



MT2301

Single P-Channel Power MOSFET

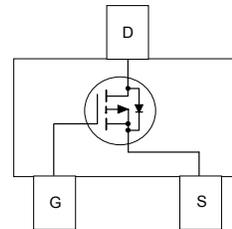
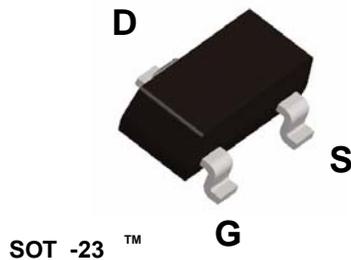
General Description

This P-Channel Power MOSFET is produced using MOS-TECH Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

These devices are well suited for portable electronics applications: load switching and power management, battery charging circuits and DC/DC conversion.

Features

- -3.3 A, -20 V. $R_{DS(ON)} = 0.072 \Omega @ V_{GS} = -4.5 V$
 $R_{DS(ON)} = 0.096 \Omega @ V_{GS} = -2.5 V$
- Low gate charge (3.6 nC typical)
- High performance trench technology for extremely low $R_{DS(ON)}$
- SuperSOT™ -23 provides low $R_{DS(ON)}$ and 30% higher power handling capability than SOT23 in the same footprint



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V _{DSS}	Drain-Source Voltage	-20	V
V _{GSS}	Gate-Source Voltage	±12	V
I _D	Drain Current – Continuous (Note 1a)	-3.3	A
	– Pulsed	-10	
P _D	Maximum Power Dissipation (Note 1a) (Note 1b)	0.5	W
		0.46	
T _J , T _{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1a)	250	°C/W
R _{θJC}	Thermal Resistance, Junction-to-Case (Note 1)	75	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
010X	MT2301	7"	8mm	3000 units

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to $25\text{ }^\circ\text{C}$		-16		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$T_J = 55\text{ }^\circ\text{C}$			-10	μA
I_{GSSF}	Gate - Body Leakage, Forward	$V_{GS} = 8\text{ V}, V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate - Body Leakage, Reverse	$V_{GS} = -8\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
ON CHARACTERISTICS (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.8		-1.5	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to $25\text{ }^\circ\text{C}$		3		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -4.5\text{ V}, I_D = -1.3\text{ A}$		0.072	0.08	Ω
		$T_J = 125\text{ }^\circ\text{C}$		0.12	0.15	
		$V_{GS} = -2.5\text{ V}, I_D = -1.1\text{ A}$		0.096	0.15	
$I_{D(on)}$	On-State Drain Current	$V_{GS} = -4.5\text{ V}, V_{DS} = -5\text{ V}$	-3.3			A
g_{FS}	Forward Transconductance	$V_{DS} = -4.5\text{ V}, I_D = -2\text{ A}$		4		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		330		pF
C_{oss}	Output Capacitance			80		pF
C_{rss}	Reverse Transfer Capacitance			35		pF
SWITCHING CHARACTERISTICS (Note 2)						
$t_{D(on)}$	Turn - On Delay Time	$V_{DD} = -5\text{ V}, I_D = -0.5\text{ A},$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\text{ }\Omega$		7	15	ns
t_r	Turn - On Rise Time			12	22	
$t_{D(off)}$	Turn - Off Delay Time			16	26	
t_f	Turn - Off Fall Time			5	12	
Q_g	Total Gate Charge	$V_{DS} = -10\text{ V}, I_D = -2\text{ A},$ $V_{GS} = -4.5\text{ V}$		3.6	5	nC
Q_{gs}	Gate-Source Charge			0.8		
Q_{gd}	Gate-Drain Charge			0.7		
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain-Source Diode Forward Current				-0.42	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -0.42\text{ A}$ (Note)		-0.7	-1.2	V

Note:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. $250\text{ }^\circ\text{C/W}$ when mounted on
a 0.02 in^2 pad of 2oz Cu.



b. $270\text{ }^\circ\text{C/W}$ when mounted on
a 0.001 in^2 pad of 2oz Cu.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

Typical Electrical Characteristics

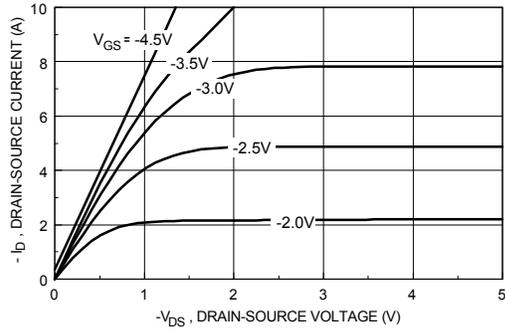


Figure 1. On-Region Characteristics.

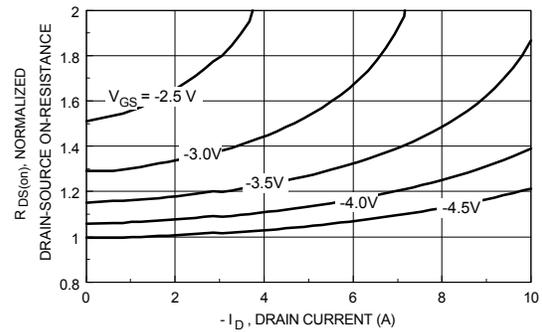


Figure 2. On-Resistance Variation with Drain Current and Gate

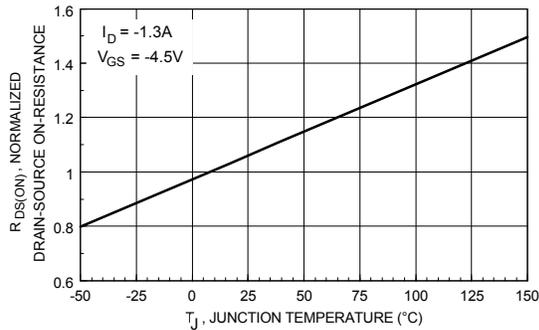


Figure 3. On-Resistance Variation with Temperature.

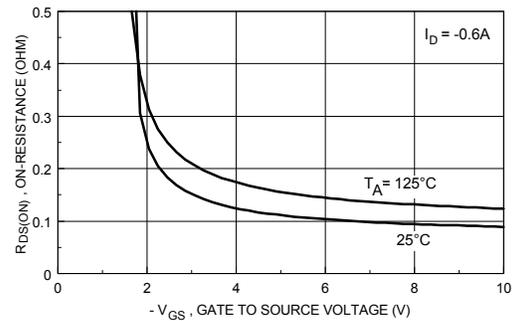


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

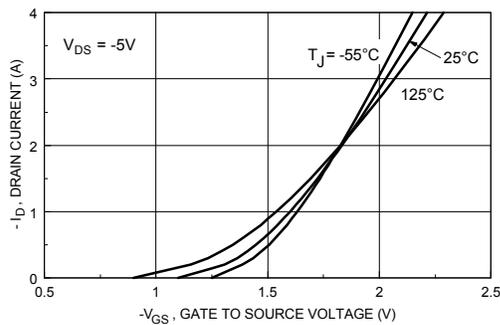


Figure 5. Transfer Characteristics.

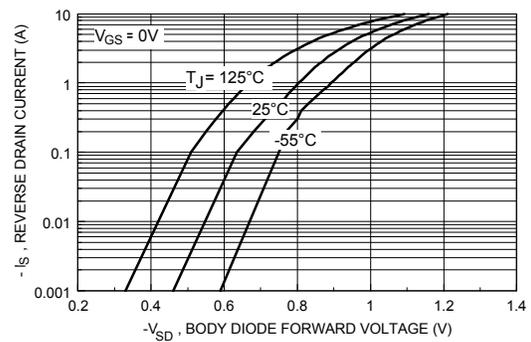


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

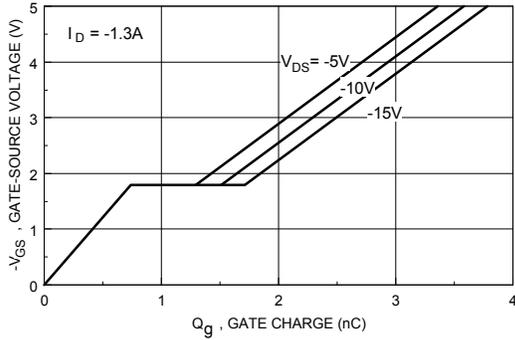


Figure 7. Gate Charge Characteristics.

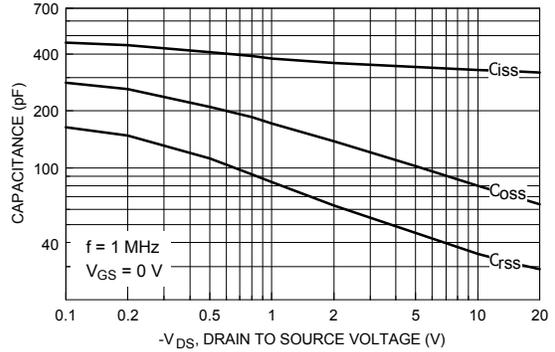


Figure 8. Capacitance Characteristics.

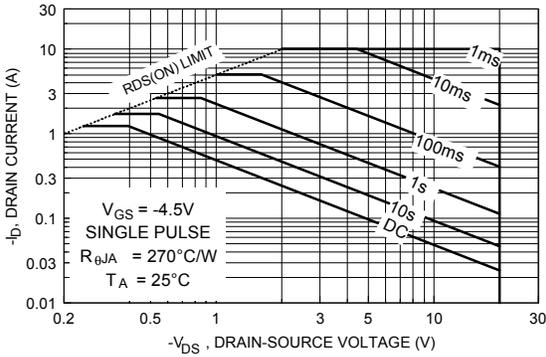


Figure 9. Maximum Safe Operating Area.

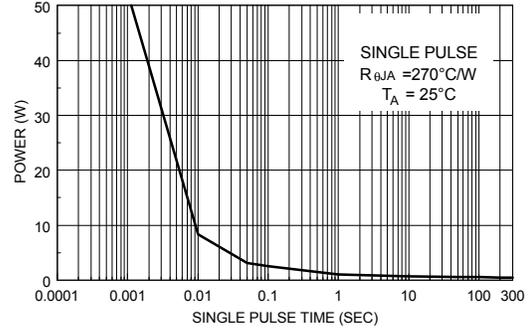


Figure 10. Single Pulse Maximum Power Dissipation.

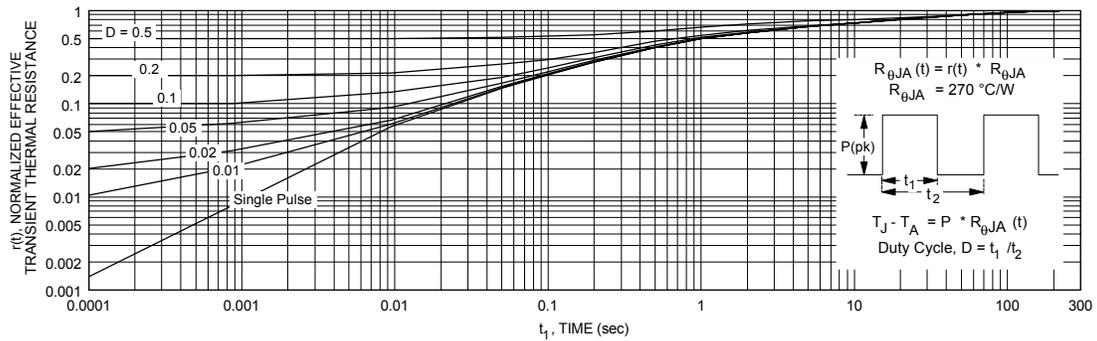
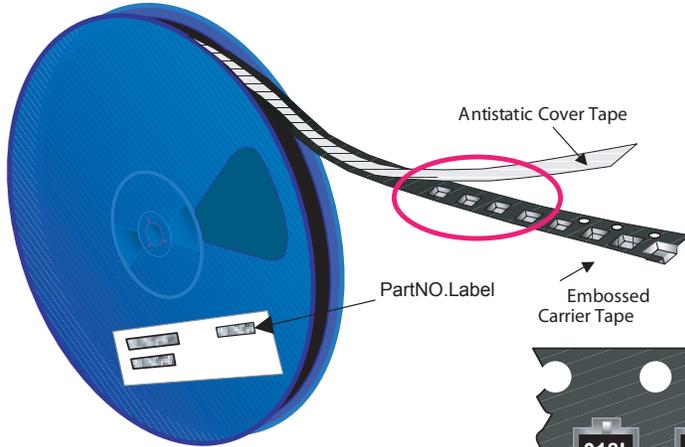


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

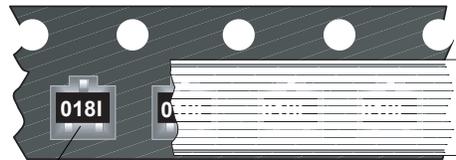
SOT-23 Std Tape and Reel Data

SOT23-3L Packaging Configuration: Figure 1.0

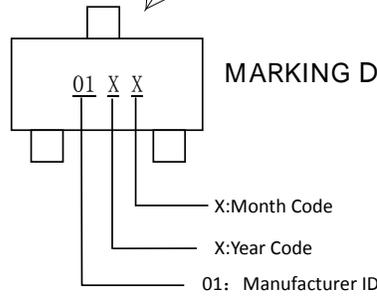


Packaging Description:
 SOT23-3L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 177mm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 10,000 units per 13" or 330cm diameter reel. This and some other options are described in the Packaging Information table.
 These full reels are individually labeled and placed inside a standard immediate box made of recyclable corrugated brown paper with a Fairchild logo printing. One box contains five reels maximum. And these immediate boxes are placed inside a labeled shipping box which comes in different sizes depending on the number of parts shipped.

SOT23-3L Packaging Information		
Packaging Option	Standard (no flow code)	D87Z
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	3,000	10,000
Reel Size	7" Dia	13"
Box Dimension (mm)	193x183x80	355x333x40
Max qty per Box	15,000	30,000
Weight per unit (gm)	0.0082	0.0082
Weight per Reel (kg)	0.1175	0.4006
Note/Comments		

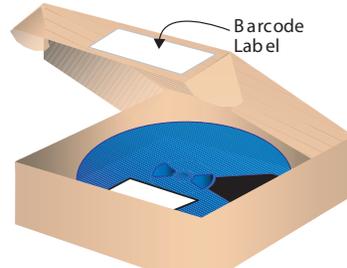


SOT23-3L Unit Orientation



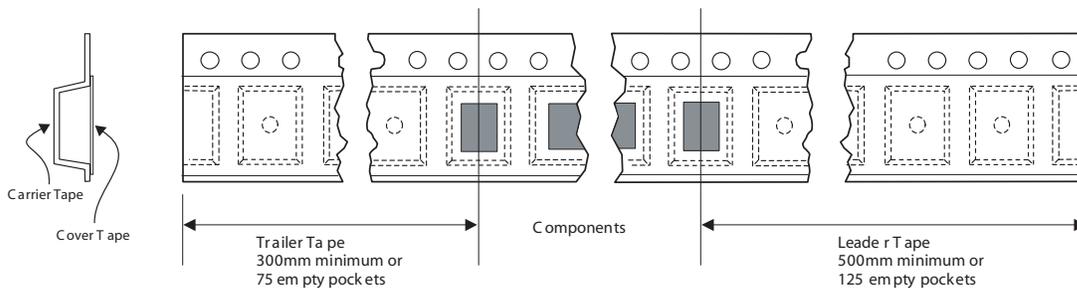
MARKING DIAGRAM

Barcode Label sample



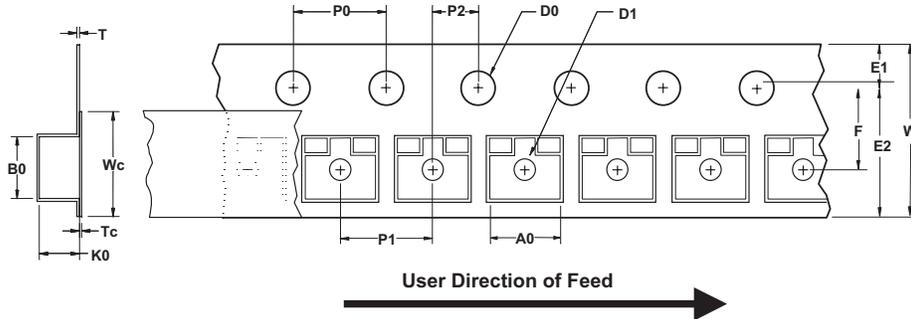
193mm x 183mm x 80mm Pizza Box for Standard Option

SOT23-3L Tape Leader and Trailer Configuration: Figure 2.0



SOT-23 Std Tape and Reel Data, continued

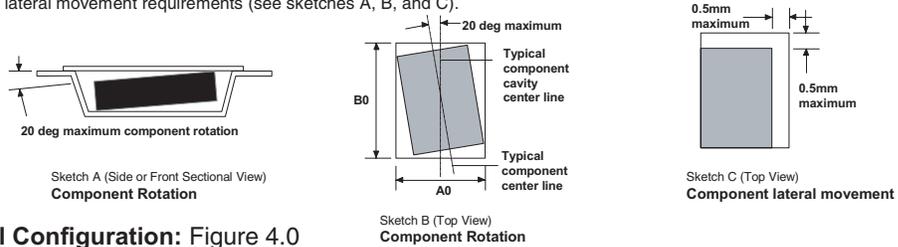
SOT23-3L Embossed Carrier Tape Configuration: Figure 3.0



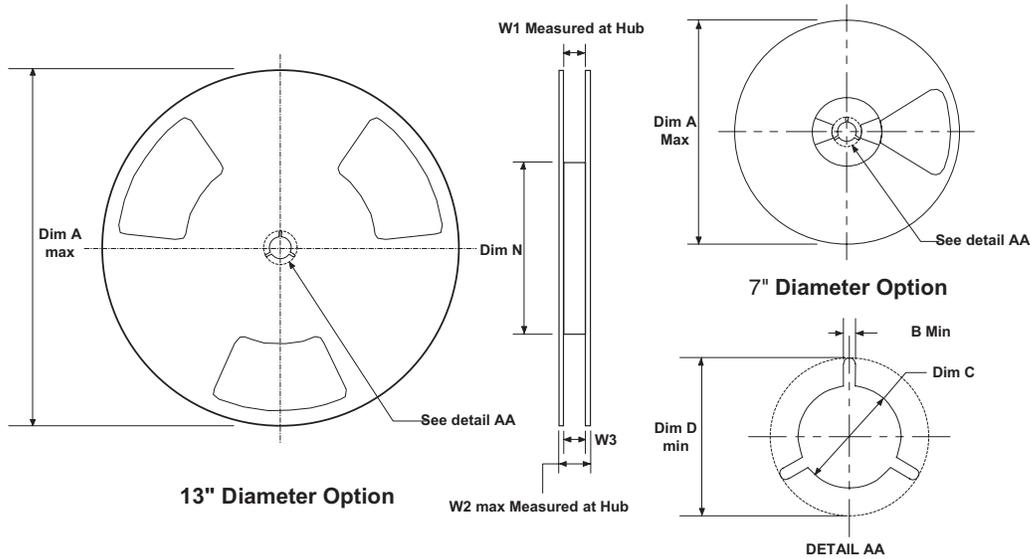
Dimensions are in millimeter

Pkg type	A0	B0	W	D0	D1	E1	E2	F	P1	P0	K0	T	Wc	Tc
SOT-23 (8mm)	3.15 +/-0.10	2.77 +/-0.10	8.0 +/-0.3	1.55 +/-0.05	1.125 +/-0.125	1.75 +/-0.10	6.25 min	3.50 +/-0.05	4.0 +/-0.1	4.0 +/-0.1	1.30 +/-0.10	0.228 +/-0.013	5.2 +/-0.3	0.06 +/-0.02

Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).



SOT23-3L Reel Configuration: Figure 4.0



Dimensions are in inches and millimeters

Tape Size	Reel Option	Dim A	Dim B	Dim C	Dim D	Dim N	Dim W1	Dim W2	Dim W3 (LSL-USL)
8mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 - 0.429 7.9 - 10.9
8mm	13" Dia	13.00 330	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	4.00 100	0.331 +0.059/-0.000 8.4 +1.5/0	0.567 14.4	0.311 - 0.429 7.9 - 10.9



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