

20V P-Channel Enhancement Mode MOSFET

Description

The NP2301A uses advanced trench technology to provide excellent $R_{DS(ON)}$, 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.

General Features

- ◆ $V_{DS} = -20V$, $I_D = -2.8A$
 $R_{DS(ON)}(Typ.) = 75m\Omega$ @ $V_{GS} = -2.5V$
 $R_{DS(ON)}(Typ.) = 60m\Omega$ @ $V_{GS} = -4.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package

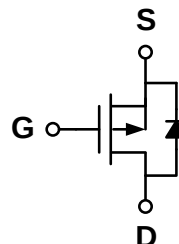
Application

- ◆ PWM applications
- ◆ Load switch

Package

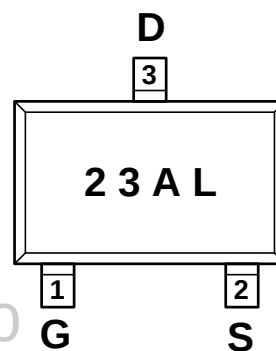
- ◆ SOT-23-3L

Schematic diagram



Marking and pin assignment

SOT-23-3L
(TOP VIEW)



23A----NP2301A

L-----Package Information

Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP2301AMR-G	-55°C to +150°C	SOT-23-3L	3000

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

parameter	symbol	limit	unit
Drain-source voltage	V_{DS}	-20	V
Gate-source voltage	V_{GS}	±12	V
Drain current-continuous ^a @Tj=125°C -pulse ^a	I_D	-2.8	A
	I_{DM}	-11	A
Drain-source Diode forward current	I_S	-1.25	A
Maximum power dissipation	P_D	1.2	W
Operating junction Temperature range	T_J	-55—150	°C

Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-20	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =-20V, V _{GS} =0V	-	-	-1	μA
Gate-body leakage	I _{GSS}	V _{DS} =0V, V _{GS} =±12V	-	-	±100	nA
ON Characteristics						
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-0.4	-0.65	-1.2	V
Drain-source on-state resistance	R _{DS(ON)}	V _{GS} =-4.5V, I _D =-2.8A	-	60	90	mΩ
		V _{GS} =-2.5V, I _D =-2.8A	-	75	120	
Forward transconductance	g _{fs}	V _{GS} =-5V, I _D =-5A	-	5	-	S
Dynamic Characteristics						
Input capacitance	C _{ISS}	V _{DS} =-10V ,V _{GS} =0V f=1.0MHz	-	561	-	pF
Output capacitance	C _{OSS}		-	61	-	
Reverse transfer capacitance	C _{RSS}		-	52	-	
Switching Characteristics						
Turn-on delay time	t _{D(ON)}	V _{DD} =-10V I _D =-2.8A V _{GEN} =-4.5V R _L =10ohm R _{GEN} =-60ohm	-	12.5	-	ns
Rise time	t _r		-	6.6	-	
Turn-off delay time	t _{D(OFF)}		-	113	-	
Fall time	t _f		-	46.6	-	
Total gate charge	Q _g	V _{DS} =-10V,I _D =-3A V _{GS} =-4.5V	-	6.1	-	nC
Gate-source charge	Q _{gs}		-	1.7	-	
Gate-drain charge	Q _{gd}		-	1.2	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V _{SD}	V _{GS} =0V,I _S =-1.25A	-	-0.81	-1.2	V

Notes:

- surface mounted on FR4 board, $t \leq 10sec$
- pulse test: pulse width $\leq 300\mu s$, duty $\leq 2\%$
- guaranteed by design, not subject to production testing

Thermal Characteristics

Thermal Resistance junction-to ambient	$R_{th JA}$	100	$^{\circ}C/W$
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Typical Performance Characteristics

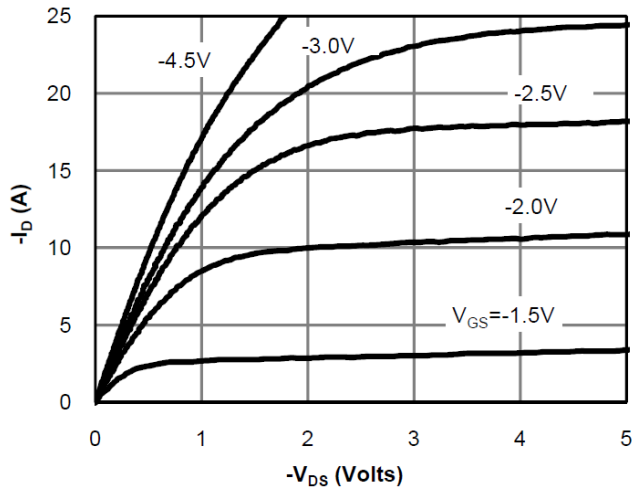


Figure 1: On-Region Characteristics

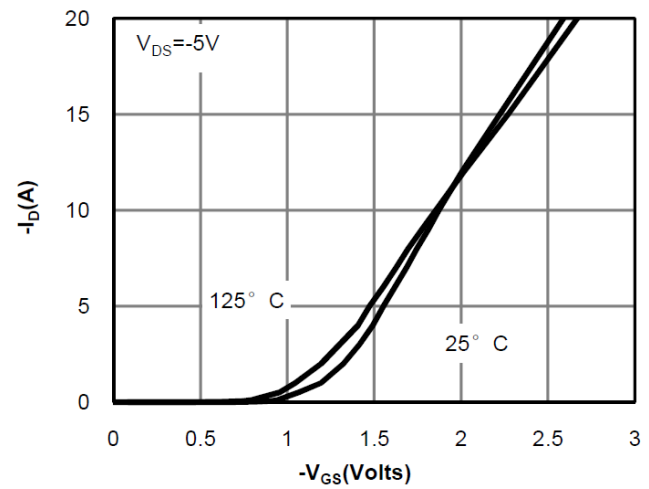


Figure 2: Transfer Characteristics

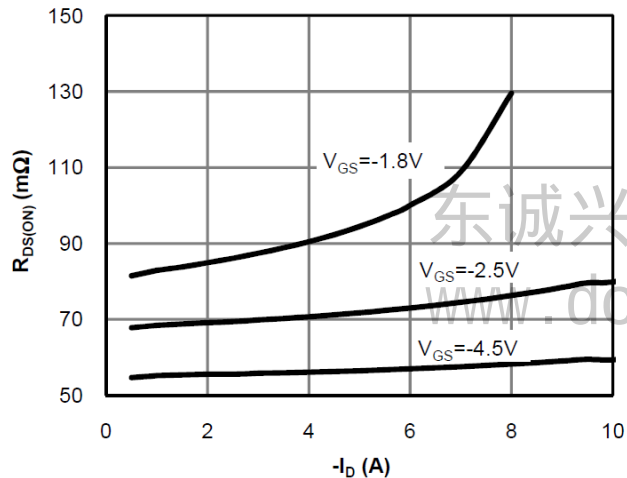


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

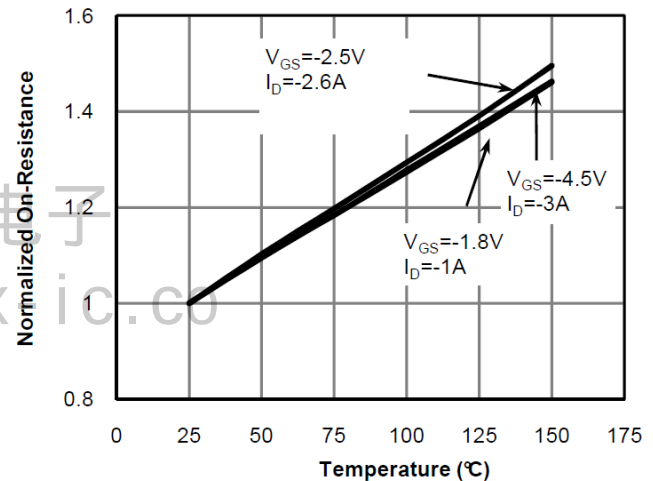


Figure 4: On-Resistance vs. Junction Temperature

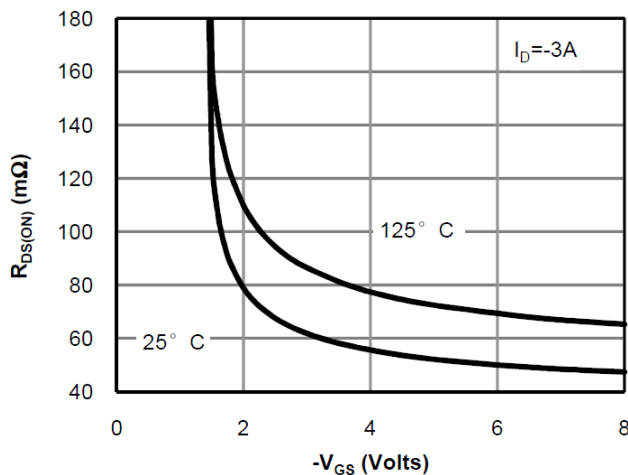


Figure 5: On-Resistance vs. Gate-Source Voltage

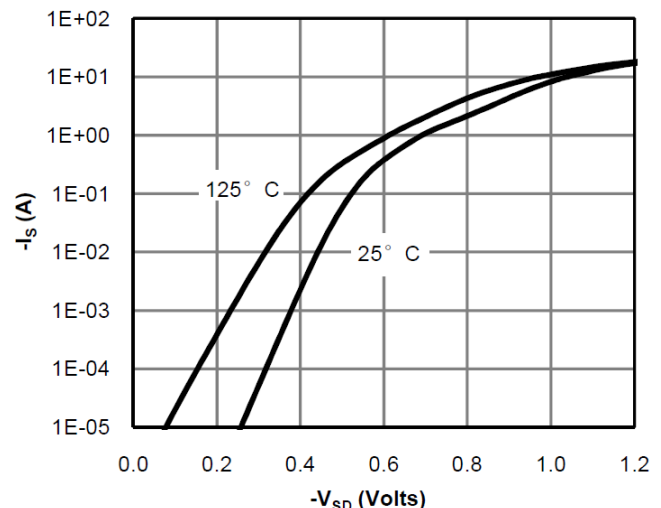


Figure 6: Body-Diode Characteristics

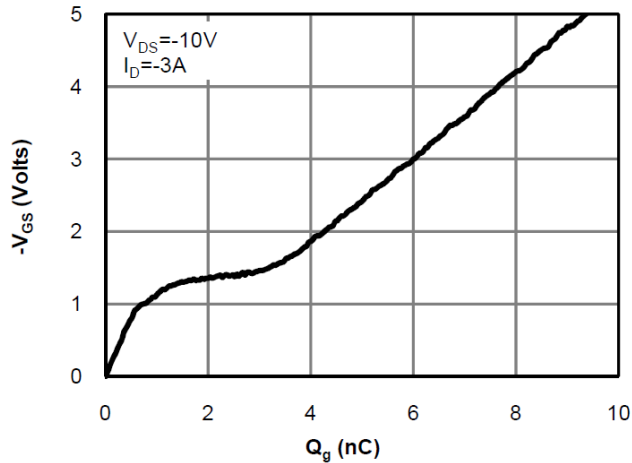


Figure 7: Gate-Charge Characteristics

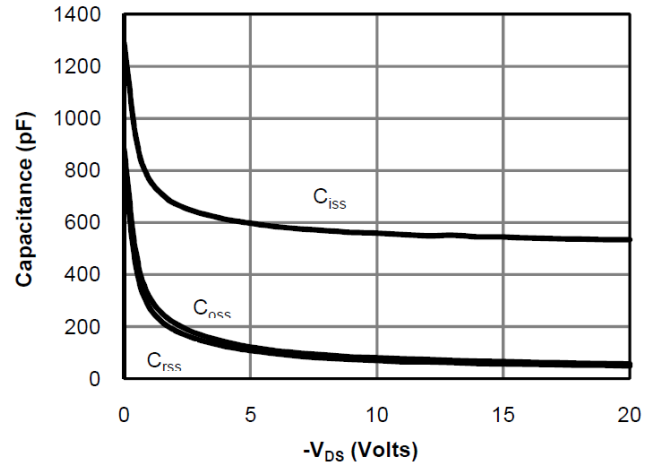


Figure 8: Capacitance Characteristics

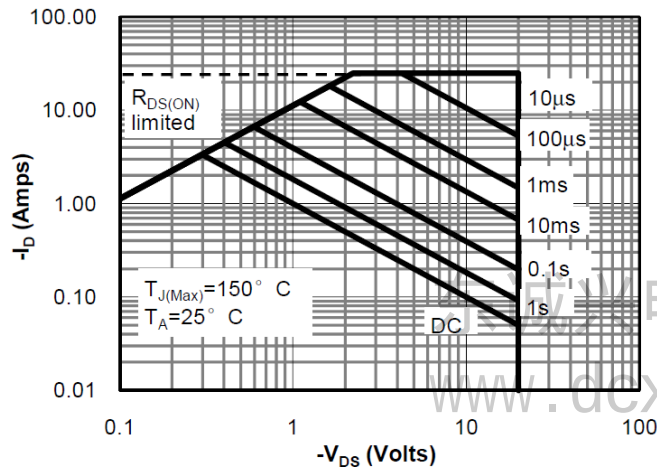


Figure 9: Maximum Forward Biased Safe Operating Area

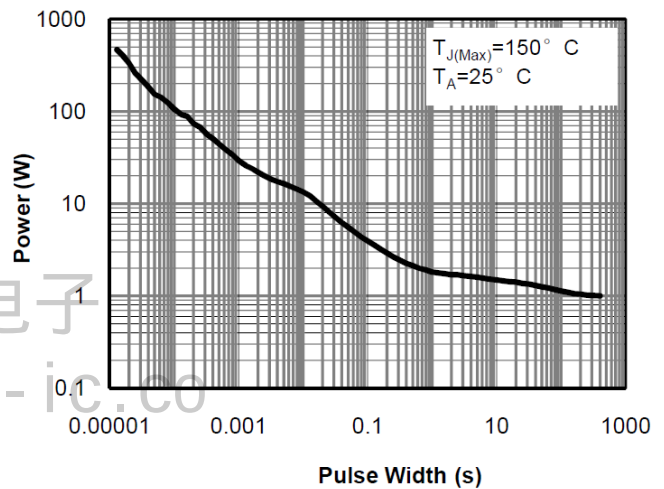


Figure 10: Single Pulse Power Rating Junction-to-Ambient

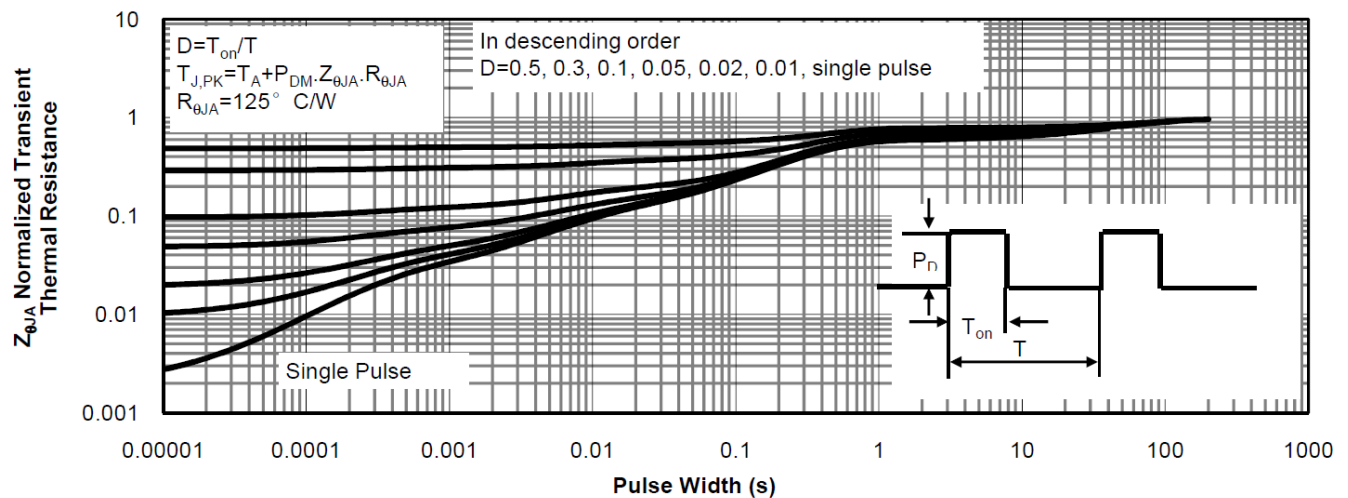
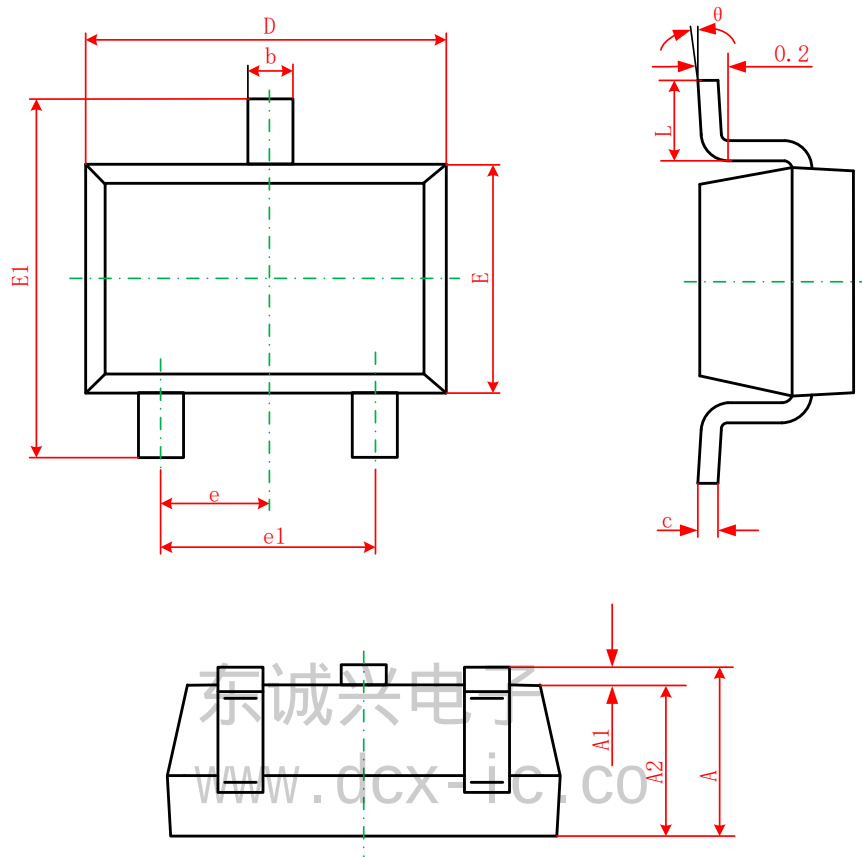


Figure 11: Normalized Maximum Transient Thermal Impedance

Package Information

- SOT-23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°