



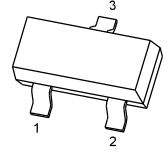
## SOT-23 Plastic-Encapsulate MOSFETs

### 2N7002K N-channel MOSFET

| $V_{(BR)DSS}$ | $R_{DS(on)MAX}$ | $I_D$ |
|---------------|-----------------|-------|
| 60V           | 2.5Ω@10V        | 340mA |
|               | 3Ω@4.5V         |       |

#### SOT-23

1. GATE
2. SOURCE
3. DRAIN



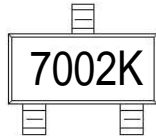
#### FEATURE

- High density cell design for Low  $R_{DS(on)}$
- Voltage controlled small signal switch
- Rugged and reliable
- High saturation current capability
- ESD protection for high speed data lines to IEC61000-4-2
- ESD contact discharge typical 8KV, max 15KV
- ESD air discharge typical 15KV, max 25KV

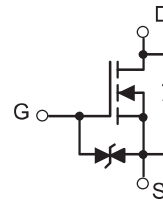
#### APPLICATION

- Load Switch for Portable Devices
- DC/DC Converter

#### MARKING



#### Equivalent circuit



#### MOSFET MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ unless otherwise noted)

| Symbol          | Parameter  | Value    | Unit  |
|-----------------|--|----------|-------|
| $V_{DS}$        | Drain-Source voltage                             | 60       | V     |
| $V_{GS}$        | Gate-Source voltage                              | ±20      | V     |
| $I_D$           | Drain Current                                    | 340      | mA    |
| $P_D$           | Power Dissipation                                | 0.35     | W     |
| $T_J, T_{stg}$  | Operation Junction and Storage Temperature Range | -55~+150 | °C    |
| $R_{\theta JA}$ | Thermal Resistance from Junction to Ambient      | 357      | °C /W |

## MOSFET ELECTRICAL CHARACTERISTICS

$T_a=25\text{ }^\circ\text{C}$  unless otherwise specified

| Parameter                          | Symbol       | Test Condition  | Min        | Typ | Max       | Units    |
|------------------------------------|--------------|---|------------|-----|-----------|----------|
| <b>Static Characteristics</b>      |              |   |            |     |           |          |
| Drain-Source Breakdown Voltage     | $V_{DS}$     | $V_{GS} = 0V, I_D = 250\mu A$   | 60         |     |           | V        |
| Gate Threshold Voltage*            | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 1mA$  | 1          | 1.3 | 2.5       | V        |
| Zero Gate Voltage Drain Current    | $I_{DSS}$    | $V_{DS} = 48V, V_{GS} = 0V$   |            |     | 1         | $\mu A$  |
| Gate -Source leakage current       | $I_{GSS1}$   | $V_{GS} = \pm 20V, V_{DS} = 0V$   |            |     | $\pm 10$  | $\mu A$  |
|                                    | $I_{GSS2}$   | $V_{GS} = \pm 10V, V_{DS} = 0V$   |            |     | $\pm 200$ | nA       |
|                                    | $I_{GSS3}$   | $V_{GS} = \pm 5V, V_{DS} = 0V$  |            |     | $\pm 100$ | nA       |
| Drain-Source On-Resistance*        | $R_{DS(on)}$ | $V_{GS} = 4.5V, I_D = 200mA$  |            | 1.1 | 3         | $\Omega$ |
|                                    |              | $V_{GS} = 10V, I_D = 500mA$   |            | 0.9 | 2.5       | $\Omega$ |
| Diode Forward Voltage              | $V_{SD}$     | $V_{GS} = 0V, I_S = 300mA$  |            |     | 1.5       | V        |
| Recovered charge                   | $Q_r$        | $V_{GS} = 0V, I_S = 300mA, V_R = 25V,$<br>$di_S/dt = -100A/\mu S$                     |            | 30  |           | nC       |
| <b>Dynamic Characteristics**</b>   |              |   |            |     |           |          |
| Input Capacitance                  | $C_{iss}$    | $V_{DS} = 10V, V_{GS} = 0V, f = 1MHz$   |            |     | 40        | pF       |
| Output Capacitance                 | $C_{oss}$    |   |            |     | 30        | pF       |
| Reverse Transfer Capacitance       | $C_{rss}$    |   |            |     | 10        | pF       |
| <b>Switching Characteristics**</b> |              |   |            |     |           |          |
| Turn-On Delay Time                 | $t_{d(on)}$  | $V_{GS} = 10V, V_{DD} = 50V, R_G = 50\Omega,$<br>$R_{GS} = 50\Omega, R_L = 250\Omega$ |            |     | 10        | ns       |
| Turn-Off Delay Time                | $t_{d(off)}$ |   |            |     | 15        | ns       |
| Reverse recovery Time              | $t_{rr}$     | $V_{GS} = 0V, I_S = 300mA, V_R = 25V,$<br>$di_S/dt = -100A/\mu S$                     |            | 30  |           | ns       |
| <b>GATE-SOURCE ZENER DIODE</b>     |              |   |            |     |           |          |
| Gate-Source Breakdown Voltage      | $BV_{GSO}$   | $I_{GS} = \pm 1mA$ (Open Drain)   | $\pm 21.5$ |     | $\pm 30$  | V        |

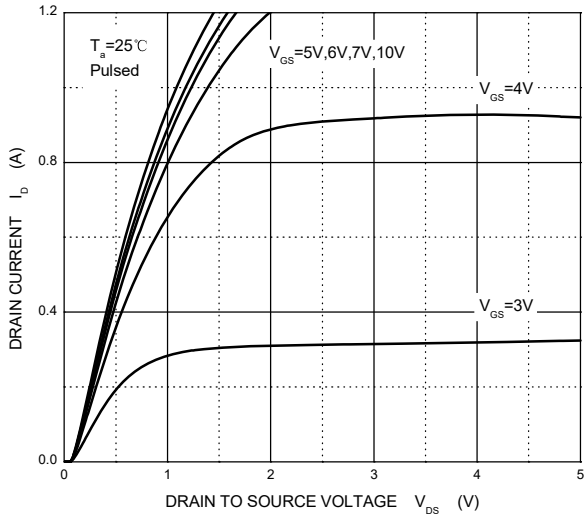
**Notes :**

\*Pulse Test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

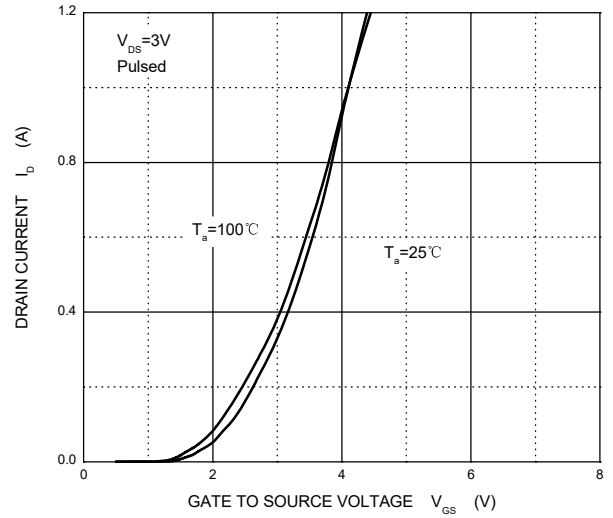
\*\*These parameters have no way to verify.

# Typical Characteristics

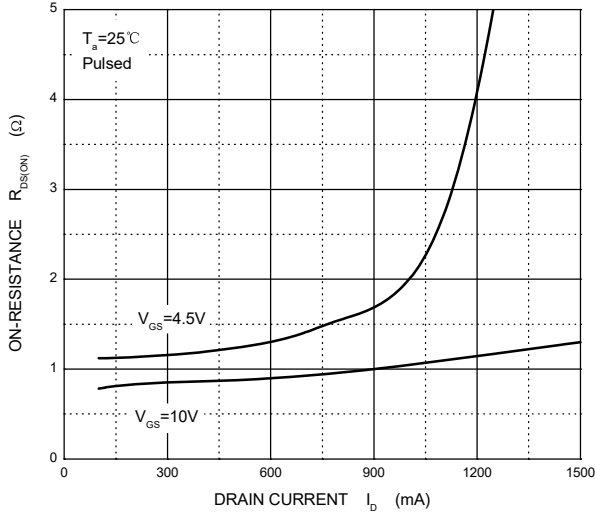
**Output Characteristics**



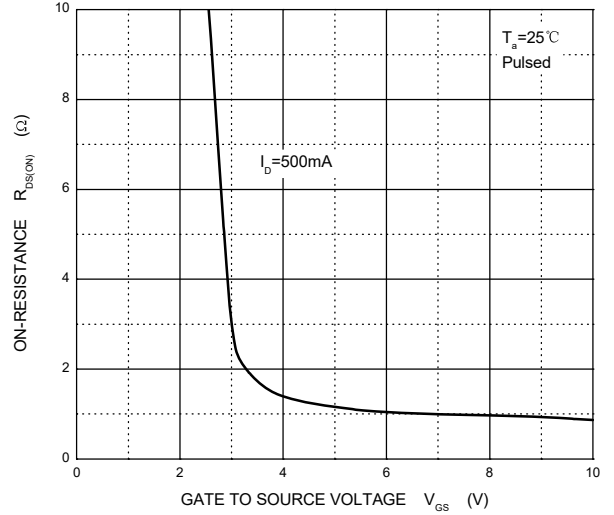
**Transfer Characteristics**



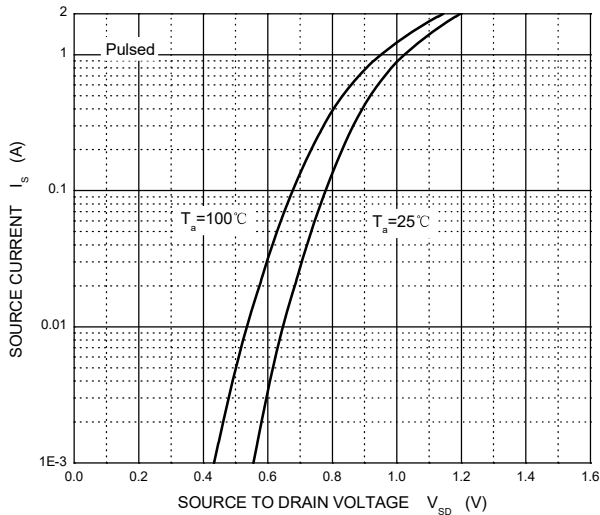
**$R_{DS(ON)}$  —  $I_D$**



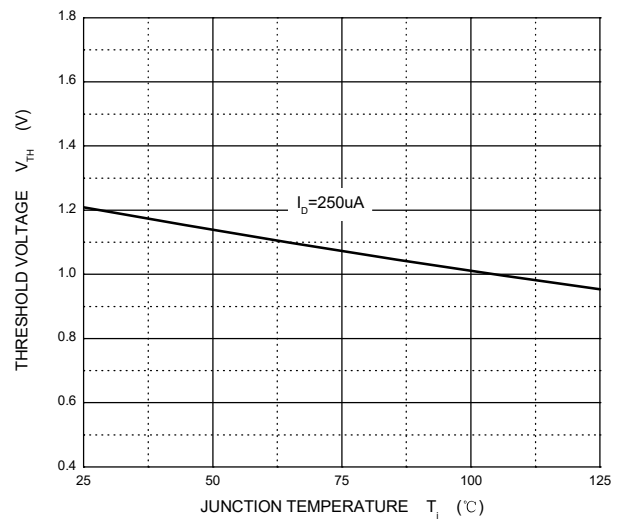
**$R_{DS(ON)}$  —  $V_{GS}$**



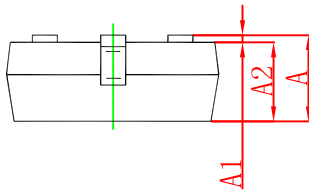
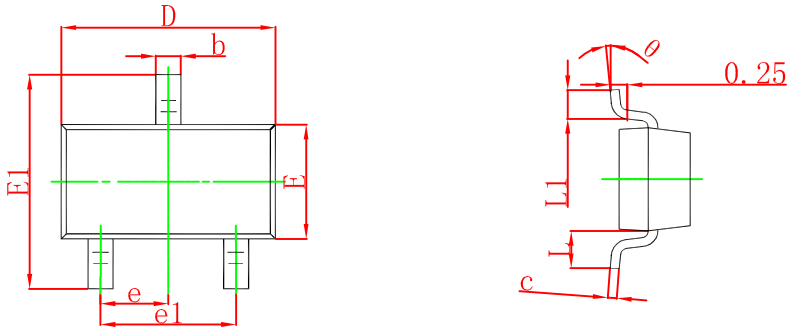
**$I_S$  —  $V_{SD}$**



**Threshold Voltage**

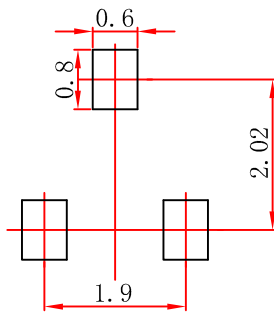


## SOT-23 Package Outline Dimensions



| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min                       | Max   | Min                  | Max   |
| A        | 0.900                     | 1.150 | 0.035                | 0.045 |
| A1       | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2       | 0.900                     | 1.050 | 0.035                | 0.041 |
| b        | 0.300                     | 0.500 | 0.012                | 0.020 |
| c        | 0.080                     | 0.150 | 0.003                | 0.006 |
| D        | 2.800                     | 3.000 | 0.110                | 0.118 |
| E        | 1.200                     | 1.400 | 0.047                | 0.055 |
| E1       | 2.250                     | 2.550 | 0.089                | 0.100 |
| e        | 0.950 TYP                 |       | 0.037 TYP            |       |
| e1       | 1.800                     | 2.000 | 0.071                | 0.079 |
| L        | 0.550 REF                 |       | 0.022 REF            |       |
| L1       | 0.300                     | 0.500 | 0.012                | 0.020 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |

## SOT-23 Suggested Pad Layout

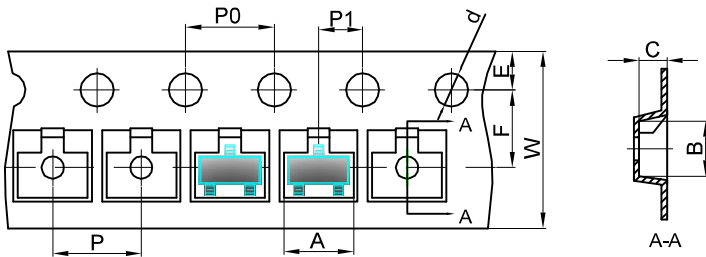


### Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05$  mm.
3. The pad layout is for reference purposes only.

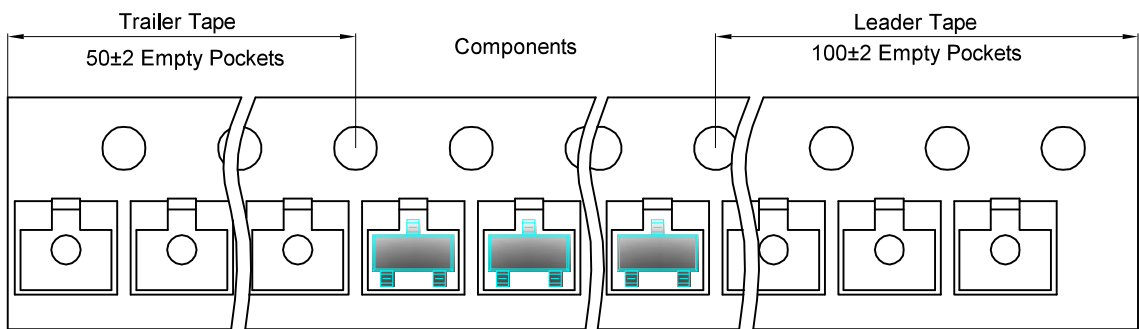
## SOT-23 Tape and reel

SOT-23 Embossed Carrier Tape

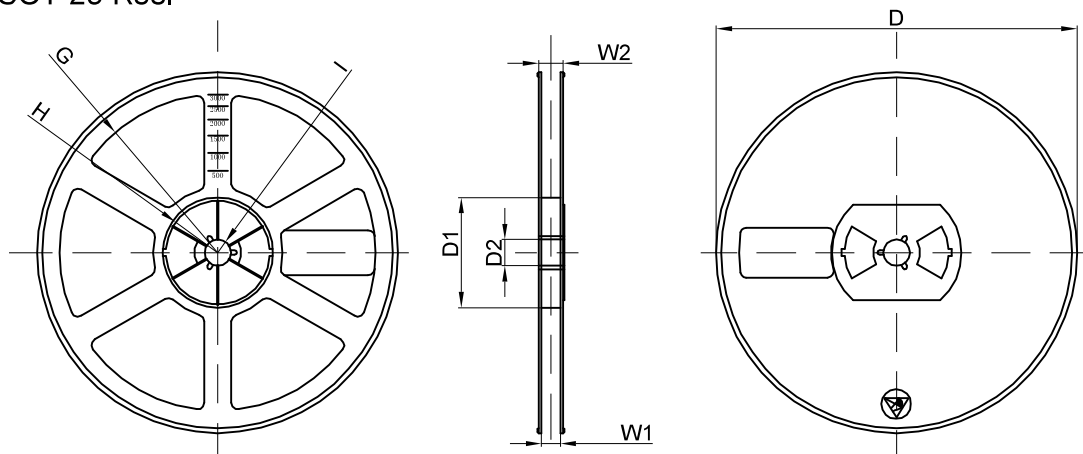


| Dimensions are in millimeter |      |      |      |       |      |      |      |      |      |      |
|------------------------------|------|------|------|-------|------|------|------|------|------|------|
| Pkg type                     | A    | B    | C    | d     | E    | F    | P0   | P    | P1   | W    |
| SOT-23                       | 3.15 | 2.77 | 1.22 | Ø1.50 | 1.75 | 3.50 | 4.00 | 4.00 | 2.00 | 8.00 |

## SOT-23 Tape Leader and Trailer



## SOT-23 Reel



| Dimensions are in millimeter |         |       |       |        |        |       |      |       |
|------------------------------|---------|-------|-------|--------|--------|-------|------|-------|
| Reel Option                  | D       | D1    | D2    | G      | H      | I     | W1   | W2    |
| 7" Dia                       | Ø178.00 | 54.40 | 13.00 | R78.00 | R25.60 | R6.50 | 9.50 | 12.30 |

| REEL     | Reel Size | Box        | Box Size(mm) | Carton      | Carton Size(mm) | G.W.(kg) |
|----------|-----------|------------|--------------|-------------|-----------------|----------|
| 3000 pcs | 7 inch    | 30,000 pcs | 203×203×195  | 120,000 pcs | 438×438×220     |          |