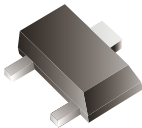


# 2N7002KM-P2-HF

N-Channel  
RoHS Device  
Halogen Free



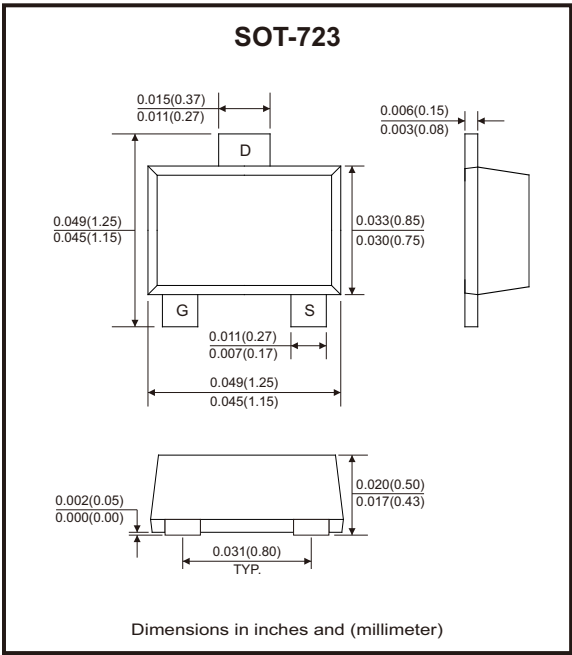
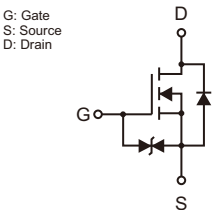
## Features

- High density cell design for low  $R_{DS(ON)}$ .
- Voltage controlled small signal switch.
- Small outline surface mount package.

## Mechanical data

- Case: SOT-723, molded plastic.
- Terminals: Solderable per MIL-STD-750, method 2026.
- Mounting position: Any.

## Circuit Diagram



## Maximum Ratings (at $T_A=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter                              | Symbol          | Value       | Unit                 |
|----------------------------------------|-----------------|-------------|----------------------|
| Drain-source voltage                   | $V_{DS}$        | 60          | V                    |
| Gate-source voltage                    | $V_{GS}$        | $\pm 20$    | V                    |
| Continuous drain current               | $I_D$           | 0.34        | A                    |
| Power dissipation                      | $P_D$           | 0.15        | W                    |
| Thermal resistance junction to ambient | $R_{\theta JA}$ | 833         | $^{\circ}\text{C/W}$ |
| Junction temperature                   | $T_J$           | 150         | $^{\circ}\text{C}$   |
| Storage temperature range              | $T_{STG}$       | -55 to +150 | $^{\circ}\text{C}$   |

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

| Parameter                       | Symbol              | Conditions                                                                                                         | Min | Typ  | Max  | Unit |
|---------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Drain-source breakdown voltage  | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                                       | 60  |      |      | V    |
| Gate threshold voltage          | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                                         | 1   | 1.4  | 2.5  | V    |
| Zero gate voltage drain current | I <sub>DSS</sub>    | V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V                                                                        |     |      | 1    | μA   |
| Gate-body leakage current       | I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                                                                       |     |      | ±10  | μA   |
|                                 |                     | V <sub>GS</sub> = ±10V, V <sub>DS</sub> = 0V                                                                       |     |      | ±200 | nA   |
|                                 |                     | V <sub>GS</sub> = ±5V, V <sub>DS</sub> = 0V                                                                        |     |      | ±100 | nA   |
| Drain-source on-resistance      | R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 500mA                                                                      |     | 1.3  | 4    | Ω    |
|                                 | R <sub>DS(on)</sub> | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 200mA                                                                     |     | 1.4  | 4.5  | Ω    |
| Recovered charge                | Q <sub>r</sub>      | V <sub>GS</sub> = 0V, I <sub>S</sub> = 300mA, V <sub>R</sub> = 25V, dI/dt = -100A/μs                               |     | 30   |      | nC   |
| Dynamic Characteristics         |                     |                                                                                                                    |     |      |      |      |
| Input capacitance               | C <sub>iss</sub>    | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, f = 1MHz                                                              |     |      | 40   | pF   |
| Output capacitance              | C <sub>oss</sub>    |                                                                                                                    |     |      | 30   |      |
| Reverse transfer capacitance    | C <sub>rss</sub>    |                                                                                                                    |     |      | 10   |      |
| Switching Characteristics       |                     |                                                                                                                    |     |      |      |      |
| Turn-on delay time              | t <sub>d(on)</sub>  | V <sub>DD</sub> = 25V, V <sub>GS</sub> = 10V, R <sub>L</sub> = 250Ω, R <sub>GS</sub> = 50K, R <sub>GEN</sub> = 25Ω |     |      | 10   | ns   |
| Turn-off delay time             | t <sub>d(off)</sub> |                                                                                                                    |     |      | 15   |      |
| Reverse recovery time           | trr                 | V <sub>GS</sub> = 0V, I <sub>S</sub> = 300mA, V <sub>R</sub> = 25V, dI/dt = -100A/μs                               |     | 30   |      |      |
| Diode forward voltage           | V <sub>SD</sub>     | V <sub>GS</sub> = 0V, I <sub>S</sub> = 200mA                                                                       |     | 0.97 | 1.5  | V    |

## Typical Rating and Characteristic Curves (2N7002KM-P2-HF)

Fig.1 - Output Characteristics

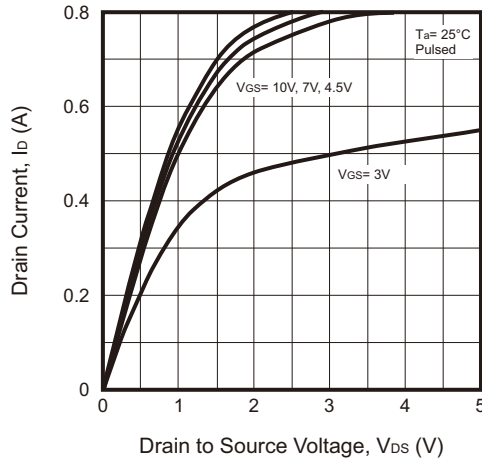


Fig.2 - Transfer Characteristics

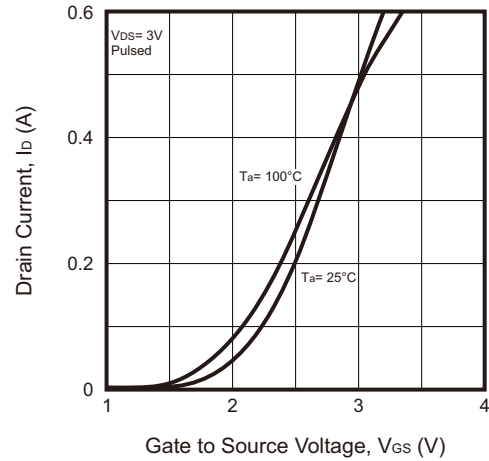


Fig.3 - On-Resistance vs. Drain Current

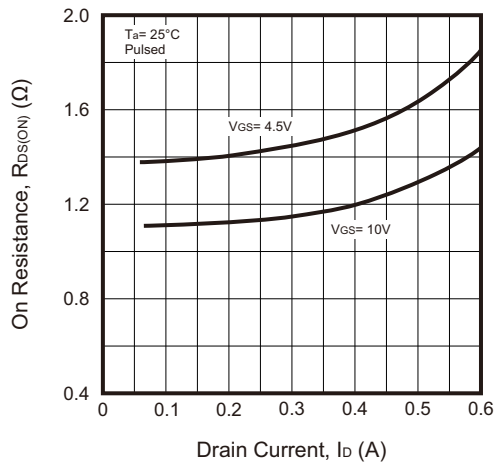


Fig.4 - On-Resistance vs. Gate to Source Voltage

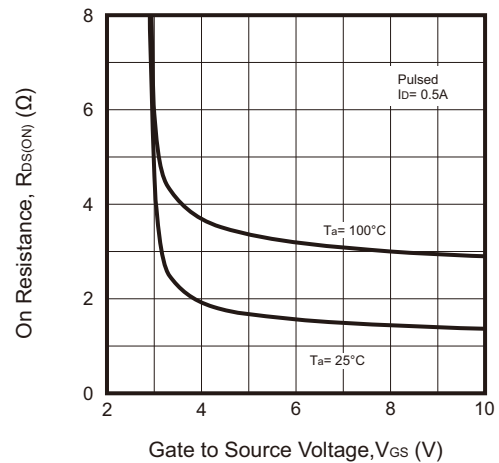


Fig.6 -  $I_S$  —  $V_{SD}$

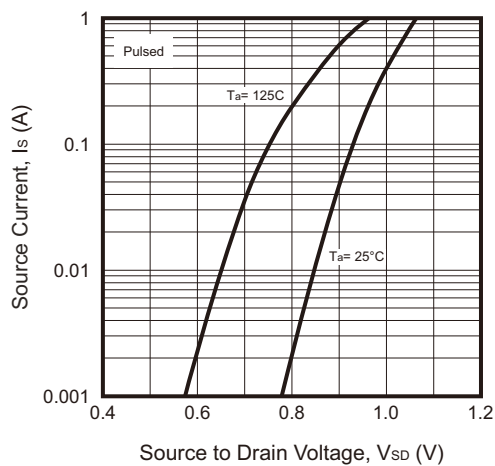
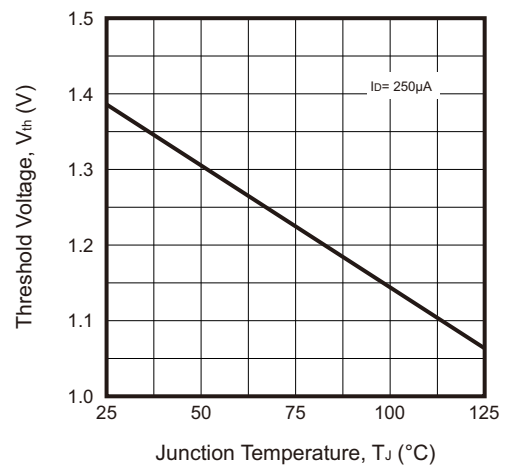
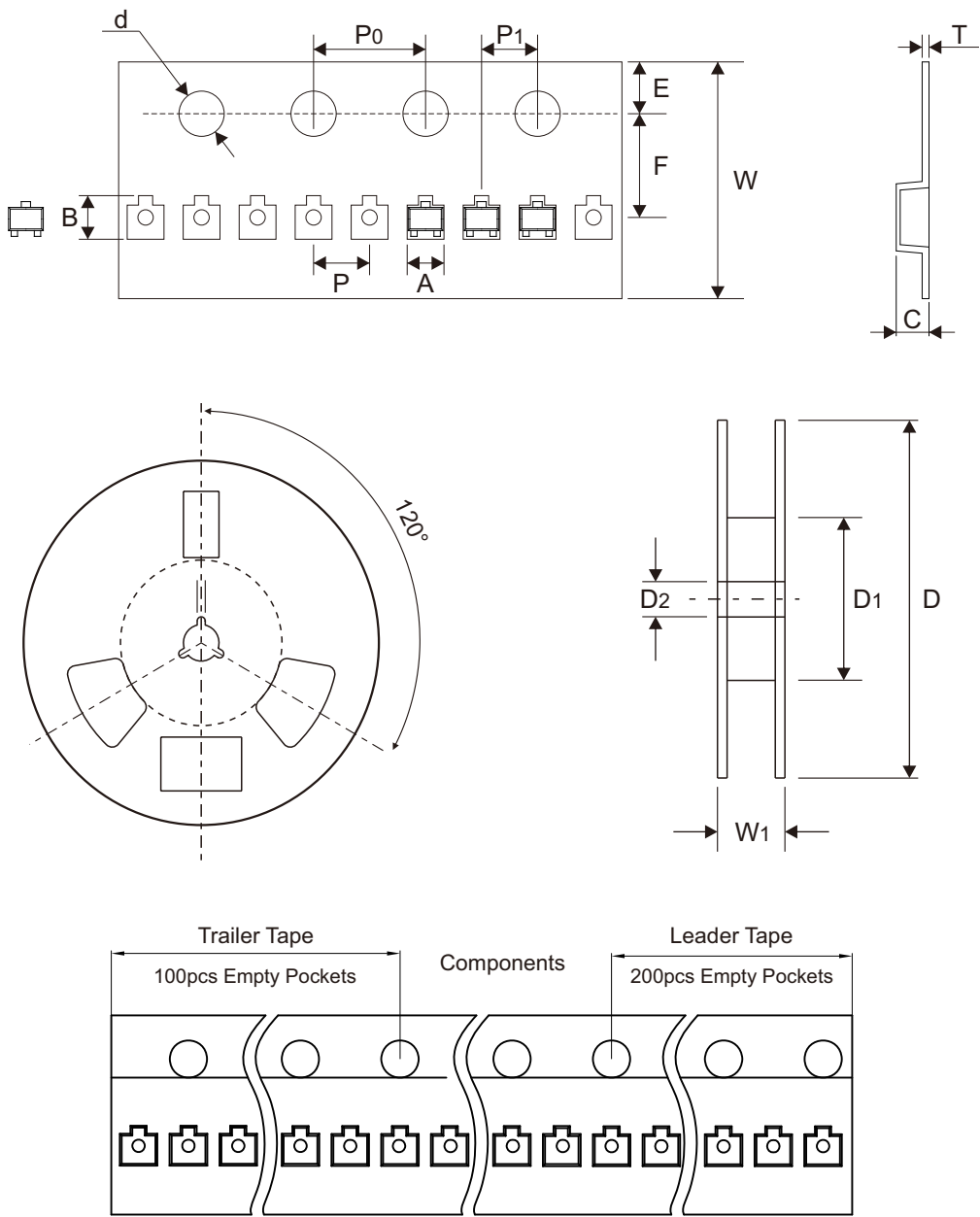


Fig.7 - Threshold Voltage



Reel Taping Specification

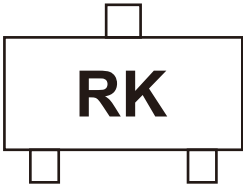


| SOT-723 | SYMBOL | A             | B             | C             | d             | D             | D1            | D2            |
|---------|--------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|         | (mm)   | 1.31 ± 0.05   | 1.45 ± 0.05   | 0.61 ± 0.05   | 1.50 ± 0.10   | 178.00 ± 2.00 | 50.00 ± 0.50  | 13.00 ± 0.25  |
|         | (inch) | 0.052 ± 0.002 | 0.057 ± 0.002 | 0.024 ± 0.002 | 0.059 ± 0.004 | 7.008 ± 0.079 | 1.969 ± 0.020 | 0.512 ± 0.010 |

| SOT-723 | SYMBOL | E             | F             | P             | P0            | P1            | T             | W                        | W1            |
|---------|--------|---------------|---------------|---------------|---------------|---------------|---------------|--------------------------|---------------|
|         | (mm)   | 1.75 ± 0.10   | 3.50 ± 0.05   | 2.00 ± 0.05   | 4.00 ± 0.10   | 2.00 ± 0.05   | 0.20 ± 0.02   | 8.00 + 0.30<br>- 0.10    | 9.50 ± 0.50   |
|         | (inch) | 0.069 ± 0.004 | 0.138 ± 0.002 | 0.079 ± 0.002 | 0.157 ± 0.004 | 0.079 ± 0.002 | 0.008 ± 0.001 | 0.315 + 0.012<br>- 0.004 | 0.374 ± 0.197 |

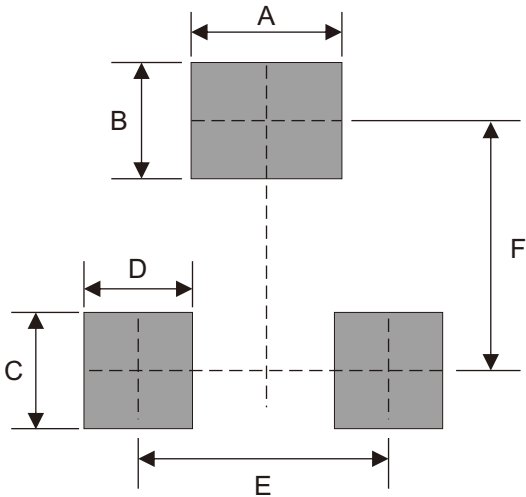
Marking Code

| Part Number    | Marking Code |
|----------------|--------------|
| 2N7002KM-P2-HF | RK           |



Suggested P.C.B. PAD Layout

| SIZE | SOT-723 |        |
|------|---------|--------|
|      | (mm)    | (inch) |
| A    | 0.42    | 0.017  |
| B    | 0.30    | 0.012  |
| C    | 0.30    | 0.012  |
| D    | 0.32    | 0.013  |
| E    | 0.80    | 0.031  |
| F    | 1.00    | 0.039  |



Standard Packaging

| Case Type | REEL PACK       |                     |
|-----------|-----------------|---------------------|
|           | REEL<br>( pcs ) | Reel Size<br>(inch) |
| SOT-723   | 8,000           | 7                   |