

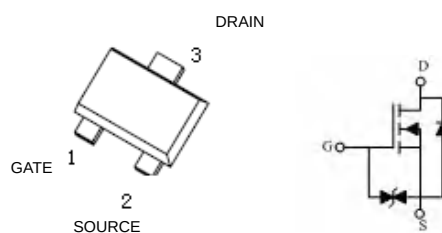
## Features

Lead Free Product is Acquired  
Surface Mount Package  
N-Channel Switch with Low  $R_{DS(on)}$   
Operated at Low Logic Level Gate Drive

## Application

Load/Power Switching  
Interfacing Switching  
Battery Management for Ultra Small Portable Electronics  
Logic Level Shift

$V_{DSS}$  20 V  
 $I_D$  0.75 A  
 $R_{DS(on)}$  380 m $\Omega$



**SOT-723**

## 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                  |
| Typical Gate-Source Voltage                                      | $V_{GS}$        | $\pm 12$ | V                  |
| Continuous Drain Current (note 1)                                | $I_D$           | 0.75     | A                  |
| Pulsed Drain Current ( $t_p=10 \mu s$ )                          | $I_{DM}$        | 1.8      | A                  |
| Power Dissipation (note 1)                                       | $P_D$           | 150      | mW                 |
| Thermal Resistance from Junction to Ambient (note 1)             | $R_{\theta JA}$ | 833      | $^\circ\text{C/W}$ |
| Operation Junction and Storage Temperature Range                 | $T_J, T_{STG}$  | -55~+150 | $^\circ\text{C}$   |
| Lead Temperature for Soldering Purposes(1/8" from case for 10 s) | $T_L$           | 260      | $^\circ\text{C}$   |

## Electrical Characteristics $T_A=25^{\circ}\text{C}$ unless otherwise specified

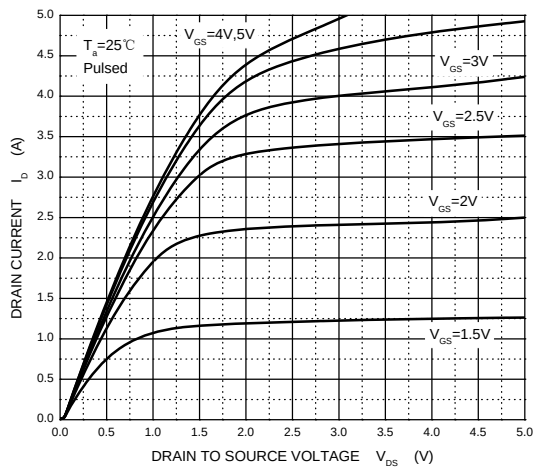
| Parameter                           | Symbol        | Test Condition                                                      | Min  | Typ  | Max      | Unit       |
|-------------------------------------|---------------|---------------------------------------------------------------------|------|------|----------|------------|
| STATIC CHARACTERISTICS              |               |                                                                     |      |      |          |            |
| 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           | $I_{GSS}$     | $V_{GS} = \pm 10V, V_{DS} = 0V$                                     |      |      | $\pm 20$ | $\mu A$    |
| Gate threshold voltage (note 2)     | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu A$                                   | 0.35 | 0.54 | 1.1      | V          |
| Drain-source on-resistance (note 2) | $R_{DS(on)}$  | $V_{GS} = 4.5V, I_D = 0.65A$                                        |      | 270  | 380      | m $\Omega$ |
|                                     |               | $V_{GS} = 2.5V, I_D = 0.55A$                                        |      | 320  | 450      | m $\Omega$ |
|                                     |               | $V_{GS} = 1.8V, I_D = 0.45A$                                        |      | 390  | 800      | m $\Omega$ |
| Forward transconductance (note 2)   | $g_{FS}$      | $V_{DS} = 10V, I_D = 0.8A$                                          |      | 1.6  |          | S          |
| Diode forward voltage               | $V_{SD}$      | $I_S = 0.15A, V_{GS} = 0V$                                          |      |      | 1.2      | V          |
| DYNAMIC CHARACTERISTICS (note 4)    |               |                                                                     |      |      |          |            |
| Input capacitance                   | $C_{iss}$     | $V_{DS} = 16V, V_{GS} = 0V, f = 1MHz$                               |      | 79   | 120      | pF         |
| Output capacitance                  | $C_{oss}$     |                                                                     |      | 13   | 20       | pF         |
| Reverse transfer capacitance        | $C_{rss}$     |                                                                     |      | 9    | 15       | pF         |
| SWITCHING CHARACTERISTICS (note 4)  |               |                                                                     |      |      |          |            |
| Turn-on delay time (note 3)         | $t_{d(on)}$   | $V_{GS} = 4.5V, V_{DS} = 10V,$<br>$I_D = 500mA, R_{GEN} = 10\Omega$ |      | 6.7  |          | ns         |
| Turn-on rise time (note 3)          | $t_r$         |                                                                     |      | 4.8  |          | ns         |
| Turn-off delay time (note 3)        | $t_{d(off)}$  |                                                                     |      | 17.3 |          | ns         |
| Turn-off fall time (note 3)         | $t_f$         |                                                                     |      | 7.4  |          | ns         |
| Total Gate Charge (note 3)          | $Q_g$         | $V_{DS} = 10V, V_{GS} = 4.5V, I_D = 0.25A$                          |      | 750  |          | pC         |
| Gate-Source Charge (note 3)         | $Q_{gs}$      |                                                                     |      | 75   |          | pC         |
| Gate-Drain Charge (note 3)          | $Q_{gd}$      |                                                                     |      | 225  |          | pC         |

### Notes :

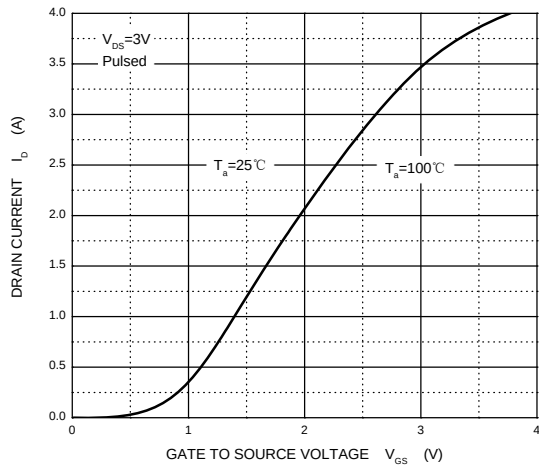
1. Surface mounted on FR4 board using the minimum recommended pad size.
2. Pulse Test : Pulse Width=300 $\mu s$ , Duty Cycle=2%.
3. Switching characteristics are independent of operating junction temperatures.
4. Guaranteed by design, not subject to producing.

## RATING AND CHARACTERISTIC CURVES

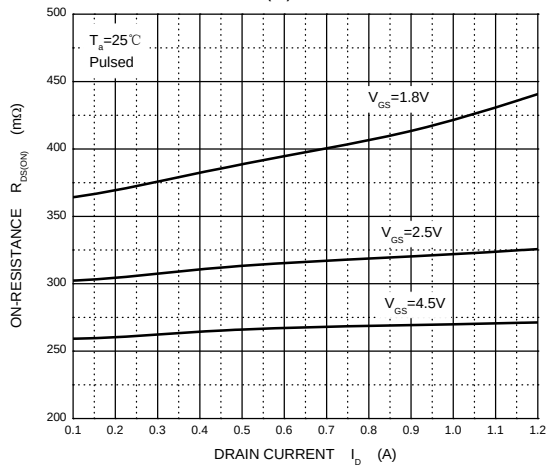
**Output Characteristics**



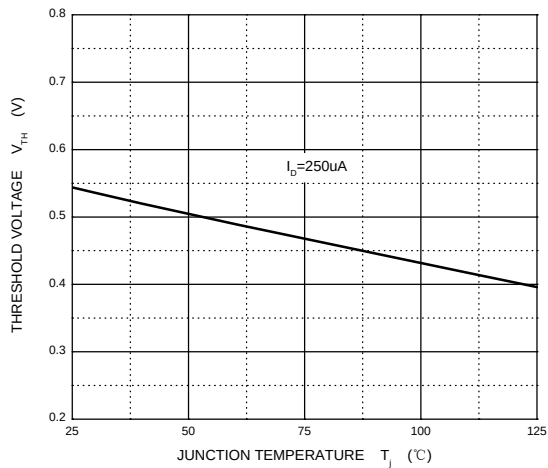
**Transfer Characteristics**



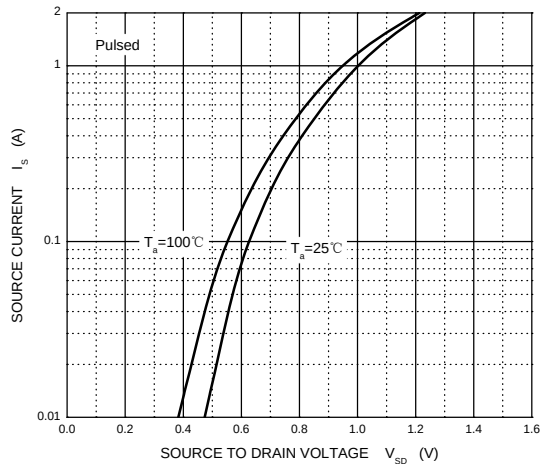
**$R_{DS(ON)}$  —  $I_D$**



**Threshold Voltage**

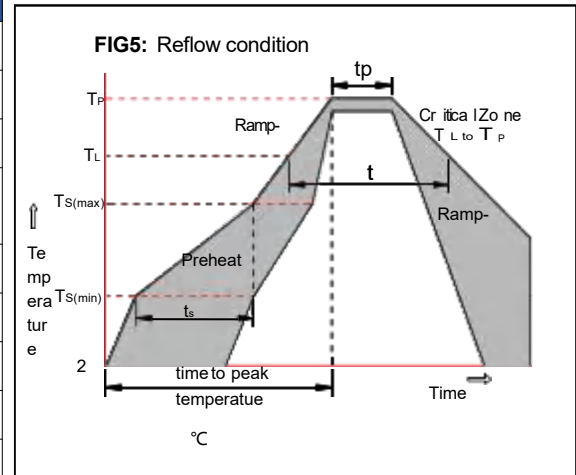


**$I_S$  —  $V_{SD}$**



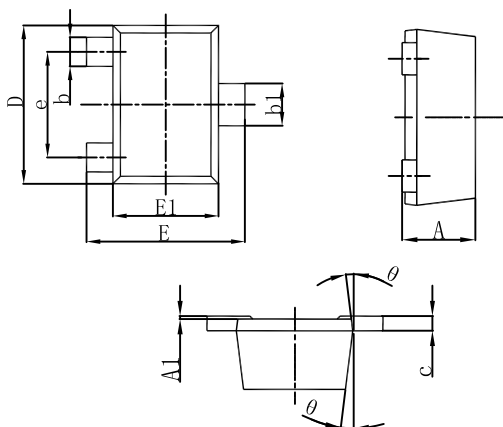
## Soldering parameters

| Reflow Condition                                        |                                   | Pb-Free assembly<br>(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                            |

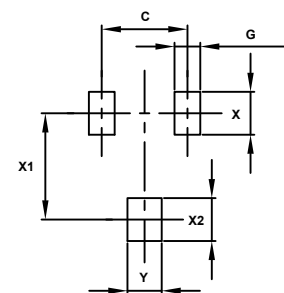


## Package Dimensions & Suggested Pad Layout

### SOT-723 Package Outline Dimensions



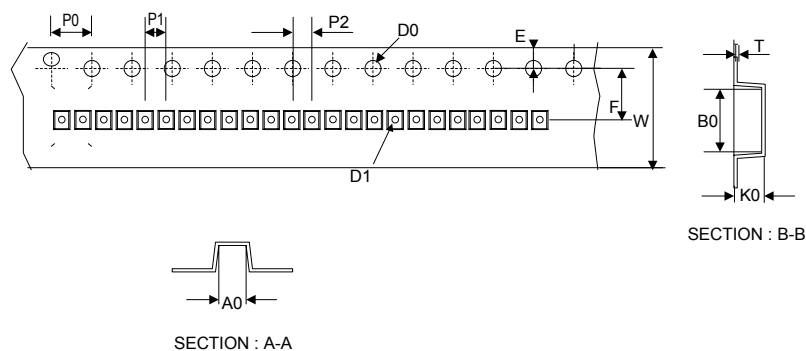
| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 0.430                     | 0.500 | 0.017                | 0.020 |
| A1     | 0.000                     | 0.050 | 0.000                | 0.002 |
| b      | 0.170                     | 0.270 | 0.007                | 0.011 |
| b1     | 0.270                     | 0.370 | 0.011                | 0.015 |
| c      | 0.080                     | 0.150 | 0.003                | 0.006 |
| D      | 1.150                     | 1.250 | 0.045                | 0.049 |
| E      | 1.150                     | 1.250 | 0.045                | 0.049 |
| E1     | 0.750                     | 0.850 | 0.030                | 0.033 |
| e      | 0.800TYP.                 |       | 0.031TYP.            |       |
| θ      | 7° REF.                   |       | 7° REF.              |       |



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.80          |
| G          | 0.35          |
| X          | 0.40          |
| X1         | 1.00          |
| X2         | 0.40          |
| Y          | 0.45          |

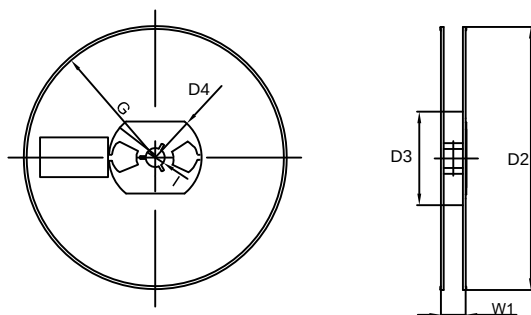
## Tape & reel specification

### Tape



| Symbol | Dimension (mm) |
|--------|----------------|
| P0     | 4.00±0.20      |
| P1     | 2.00±0.20      |
| P2     | 2.00±0.20      |
| D0     | 1.55±0.20      |
| D1     | 0.65±0.20      |
| E      | 1.55±0.25      |
| F      | 3.60±0.20      |
| W      | 8.00±0.20      |
| A0     | 1.65±0.20      |
| B0     | 1.75±0.20      |
| K0     | 0.85±0.20      |
| T      | 0.20±0.20      |
| D2     | 177.0±5.0      |
| D3     | 55Min.         |
| D4     | R24.6±2.0      |
| G      | R82.0±2.0      |
| I      | 13.0±2.0       |
| W1     | 10.20±3.0      |

### 7" Reel



Quantity: 8000PCS