

P-Channel Enhancement Mode Power MOSFET

Description

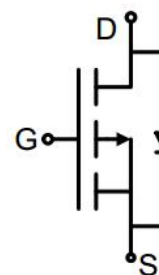
The 2301 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.

General Features

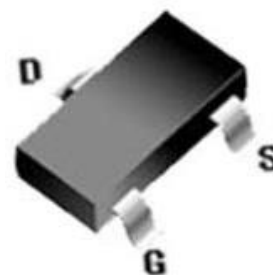
- V_{DS} -20V
- I_D (at $V_{GS} = -10V$) -3A
- $R_{DS(ON)}$ (at $V_{GS} = -4.5V$) < 56m Ω
- $R_{DS(ON)}$ (at $V_{GS} = -2.5V$) < 80m Ω
- 100% Avalanche Tested
- RoHS Compliant

Application

- Power switch
- DC/DC converters



Schematic diagram



SOT-23

Ordering Information

Device	Package	Marking	Packaging
2301	SOT-23	2301	3000pcs/Reel

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-20	V
Continuous Drain Current	I_D	-3	A
		-1.9	
Pulsed Drain Current (note1)	I_{DM}	-12	A
Gate-Source Voltage	V_{GS}	± 12	V
Power Dissipation	P_D	1	W
Single pulse avalanche energy (note2)	E_{AS}	10	mJ
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 To 150	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient, $t \leq 10s$	R_{thJA}	125	$^\circ\text{C/W}$

Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static Parameters						
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	μA
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 12V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-0.45	-0.65	-0.9	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = -4.5V, I_D = -3A$	--	51	56	m Ω
		$V_{GS} = -2.5V, I_D = -2.5A$	--	69	80	
Forward Transconductance	g_{FS}	$V_{DS} = -5V, I_D = -3A$	--	4.5	--	S
Dynamic Parameters						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = -10V,$ $f = 1.0MHz$	--	550	--	pF
Output Capacitance	C_{oss}		--	85	--	
Reverse Transfer Capacitance	C_{rss}		--	75	--	
Total Gate Charge	Q_g	$V_{DD} = -4.5V,$ $I_D = -3A,$ $V_{GS} = -10V$	--	8	--	nC
Gate-Source Charge	Q_{gs}		--	1	--	
Gate-Drain Charge	Q_{gd}		--	2	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = -10V,$ $I_D = -3A,$ $R_G = 3.3\Omega$	--	7	--	ns
Turn-on Rise Time	t_r		--	36	--	
Turn-off Delay Time	$t_{d(off)}$		--	53	--	
Turn-off Fall Time	t_f		--	56	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^\circ C$	--	--	-3	A
Body Diode Voltage	V_{SD}	$T_J = 25^\circ C, I_{SD} = -3A, V_{GS} = 0V$	--	--	-1.2	V
Reverse Recovery Charge	Q_{rr}	$I_F = -3A, V_{GS} = 0V$ $di/dt = -100A/us$	--	27	--	nC
Reverse Recovery Time	T_{rr}		--	37	--	ns

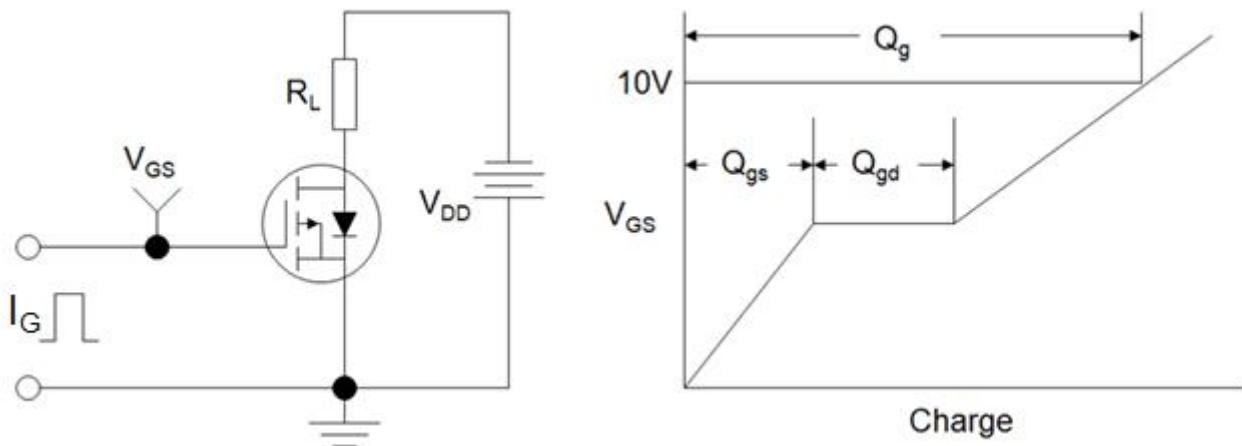
Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition : $T_J = 25^\circ\text{C}$, $V_{DD} = -20V$, $V_{GS} = -10V$, $L = 0.5mH$, $R_g = 25\Omega$

The table shows the minimum avalanche energy, which is 29mJ when the device is tested until failure

3. Identical low side and high side switch with identical R_G

Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



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

Figure 1. Output Characteristics

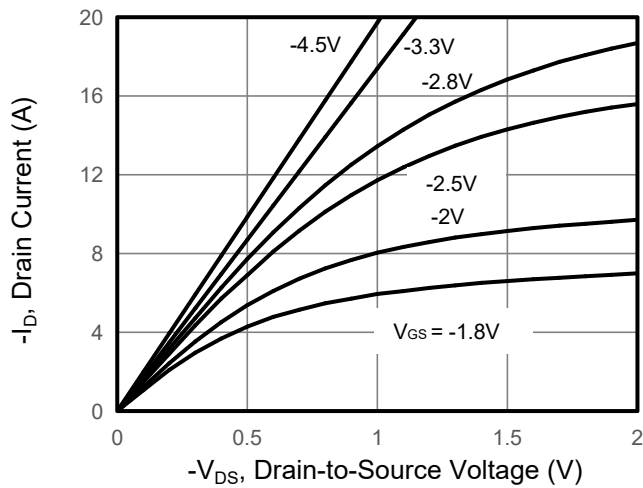


Figure 2. Transfer Characteristics

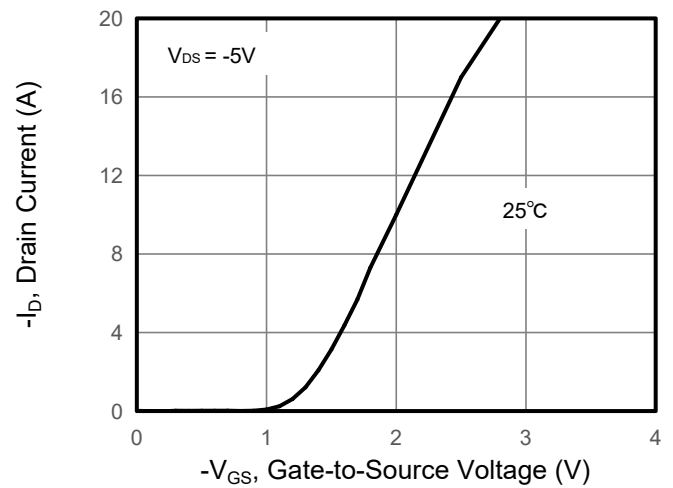


Figure 3. Drain Source On Resistance

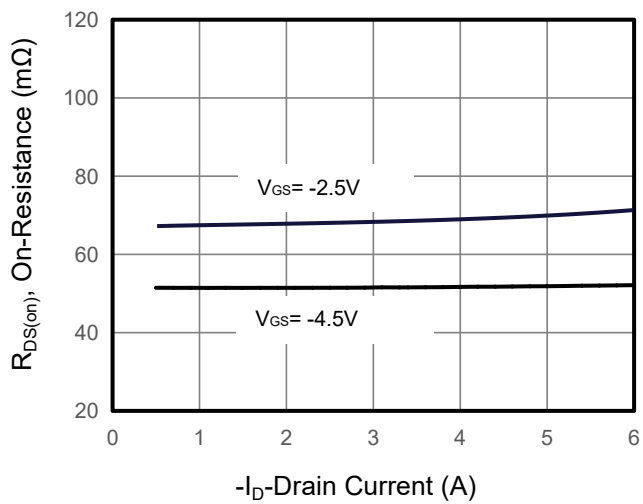


Figure 4. Gate Charge

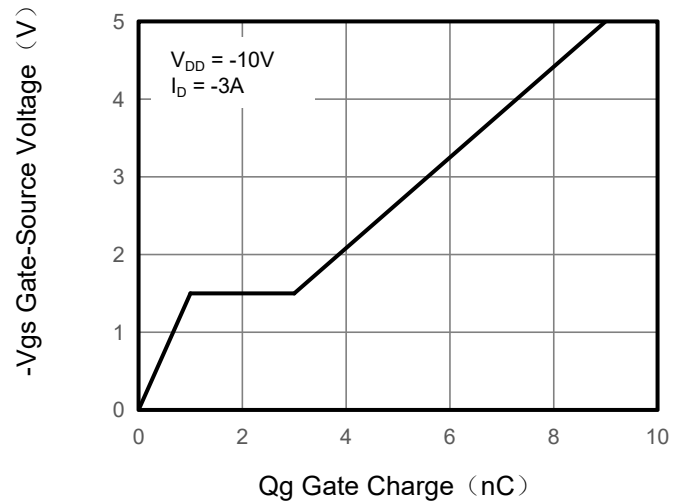


Figure 5. Capacitance

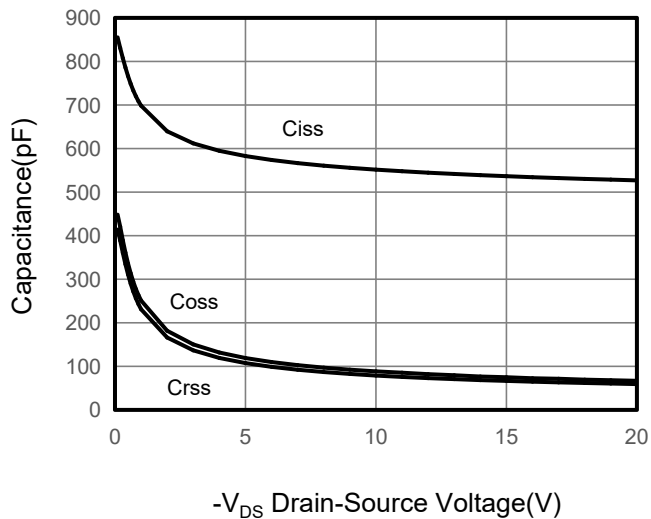
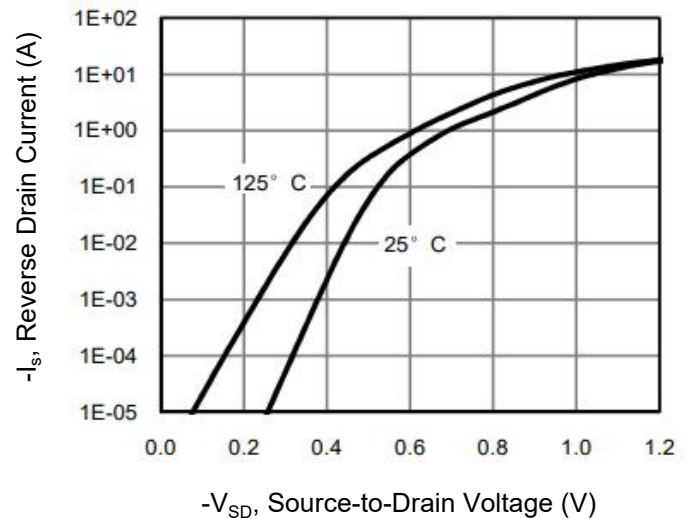


Figure 6. Source-Drain Diode Forward



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

Figure 7. Drain-Source On-Resistance

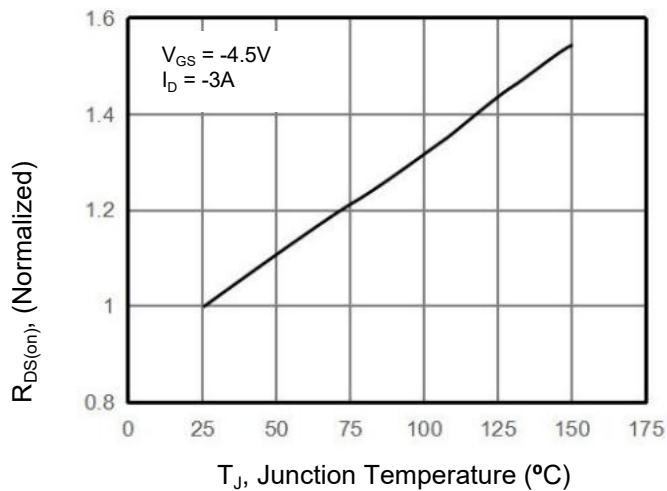


Figure 8. Safe Operation Area

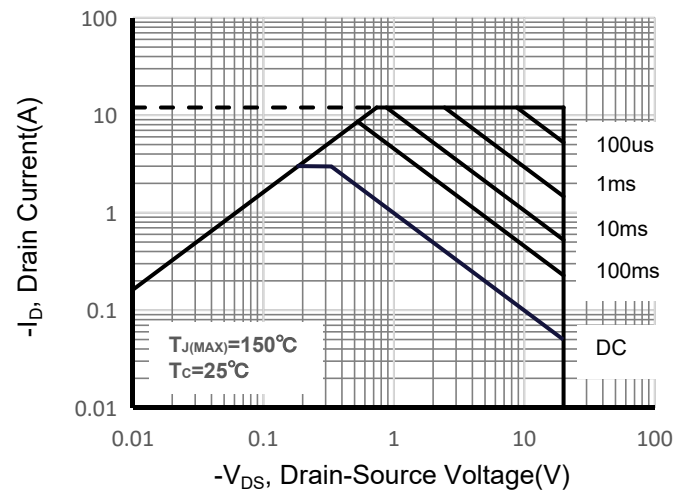


Figure 9. Maximum Continuous Drain Current vs Case Temperature

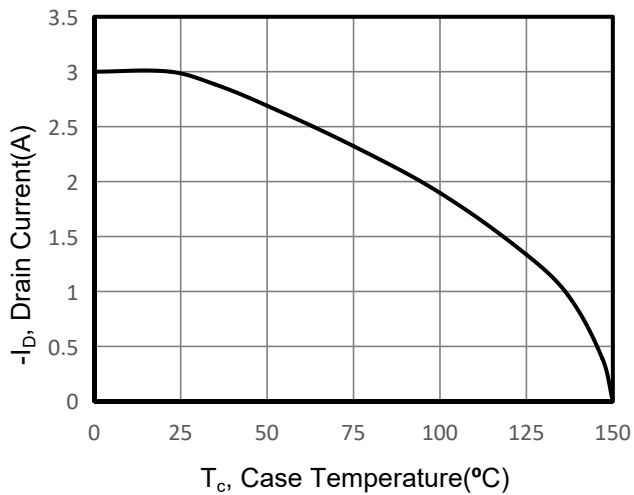
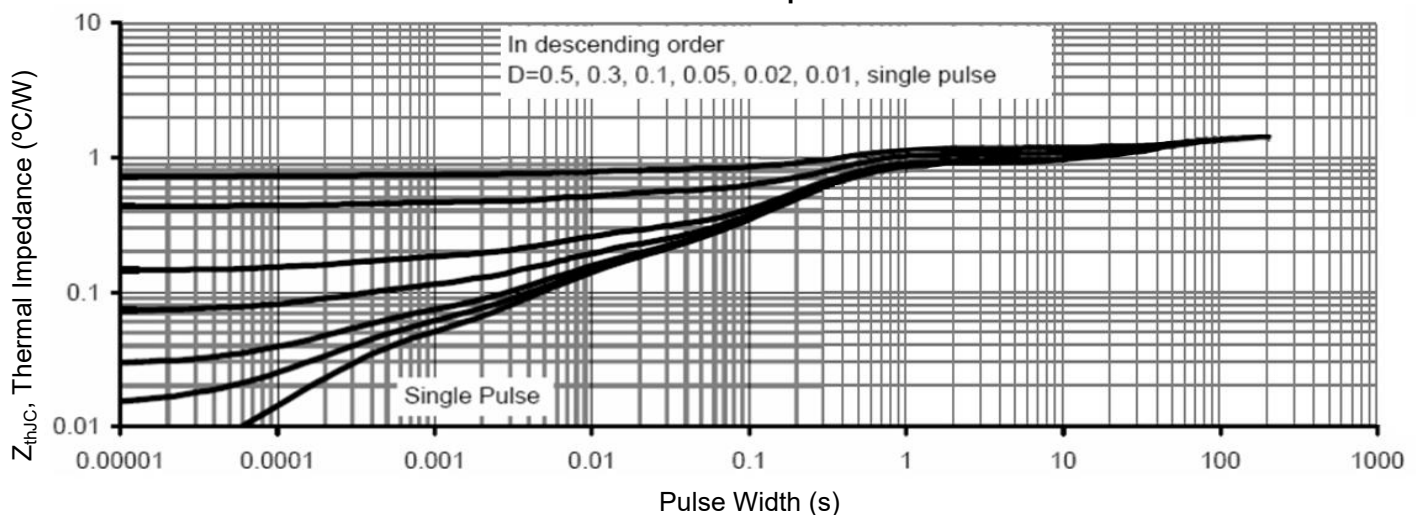
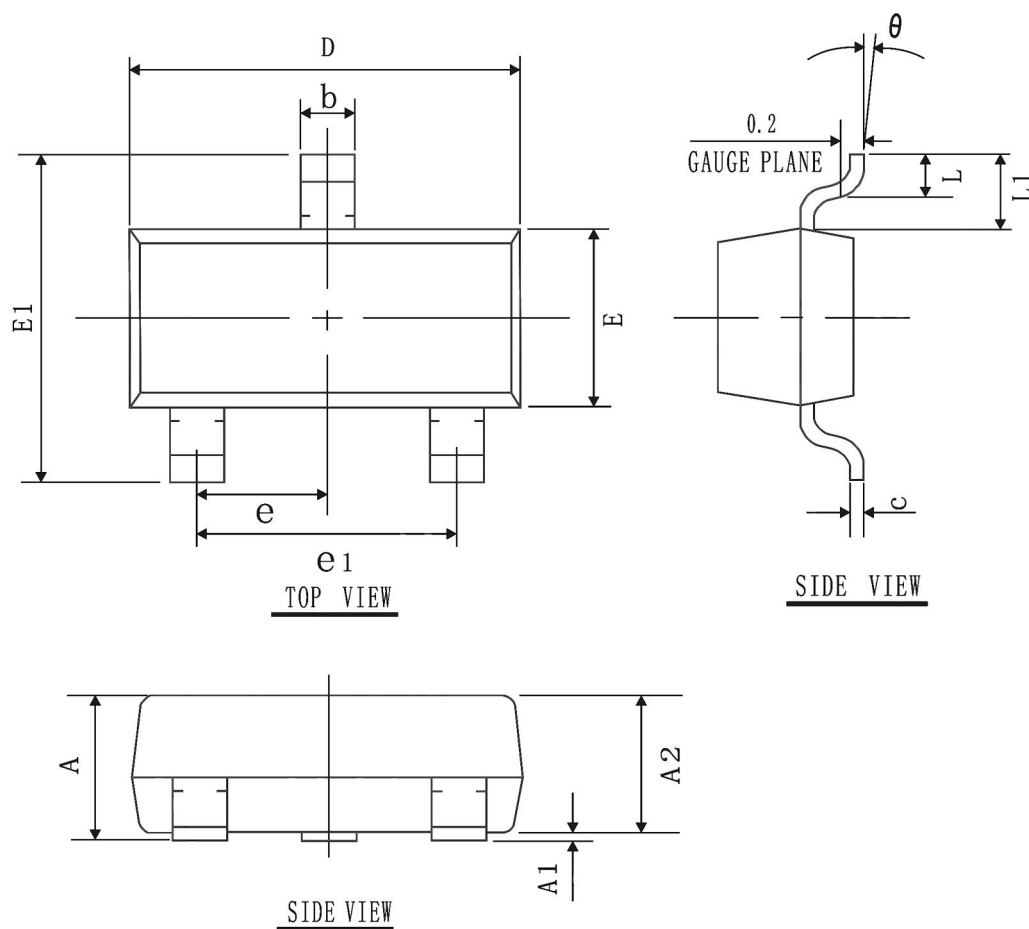


Figure 10. Normalized Maximum Transient Thermal Impedance



SOT-23 Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	0.90	1.05	1.20
A1	0.00	0.05	0.10
A2	0.90	1.00	1.10
b	0.30	0.40	0.50
c	0.08	0.10	0.15
D	2.80	2.90	3.00
E	1.20	1.30	1.40
E1	2.30	2.40	2.50
L	0.30	0.40	0.50
θ	0°	5°	10°
L1	0.55 REF		
e	0.95 BSC		
e1	1.90 REF		