

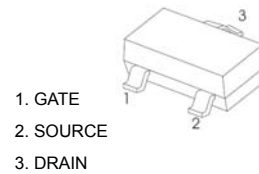
## FEATURES

- High density cell design for low  $R_{DS(ON)}$
- Voltage controlled small signal switch
- Rugged and reliable
- High saturation current capability

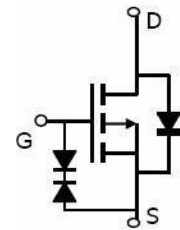
$V_{DSS}$  -20 V  
 $I_D$  -4.0A  
 $R_{DS(ON)}$  30 m  $\Omega$

3415

### SOT-23



### Equivalent Circuit



## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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	$V_{GS}$	$\pm 12$	
Continuous Drain Current ( $t \leq 10\text{s}$ )	$I_D$	-4.0	A
Maximum Power Dissipation ( $t \leq 10\text{s}$ )	$P_D$	1.2	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$
Operating Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

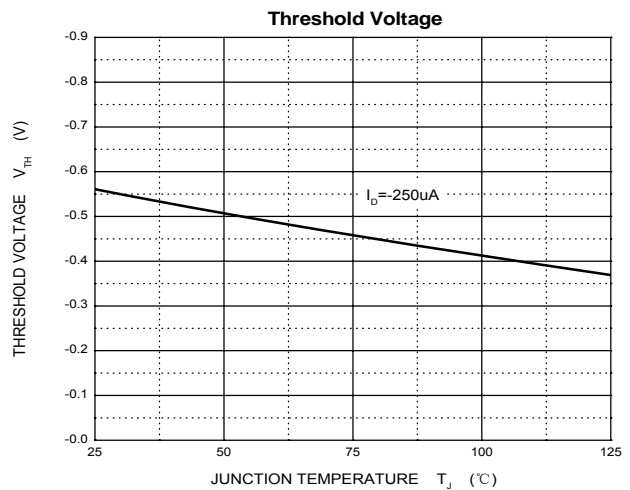
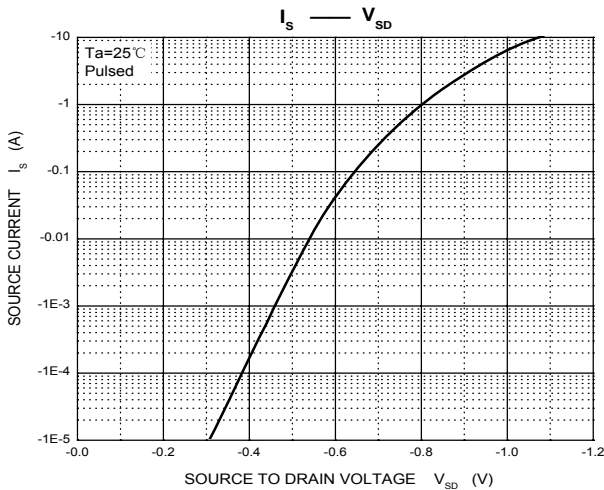
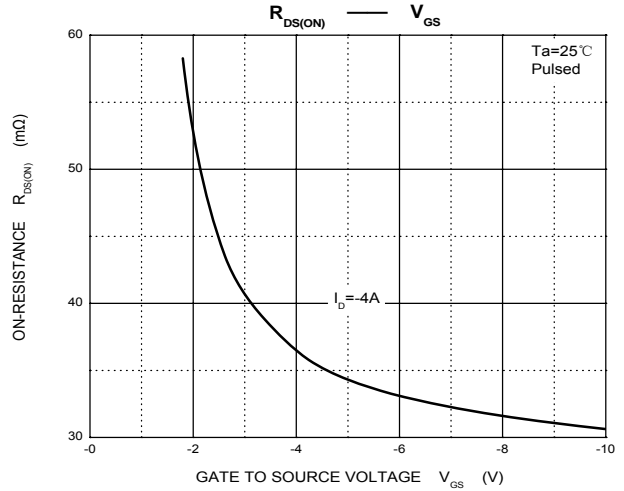
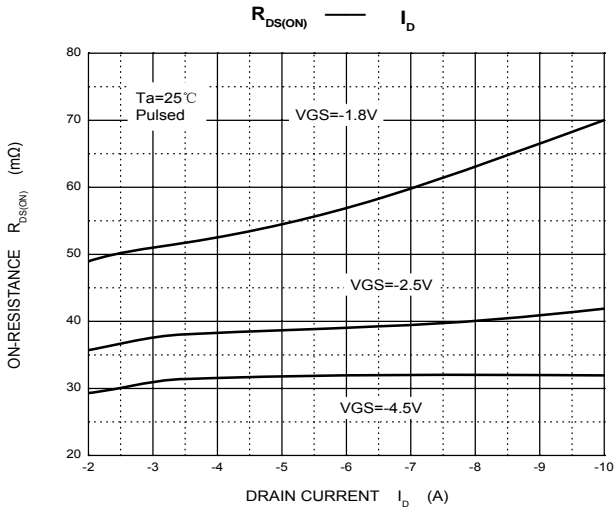
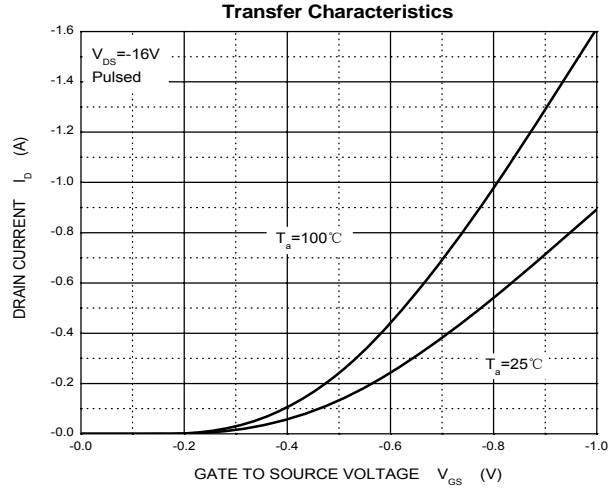
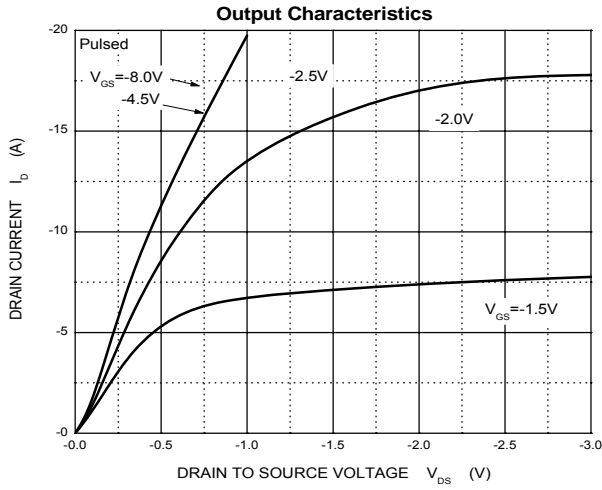
**T<sub>a</sub> = 25 °C unless otherwise specified**

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
<b>Static Parameters</b>						
Drain-source breakdown voltage	V <sub>(BR) DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA	-20			V
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-0.3	-0.56	-1.2	
Gate-body leakage current	I <sub>GSS</sub>	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±8V			±10	μA
		V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±4.5V			±1	
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V			-1	
Drain-source on-state resistance(note1)	R <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A		0.030	0.045	Ω
		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -3A		0.038	0.060	
		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -2A		0.050	0.073	
Forward transconductance(note2)	g <sub>FS</sub>	V <sub>DS</sub> = -5V, I <sub>D</sub> = -4A	8			S
Body diode voltage(note2)	V <sub>SD</sub>	I <sub>S</sub> = -1A, V <sub>GS</sub> = 0V			-1	V
<b>Dynamic Parameters (note3)</b>						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1MHz		1450		pF
Output capacitance	C <sub>oss</sub>			205		
Reverse transfer capacitance	C <sub>rss</sub>			160		
Gate resistance	R <sub>g</sub>	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz		6.5		Ω
<b>Switching Parameters</b>						
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A		17.2		nC
Gate-Source charge	Q <sub>gs</sub>			1.3		
Gate-drain charge	Q <sub>gd</sub>			4.5		
Turn-on delay time (note3)	t <sub>d(on)</sub>	V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V R <sub>GEN</sub> = 3Ω, R <sub>L</sub> = 2.5Ω,		9.5		ns
Turn-on rise time(note3)	t <sub>r</sub>			17		
Turn-off delay time(note3)	t <sub>d(off)</sub>			94		
Turn-off fall time(note3)	t <sub>f</sub>			35		

**Notes:**

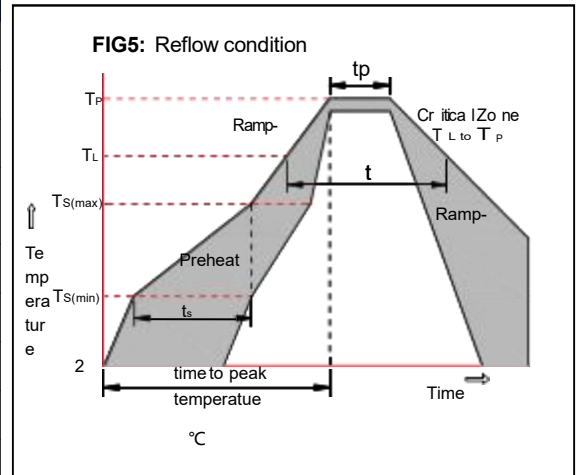
1. Repetitive rating, pulse width limited by junction temperature.
2. Pulse Test : Pulse width ≤ 300μs, duty cycle ≤ 2%.
3. These parameters have no way to verify.

RATING AND CHARACTERISTIC CURVES



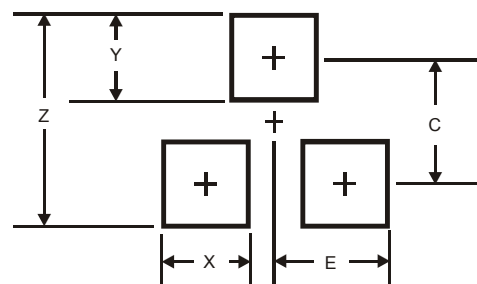
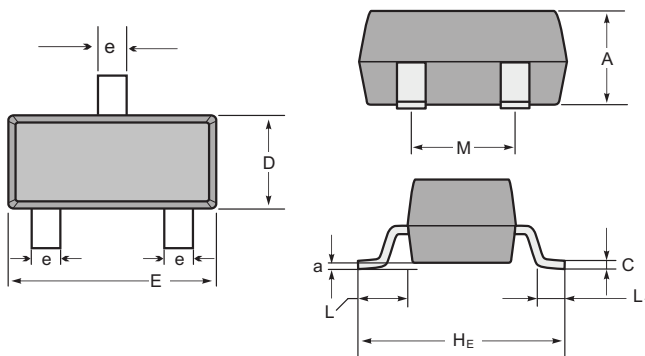
Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ( $T_{s(min)}$ )	+150°C
	-Temperature Max( $T_{s(max)}$ )	+200°C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp ( $T_L$ ) to peak)		3°C/sec. Max
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature( $T_L$ )(Liquid us)	+217°C
	-Temperature( $t_L$ )	60-150 secs.
Peak Temp ( $T_P$ )		+260(+0/-5)°C
Time within 5°C of actual Peak Temp ( $t_p$ )		30 secs. Max
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp ( $T_P$ )		8 min. Max
Do not exceed		+260°C



Package Dimensions & Suggested Pad Layout

SOT23

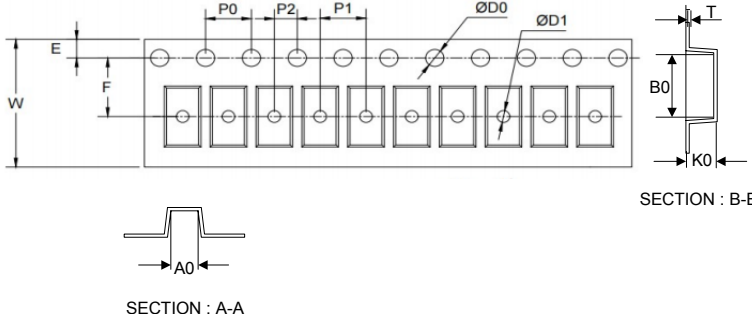
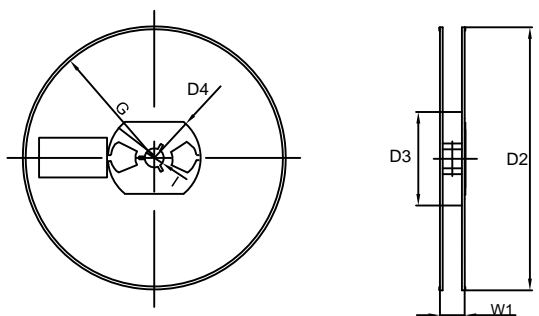


SOT-23 mechanical data

UNIT	A	C	D	E	HE	e	M	L	L1	a	
mm	max	1.1	0.15	1.4	3.0	2.6	0.5	1.95	0.55 (ref)	0.36 (ref)	0.0
	min	0.9	0.08	1.2	2.8	2.2	0.3	1.7			0.15
mil	max	43	6	55	118	102	20	77	22 (ref)	14 (ref)	0.0
	min	35	3	47	110	87	12	67			6

Dimensions	SOT23
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

Tape & reel specification

Tape	Symbol	Dimension (mm)	
	P0	4.00±0.10	
	P1	4.00±0.10	
	P2	2.00±0.10	
	D0	1.55±0.10	
	D1	1.05±0.10	
	E	1.55±0.10	
	F	3.60±0.10	
	W	8.00±0.10	
	A0	3.80±0.20	
	B0	3.25±0.20	
	K0	1.45±0.10	
	T	0.25±0.05	
	<p>7" Reel</p> 	D2	178.0±3.0
		D3	55Min.
D4		R24.0±3.0	
G		R82.0±3.0	
I		13.0±2.0	
W1		11.0±3.0	
Quantity: 3000PCS			