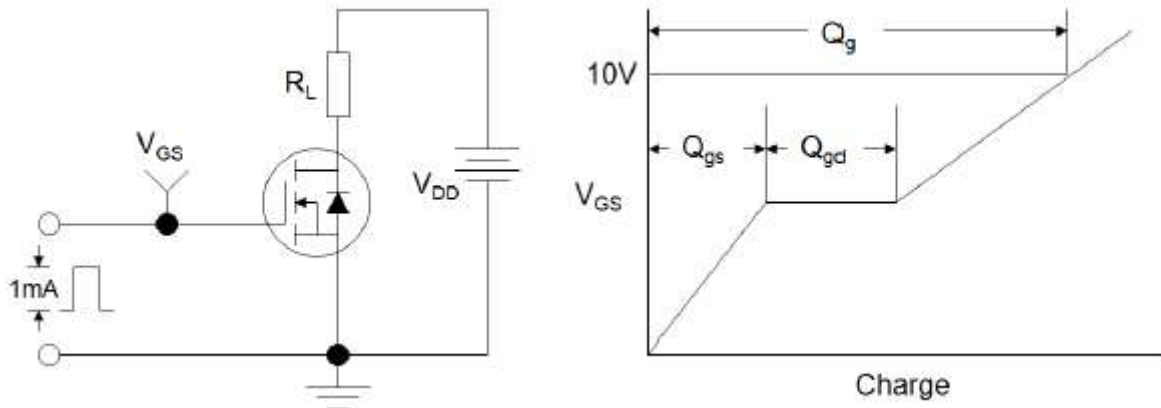


Figure1:Gate Charge Test Circuit & Waveform

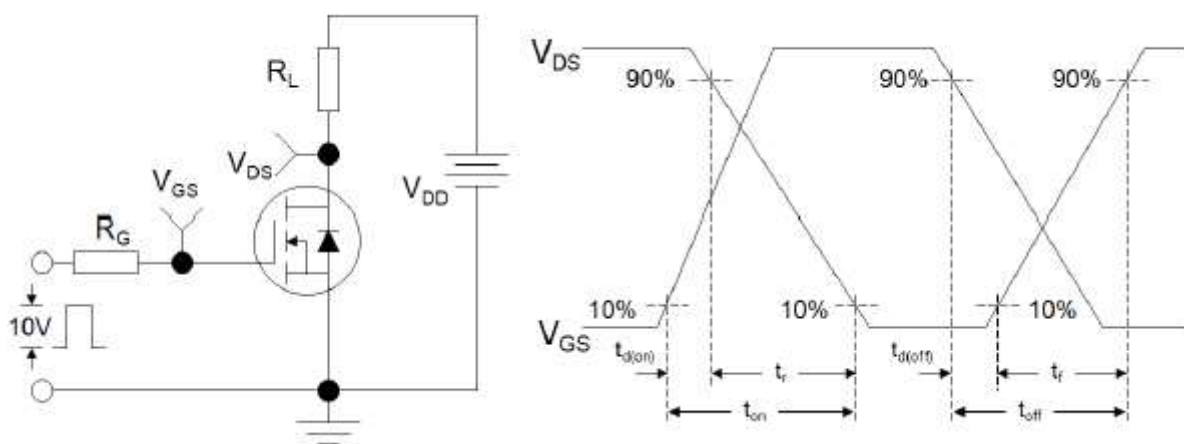


Figure 2: Resistive Switching Test Circuit & Waveforms

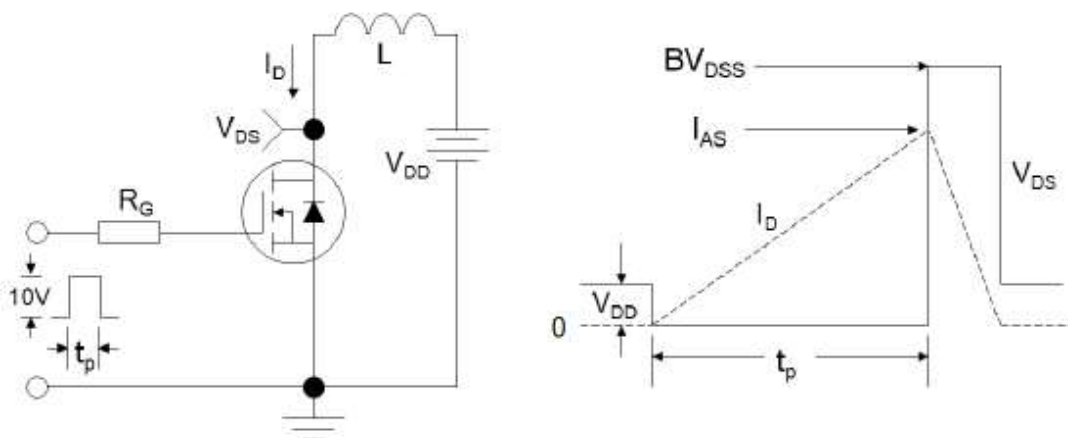
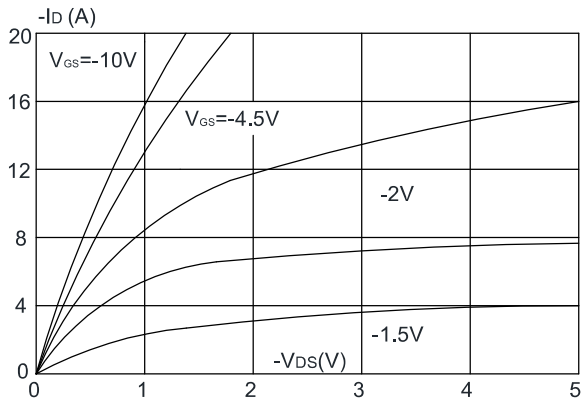


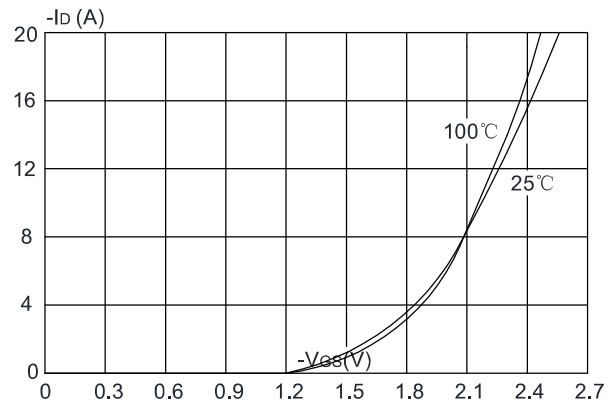
Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

**Typical Performance Characteristics**

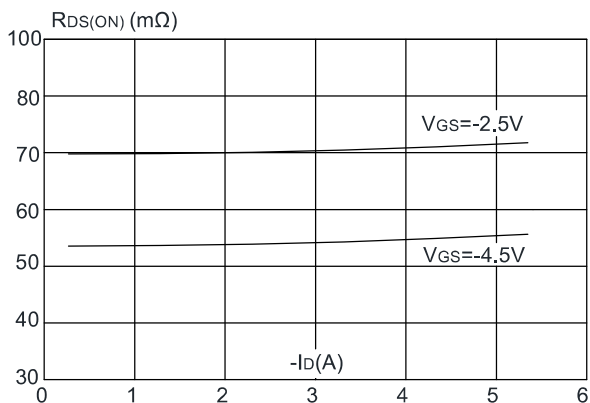
**Figure 1: Output Characteristics**



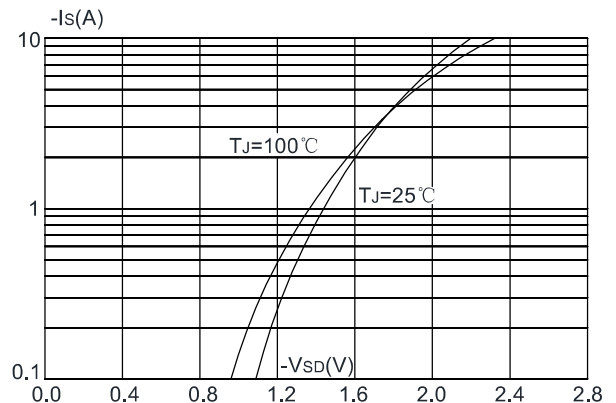
**Figure 2: Typical Transfer Characteristics**



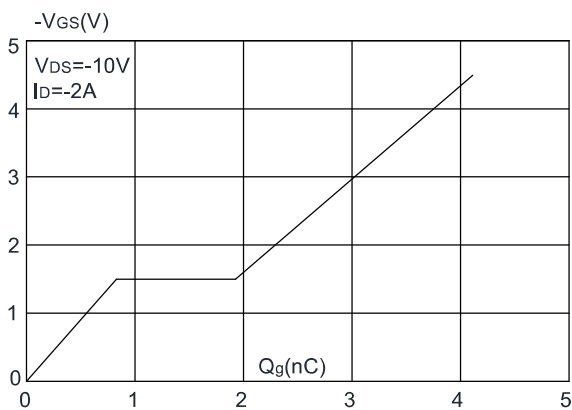
**Figure 3: On-resistance vs. Drain Current**



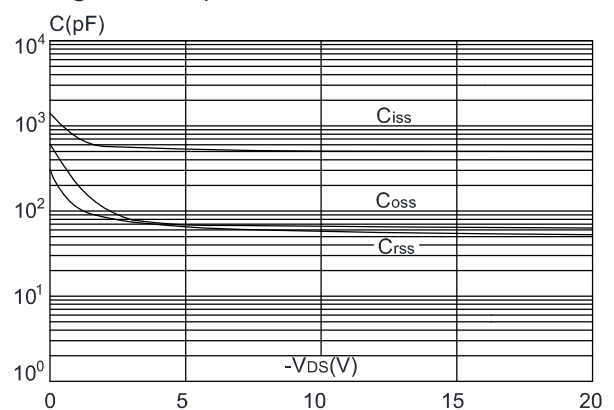
**Figure 4: Body Diode Characteristics**



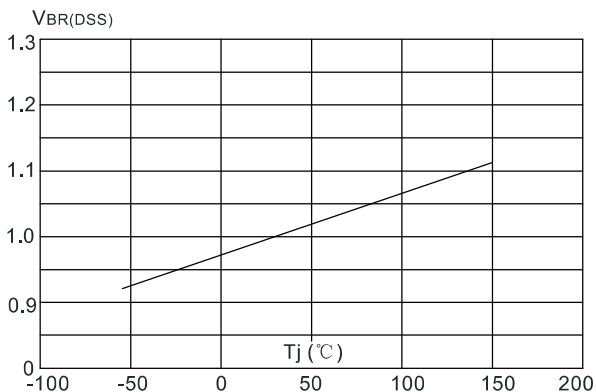
**Figure 5: Gate Charge Characteristics**



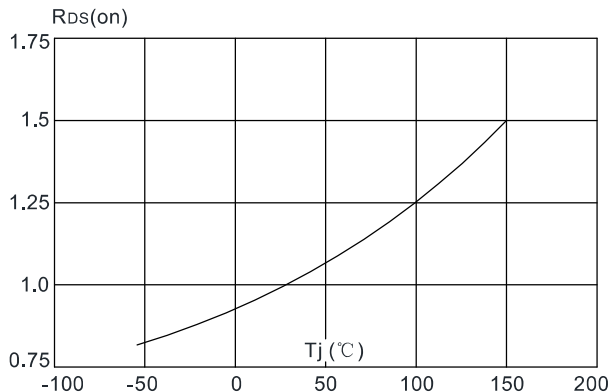
**Figure 6: Capacitance Characteristics**



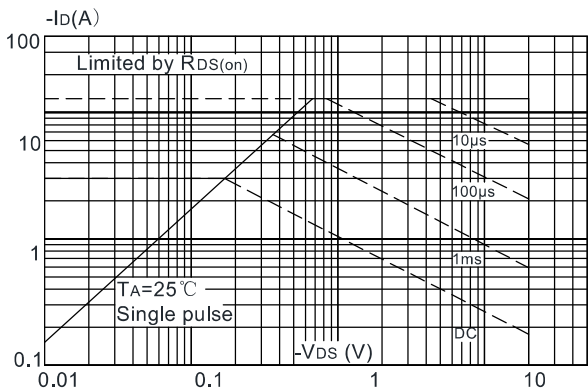
**Figure 7: Normalized Breakdown Voltage vs. Junction Temperature**



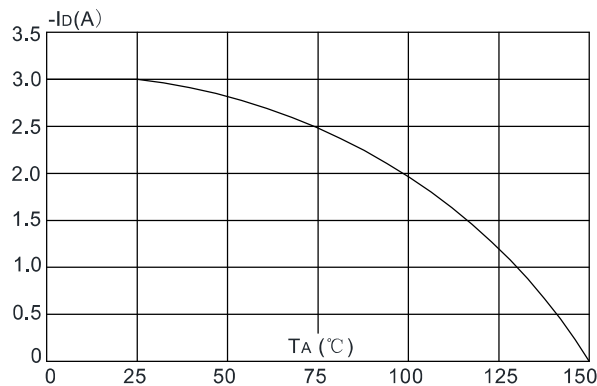
**Figure 8: Normalized on Resistance vs. Junction Temperature**



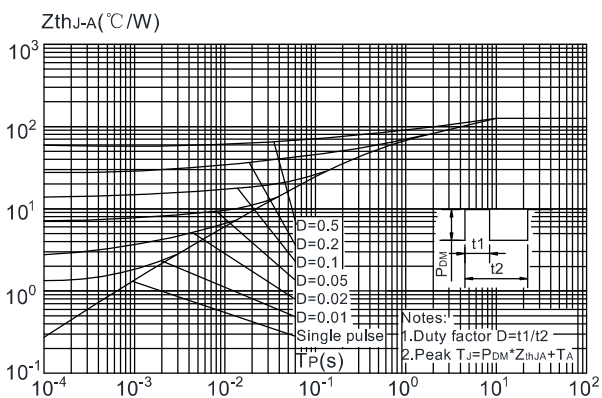
**Figure 9: Maximum Safe Operating Area**



**Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature**



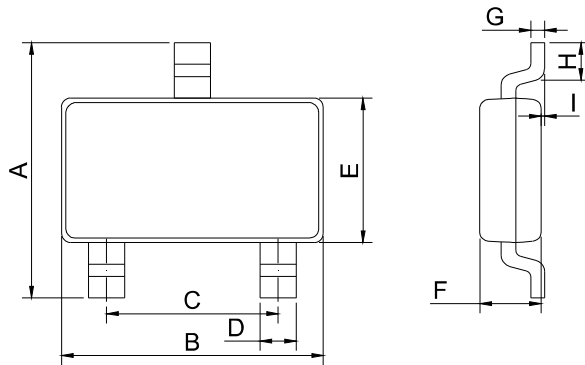
**Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient**



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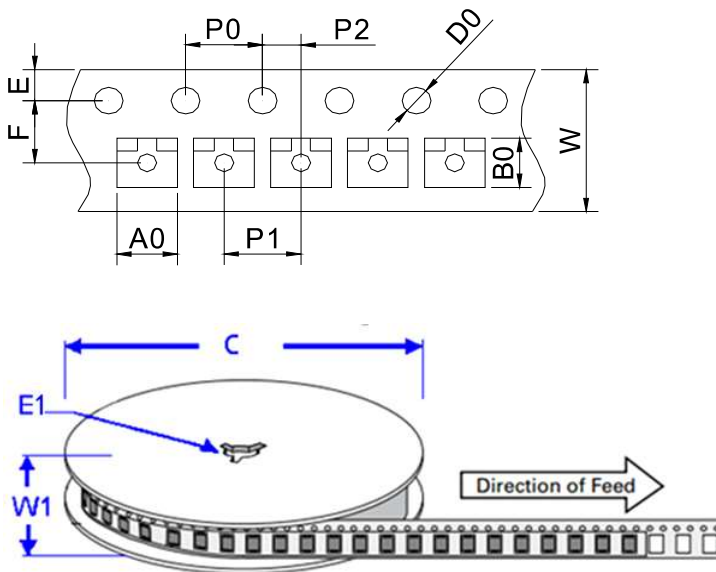
## SOT-23 Package Information



SOT-23

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.30	2.40	2.50	0.091	0.095	0.098
B	2.80	2.90	3.00	0.110	0.114	0.118
C	1.90 REF			0.075 REF		
D	0.35	0.40	0.45	0.014	0.016	0.018
E	1.20	1.30	1.40	0.047	0.051	0.055
F	0.90	1.00	1.10	0.035	0.039	0.043
G		0.10	0.15		0.004	0.006
H	0.20			0.008		
I	0		0.10	0		0.004

## Package Information-SOT-23



Ref.	Dimensions	
	Millimeters	Inches
A0	3.15 ± 0.3	0.124 ± 0.012
B0	2.77 ± 0.3	0.109 ± 0.012
C	178	7.0
D0	1.50 ± 0.1	0.059 ± 0.004
E	1.75 ± 0.2	0.069 ± 0.008
E1	13.3 ± 0.3	0.524 ± 0.012
F	3.5 ± 0.2	0.138 ± 0.008
P0	4.00 ± 0.2	0.157 ± 0.008
P1	4.00 ± 0.2	0.157 ± 0.008
P2	2.00 ± 0.2	0.079 ± 0.008
W	8.00 ± 0.2	0.315 ± 0.008
W1	11.5 ± 1.0	0.453 ± 0.039