

2N3970, 2N3971, 2N3972 N-Channel JFET

Features

- InterFET [N0132S Geometry](#)
- Low Noise: 1.2 nV/√Hz Typical
- Fast Switching
- RoHS Compliant
- SMT, TH, and Bare Die Package options.

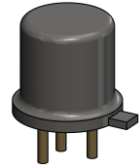
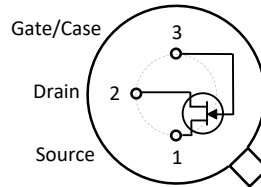
Applications

- Low $R_{DS(ON)}$
- Low Leakage
- Fast Switching

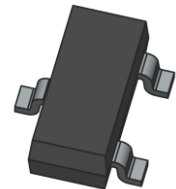
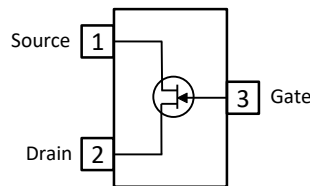
Description

The -40V InterFET 2N3970, 2N3971, and 2N3972 JFET's are targeted for very low noise switching applications for mid to high frequency designs. Gate leakages are typically 50pA at room temperatures. The 2N3972 has a cutoff voltage of less than 3.0V ideal for low-level power supplies. The TO-18 package is hermetically sealed and suitable for military applications.

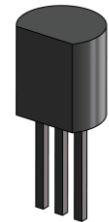
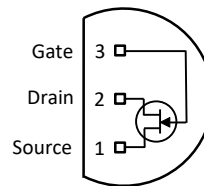
TO-18 Bottom View



SOT23 Top View



TO-92 Bottom View



Product Summary

| Parameters | 2N3970 Min | 2N3971 Min | 2N3972 Min | Unit |
|--|------------|------------|------------|------|
| BV_{GSS} Gate to Source Breakdown Voltage | -40 | -40 | -40 | V |
| I_{DSS} Drain to Source Saturation Current | 50 | 25 | 5 | mA |
| $V_{GS(off)}$ Gate to Source Cutoff Voltage | -4 | -2 | -0.5 | V |

Ordering Information Custom Part and Binning Options Available

| Part Number | Description | Case | Packaging |
|---------------------------------|---|-------|---------------------------------------|
| 2N3970; 2N3971; 2N3972 | Through-Hole | TO-18 | Bulk |
| PN3970; PN3971; PN3972 | Through-Hole | TO-92 | Bulk |
| SMP3970; SMP3971; SMP3972 | Surface Mount | SOT23 | Bulk |
| SMP3970TR; SMP3971TR; SMP3972TR | 7" Tape and Reel: Max 3,000 Pieces 13" Tape and Reel: Max 9,000 Pieces | SOT23 | Minimum 1,000 Pieces Tape and Reel |
| 2N3970COT; 2N3971COT; 2N3972COT | Chip Orientated Tray (COT Waffle Pack) | COT | 400/Waffle Pack |
| 2N3970CFT; 2N3971CFT; 2N3972CFT | Chip Face-up Tray (CFT Waffle Pack) | CFT | 400/Waffle Pack |



Disclaimer: It is the Buyers responsibility for designing, validating and testing the end application under all field use cases and extreme use conditions. Guaranteeing the application meets required standards, regulatory compliance, and all safety and security requirements is the responsibility of the Buyer. These resources are subject to change without notice.

Electrical Characteristics

Maximum Ratings (@ $T_A = 25^\circ\text{C}$, Unless otherwise specified)

| Parameters | Value | Unit |
|--|------------|----------------------|
| V_{RGS} Reverse Gate Source and Gate Drain Voltage | -40 | V |
| I_{FG} Continuous Forward Gate Current | 50 | mA |
| P_D Continuous Device Power Dissipation | 300 | mW |
| P Power Derating | 1.7 | mW/ $^\circ\text{C}$ |
| T_J Operating Junction Temperature | -55 to 125 | $^\circ\text{C}$ |
| T_{STG} Storage Temperature | -65 to 150 | $^\circ\text{C}$ |

Static Characteristics (@ $T_A = 25^\circ\text{C}$, Unless otherwise specified)

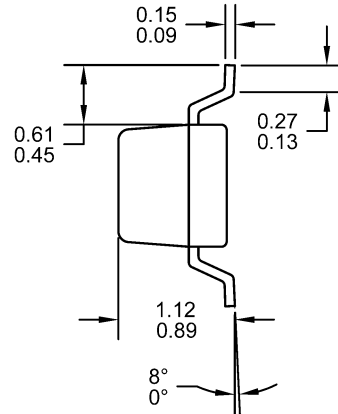
| Parameters | Conditions | 2N3970 | | 2N3971 | | 2N3972 | | Unit |
|--|---|--------|------------|--------|-------------|--------|------------|----------|
| | | Min | Max | Min | Max | Min | Max | |
| $V_{(BR)GSS}$ Gate to Source Breakdown Voltage | $I_G = -1\mu\text{A}, V_{DS} = 0\text{V}$ | -40 | | -40 | | -40 | | V |
| I_{GSS} Gate to Source Reverse Current | $V_{GS} = -20\text{V}, V_{DS} = 0\text{V}$ | | -1 | | -1 | | -1 | nA |
| $V_{GS(OFF)}$ Gate to Source Cutoff Voltage | $V_{DS} = 20\text{V}, I_D = 1\text{nA}$ | -4 | -10 | -2 | -5 | -0.5 | -3 | V |
| I_{DSS} Drain to Source Saturation Current | $V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$ (Pulsed) | 50 | 150 | 25 | 75 | 5 | 30 | mA |
| $I_{D(OFF)}$ Drain Cutoff Current | $V_{DS} = 20\text{V}, V_{GS} = -12\text{V}, T_A = 25^\circ\text{C}$ $V_{DS} = 20\text{V}, V_{GS} = -12\text{V}, T_A = 150^\circ\text{C}$ | | 250 500 | | 250 500 | | 250 500 | pA nA |
| I_{DG} Drain Reverse Current | $V_{DG} = 20\text{V}, I_S = 0\text{A}, T_A = 25^\circ\text{C}$ $V_{DG} = 20\text{V}, I_S = 0\text{A}, T_A = 150^\circ\text{C}$ | | 250 500 | | 250 500 | | 250 500 | pA nA |
| $V_{DS(ON)}$ Drain to Source ON Voltage | $V_{GS} = 0\text{V}, I_D = ()$ | | 1 (20) | | 1.5 (10) | | 2 (5) | V mA |

Dynamic Characteristics (@ $T_A = 25^\circ\text{C}$, Unless otherwise specified)

| Parameters | Conditions | 2N3970 | | 2N3971 | | 2N3972 | | Unit |
|--|--|--------|-----|--------|-----|--------|-----|----------|
| | | Min | Max | Min | Max | Min | Max | |
| $R_{DS(ON)}$ Drain to Source ON Resistance | $V_{GS} = 0\text{V}, I_D = 0\text{A},$ $f = 1\text{kHz}$ | | 30 | | 60 | | 100 | Ω |
| C_{iss} Input Capacitance | $V_{DS} = -20\text{V}, V_{GS} = 0\text{V},$ $f = 1\text{MHz}$ | | 25 | | 25 | | 25 | pF |
| C_{rss} Reverse Transfer Capacitance | $V_{DS} = 0\text{V}, V_{GS} = -12\text{V},$ $f = 1\text{MHz}$ | | 6 | | 6 | | 6 | pF |
| t_d Turn-On Delay Time | $V_{DD} = 10\text{V}, V_{GS(ON)} = 0\text{V}$ | | 10 | | 15 | | 40 | nS |
| t_r Rise Time | $V_{DD} = 10\text{V}, V_{GS(ON)} = 0\text{V}$ | | 10 | | 15 | | 40 | nS |
| t_{off} Turn-Off Time | $V_{DD} = 10\text{V}, V_{GS(ON)} = 0\text{V}$ | | 30 | | 60 | | 100 | nS |

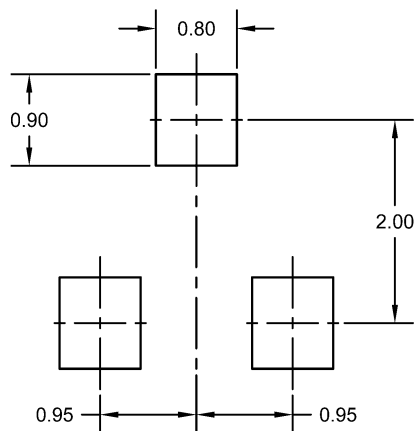
SOT23 (TO-236AB) Mechanical and Layout Data

Package Outline Data



1. All linear dimensions are in millimeters.
2. Package weight approximately 0.12 grams
3. Molded plastic case UL 94V-0 rated
4. For Tape and Reel specifications refer to InterFET CTC-021 Tape and Reel Specification, Document number: IF39002
5. Bulk product is shipped in standard ESD shipping material
6. Refer to JEDEC standards for additional information.

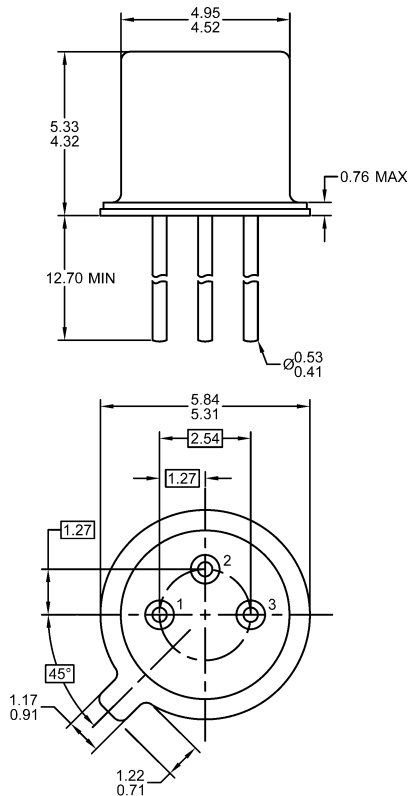
Suggested Pad Layout



1. All linear dimensions are in millimeters.
2. The suggested land pattern dimensions have been provided for reference only. A more robust pattern may be desired for wave soldering.

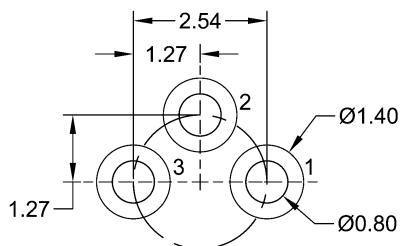
TO-18 Mechanical and Layout Data

Package Outline Data



1. All linear dimensions are in millimeters.
2. Package weight approximately 0.29 grams
3. Bulk product is shipped in standard ESD shipping material
4. Refer to JEDEC standards for additional information.

Suggested Through-Hole Layout



1. All linear dimensions are in millimeters.
2. The suggested land pattern dimensions have been provided as a straight lead reference only. A more robust pattern may be desired for wave soldering and/or bent lead configurations.