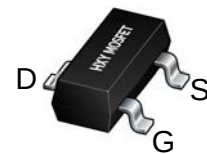




## Description

The 2N7002T-7-F uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

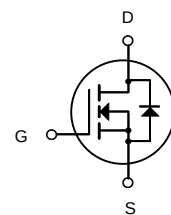


SOT-523

## General Features

$V_{DS} = 60V$   $I_D = 0.115A$

$R_{DS(ON)} < 3 \Omega @ V_{GS}=10V$



N-Channel MOSFET

## Application

Battery protection

Load switch

Uninterruptible power supply

## Package Marking and Ordering Information

| Product ID  | Pack    | Marking | Qty(PCS) |
|-------------|---------|---------|----------|
| 2N7002T-7-F | SOT-523 | 72K     | 3000     |

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

| Symbol          | Parameter                                        | Limit      | Unit          |
|-----------------|--------------------------------------------------|------------|---------------|
| $V_{DS}$        | Drain-Source Voltage                             | 60         | V             |
| $V_{GS}$        | Gate-Source Voltage                              | $\pm 20$   | V             |
| $I_D$           | Drain Current-Continuous                         | 0.115      | A             |
| $P_D$           | Maximum Power Dissipation                        | 0.15       | W             |
| $T_J, T_{STG}$  | Operating Junction and Storage Temperature Range | -55 To 150 | $^{\circ}C$   |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 2) | 833        | $^{\circ}C/W$ |



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

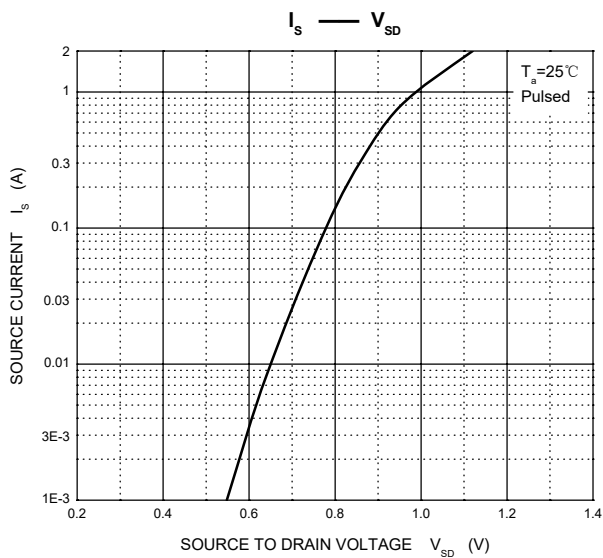
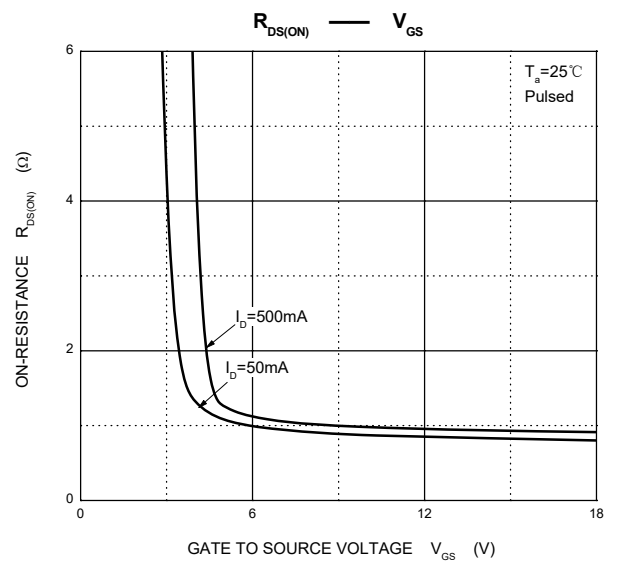
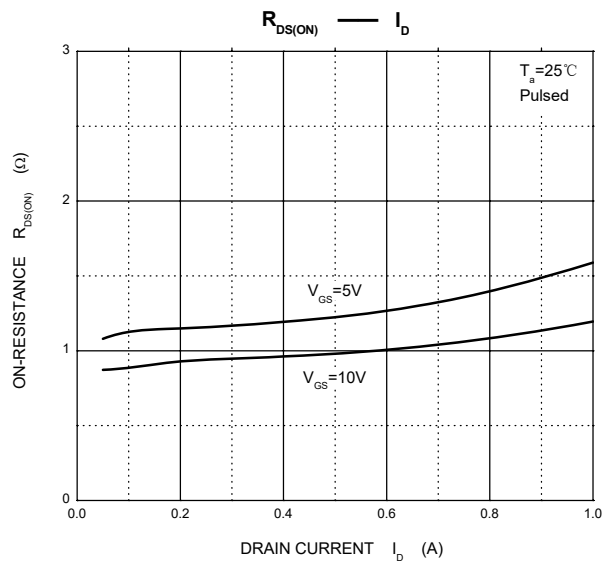
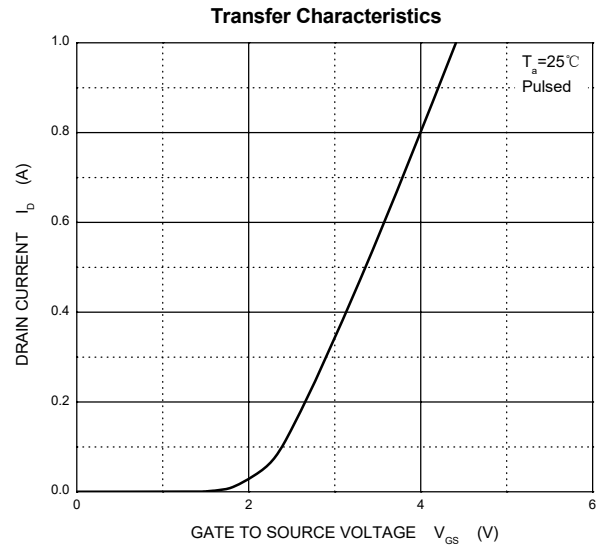
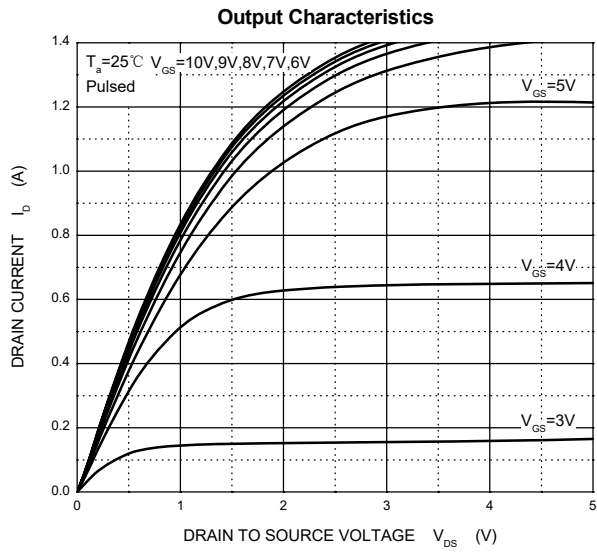
| Parameter                      | Symbol        | Test conditions                                               | Min  | Typ | Max      | Unit     |
|--------------------------------|---------------|---------------------------------------------------------------|------|-----|----------|----------|
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$            | 60   |     |          | V        |
| Gate-Threshold Voltage         | $V_{th(GS)}$  | $V_{DS}=V_{GS}$ , $I_D=250\text{ }\mu\text{A}$                | 1    |     | 2.5      |          |
| Gate-body Leakage              | $I_{GSS}$     | $V_{DS}=0\text{ V}$ , $V_{GS}=\pm 20\text{ V}$                |      |     | $\pm 80$ | nA       |
| ZeroGate Voltage Drain Current | $I_{DSS}$     | $V_{DS}=60\text{ V}$ , $V_{GS}=0\text{ V}$                    |      |     | 80       | nA       |
| On-state Drain Current         | $I_{D(ON)}$   | $V_{GS}=10\text{ V}$ , $V_{DS}=7\text{ V}$                    | 500  |     |          | mA       |
| Drain-Source On-Resistance     | $R_{DS(on)}$  | $V_{GS}=10\text{ V}$ , $I_D=115\text{ mA}$                    |      | 1.3 | 3        | $\Omega$ |
|                                |               | $V_{GS}=4.5\text{ V}$ , $I_D=50\text{ mA}$                    |      | 2   | 5        |          |
| Forward Trans conductance      | $g_{fs}$      | $V_{DS}=10\text{ V}$ , $I_D=200\text{ mA}$                    | 80   |     |          | ms       |
| Drain-source on-voltage        | $V_{DS(on)}$  | $V_{GS}=10\text{ V}$ , $I_D=500\text{ mA}$                    |      |     | 3.75     | V        |
|                                |               | $V_{GS}=5\text{ V}$ , $I_D=50\text{ mA}$                      |      |     | 0.375    | V        |
| Diode Forward Voltage          | $V_{SD}$      | $I_S=115\text{ mA}$ , $V_{GS}=0\text{ V}$                     | 0.55 |     | 1.2      | V        |
| Input Capacitance              | $C_{iss}$     | $V_{DS}=25\text{ V}$ , $V_{GS}=0\text{ V}$ , $f=1\text{ MHz}$ |      |     | 50       | pF       |
| Output Capacitance             | $C_{oss}$     |                                                               |      |     | 25       |          |
| Reverse Transfer Capacitance   | $C_{rss}$     |                                                               |      |     | 5        |          |

**Switching Time**

|               |              |                                                                                      |  |  |    |    |
|---------------|--------------|--------------------------------------------------------------------------------------|--|--|----|----|
| Turn-on Time  | $t_{d(on)}$  | $V_{DD}=25\text{ V}$ , $R_L=50\Omega$<br>$I_D=500\text{ mA}$ , $V_{GEN}=10\text{ V}$ |  |  | 20 | ns |
| Turn-off Time | $t_{d(off)}$ | $R_G=25\Omega$                                                                       |  |  | 40 |    |

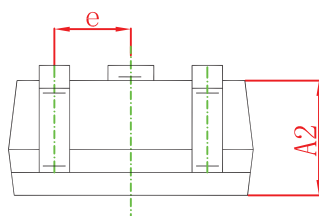
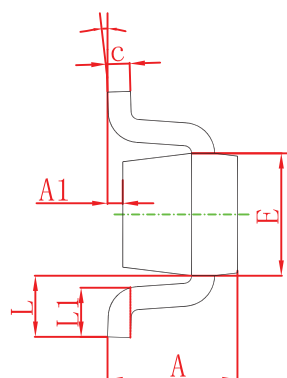
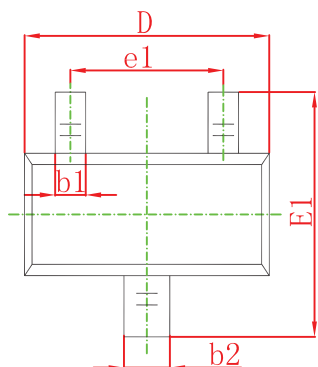


## Typical Characteristics



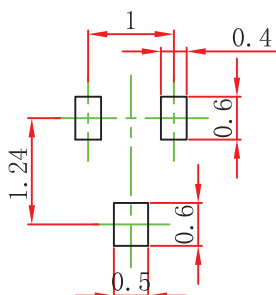


## SOT-523 Package Information



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 0.700                     | 0.900 | 0.028                | 0.035 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.700                     | 0.800 | 0.028                | 0.031 |
| b1     | 0.150                     | 0.250 | 0.006                | 0.010 |
| b2     | 0.250                     | 0.350 | 0.010                | 0.014 |
| c      | 0.100                     | 0.200 | 0.004                | 0.008 |
| D      | 1.500                     | 1.700 | 0.059                | 0.067 |
| E      | 0.700                     | 0.900 | 0.028                | 0.035 |
| E1     | 1.450                     | 1.750 | 0.057                | 0.069 |
| e      | 0.500 TYP.                |       | 0.020 TYP.           |       |
| e1     | 0.900                     | 1.100 | 0.035                | 0.043 |
| L      | 0.400 REF.                |       | 0.016 REF.           |       |
| L1     | 0.260                     | 0.460 | 0.010                | 0.018 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

## SOT-523 Suggested Pad Layout



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



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