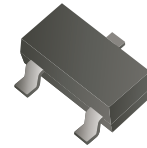


# ACMSP2301-HF

P-Channel

RoHS Device

Halogen Free



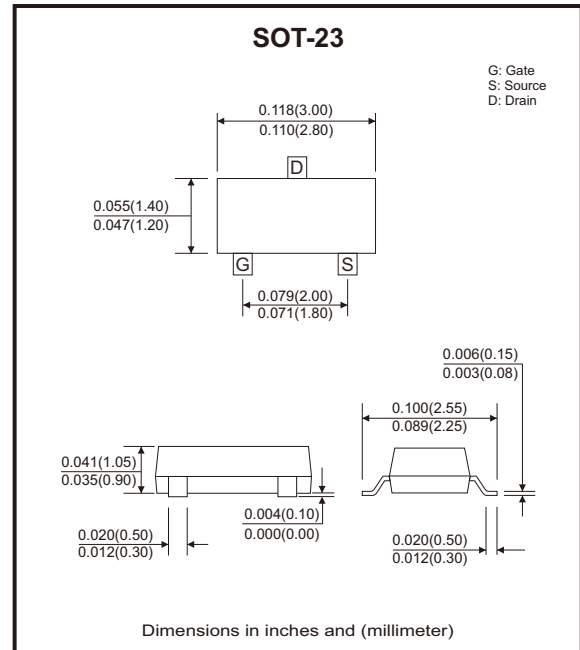
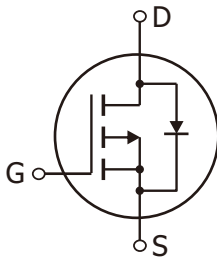
## Features

- Advanced trench process technology.
- Low threshold voltage.
- Fast switching speed.
- AEC-Q101 Qualified.

## Mechanical data

- Case: SOT-23, molded plastic.
- Terminals: Solderable per MIL-STD-750, method 2026.
- Mounting position: Any.

## Circuit Diagram



## Maximum Ratings (at TA=25°C unless otherwise noted)

| Parameter                                         | Symbol         | Value       | Unit             |
|---------------------------------------------------|----------------|-------------|------------------|
| Drain-source voltage                              | $V_{DS}$       | -20         | V                |
| Gate-source voltage                               | $V_{GS}$       | $\pm 12$    | V                |
| Continuous drain current @ $T_c=25^\circ\text{C}$ | $I_D$          | -2.3        | A                |
| Peak drain current, pulsed (Note 1)               | $I_{DM}$       | -10         | A                |
| Power dissipation @ $T_c=25^\circ\text{C}$        | $P_D$          | 1.25        | W                |
| Operating junction and storage temperature range  | $T_J, T_{STG}$ | -55 to +175 | $^\circ\text{C}$ |

## Thermal Characteristics

| Parameter                                       | Symbol          | Min | Typ | Max | Unit               |
|-------------------------------------------------|-----------------|-----|-----|-----|--------------------|
| Thermal resistance junction to ambient (Note 2) | $R_{\theta JA}$ |     |     | 100 | $^\circ\text{C/W}$ |

Notes: 1. Pulse width  $\leq 100\mu\text{s}$ , duty cycle  $\leq 1\%$ , limited by  $T_J$  max.

2. Device mounted on FR-4 substrate PC board, 2oz copper, with 1 inch square copper plate in still air.

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

| Parameter                          | Symbol              | Conditions                                                                                     | Min  | Typ  | Max  | Unit |
|------------------------------------|---------------------|------------------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics             |                     |                                                                                                |      |      |      |      |
| Drain-source breakdown voltage     | BV <sub>DSS</sub>   | I <sub>D</sub> = -250μA                                                                        | -20  |      |      | V    |
| Drain-source leakage current       | I <sub>DSS</sub>    | V <sub>DS</sub> = -20V                                                                         |      |      | -1   | μA   |
| Gate-body leakage current          | I <sub>GSS</sub>    | V <sub>GS</sub> = ±12V                                                                         |      |      | ±100 | nA   |
| Gate threshold voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                    | -0.4 | -0.7 | -1   | V    |
| Drain-source on-resistance         | R <sub>DS(on)</sub> | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2.5A                                                |      | 80   | 100  | mΩ   |
|                                    | R <sub>DS(on)</sub> | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -2A                                                  |      | 105  | 140  | mΩ   |
| Dynamic Characteristics            |                     |                                                                                                |      |      |      |      |
| Gate resistance                    | R <sub>G</sub>      | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz                                           |      |      | 7    | Ω    |
| Forward transconductance           | g <sub>fs</sub>     | V <sub>DS</sub> = -5V, I <sub>D</sub> = -2A                                                    |      | 8    |      | S    |
| Input capacitance                  | C <sub>iss</sub>    | V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1MHz                                         |      | 354  |      | pF   |
| Output capacitance                 | C <sub>oss</sub>    |                                                                                                |      | 48   |      |      |
| Reverse transfer capacitance       | C <sub>rss</sub>    |                                                                                                |      | 28   |      |      |
| Total gate charge                  | Q <sub>g</sub>      | V <sub>DS</sub> = -10V, I <sub>DS</sub> = -1A, V <sub>GS</sub> = -4.5V                         |      | 4.9  |      | nC   |
| Gate to source charge              | Q <sub>gs</sub>     |                                                                                                |      | 1.4  |      |      |
| Gate to drain charge               | Q <sub>gd</sub>     |                                                                                                |      | 1.3  |      |      |
| Turn-on delay time                 | t <sub>d(on)</sub>  | V <sub>DD</sub> = -10V, I <sub>DS</sub> = -1A, R <sub>g</sub> = 10Ω<br>V <sub>GS</sub> = -4.5V |      | 8.4  |      | ns   |
| Turn-on rise time                  | t <sub>r</sub>      |                                                                                                |      | 11.8 |      |      |
| Turn-off delay time                | t <sub>d(off)</sub> |                                                                                                |      | 32.4 |      |      |
| Turn-off fall time                 | t <sub>f</sub>      |                                                                                                |      | 17.8 |      |      |
| Body-Diode Parameters              |                     |                                                                                                |      |      |      |      |
| Diode source diode forward voltage | V <sub>SD</sub>     | I <sub>S</sub> = -0.75A, V <sub>GS</sub> = 0V                                                  |      |      | 1.2  | V    |
| Reverse recovery time              | t <sub>rr</sub>     | I <sub>F</sub> = 1A, dI <sub>SD</sub> /dt = 100A/μs                                            |      | 5.3  |      | ns   |
| Reverse recovery charge            | Q <sub>rr</sub>     |                                                                                                |      | 1.7  |      | nC   |

Typical Rating and Characteristic Curves (ACMSP2301-HF)

Fig.1 - Typical Output Characteristics

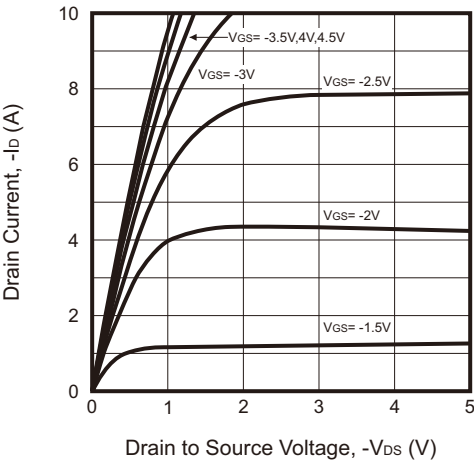


Fig.2 - Typical Transfer Characteristics

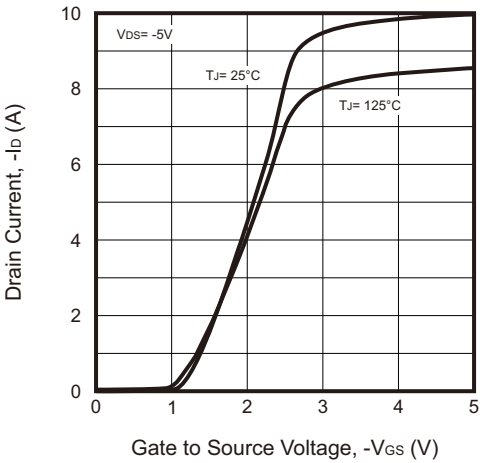


Fig.5 - On-Resistance vs. Gate to Source Voltage

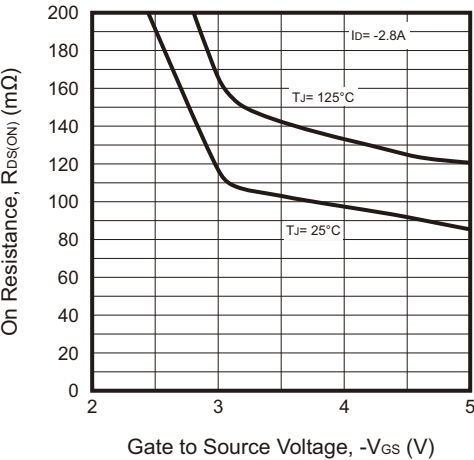


Fig.4 - On-Resistance vs. Junction Temperature

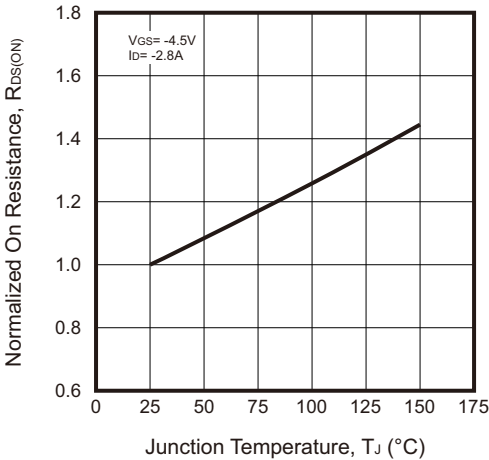


Fig.5 - Drain Current vs. On-Resistance

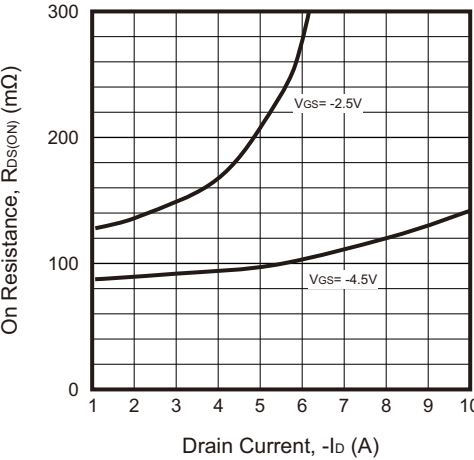
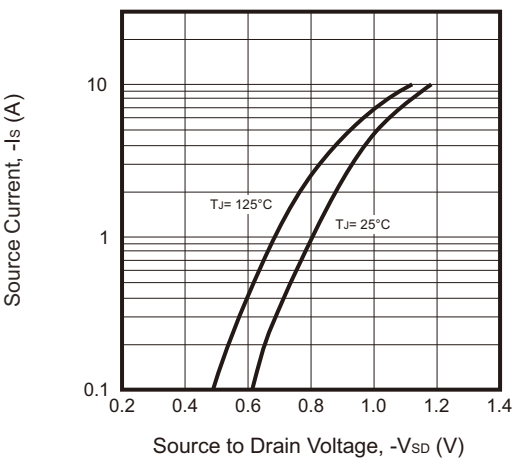


Fig.6 - Typical Forward Characteristics



## Typical Rating and Characteristic Curves (ACMSP2301-HF)

Fig.7 -  $V_{BR(DSS)}$  vs. Junction Temperature

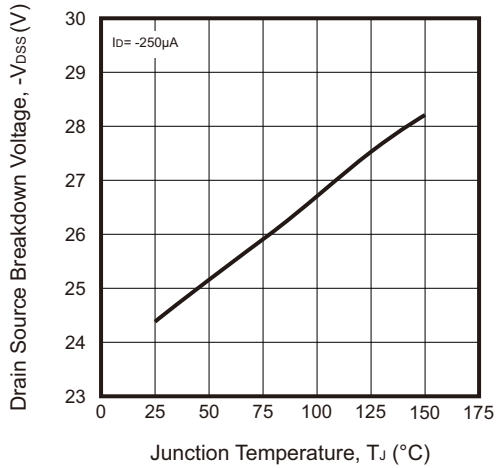


Fig.8 - Gate Threshold Variation vs. Junction Temperature

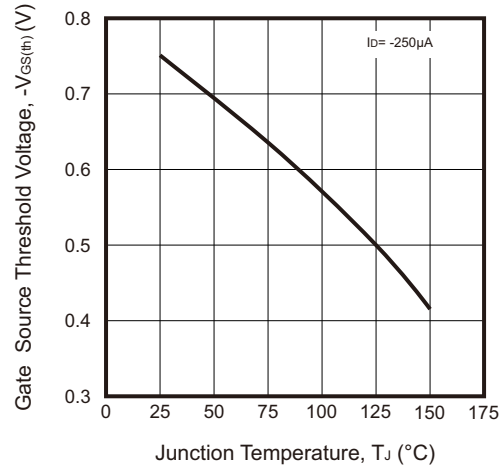


Fig.9 - Typical Junction Capacitance

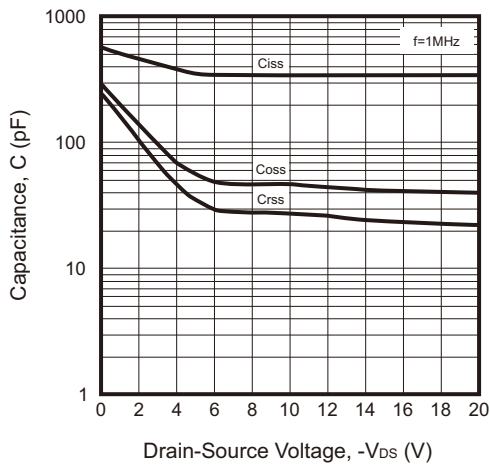


Fig.10 - Gate Charge Characteristics

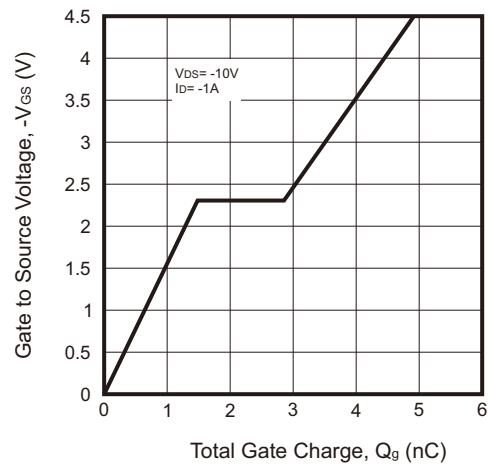


Fig.11 - Drain Source Leakage Current

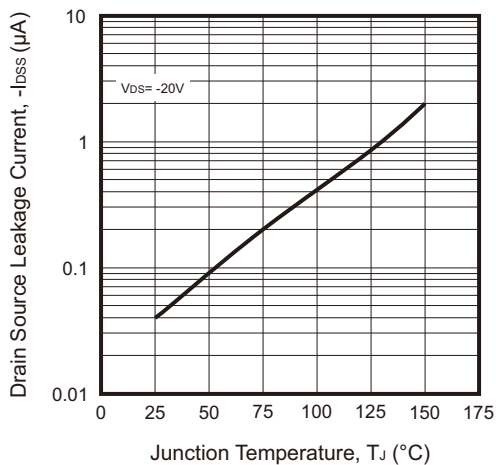
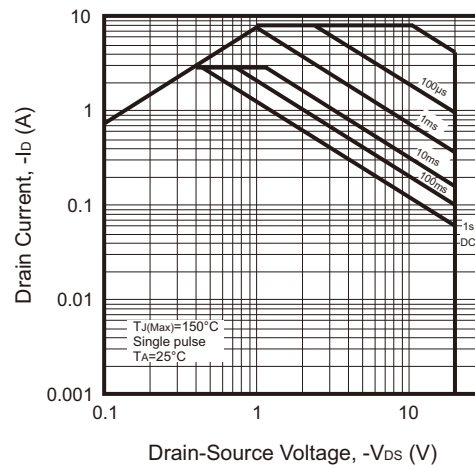
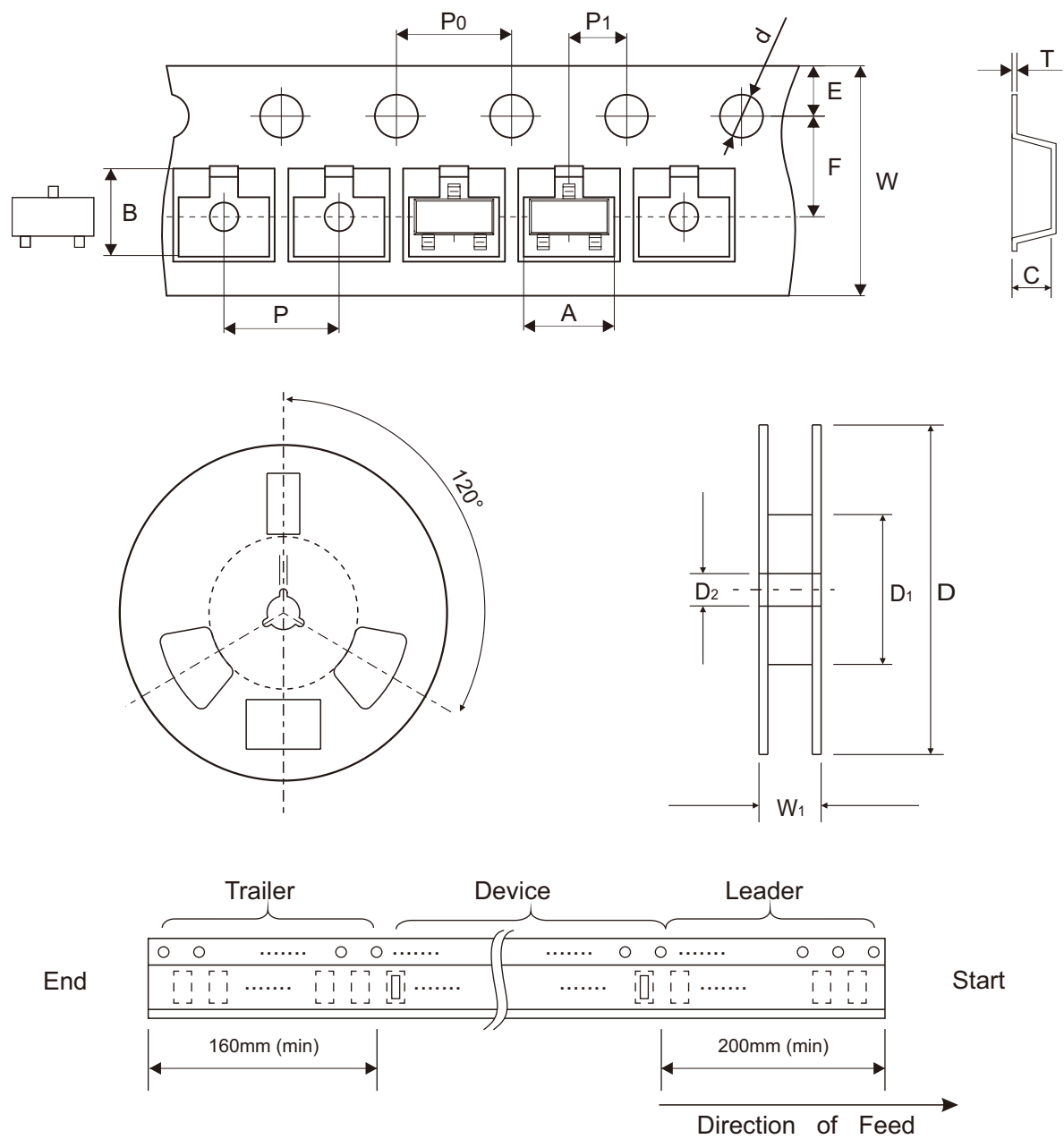


Fig.12 - Safe Operating Area



Reel Taping Specification

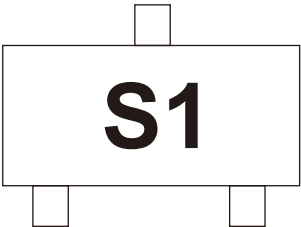


| SOT-23 | SYMBOL | A             | B             | C             | d                        | D             | D1            | D2            |
|--------|--------|---------------|---------------|---------------|--------------------------|---------------|---------------|---------------|
|        | (mm)   | 3.08 ± 0.10   | 2.72 ± 0.10   | 1.22 ± 0.10   | 1.50 + 0.10<br>- 0.00    | 178.00 ± 2.00 | 54.40 ± 1.00  | 13.00 ± 1.00  |
|        | (inch) | 0.121 ± 0.004 | 0.107 ± 0.004 | 0.048 ± 0.004 | 0.059 + 0.004<br>- 0.000 | 7.008 ± 0.079 | 2.142 ± 0.039 | 0.512 ± 0.039 |

| SOT-23 | SYMBOL | E             | F             | P             | P0            | P1            | T             | W                        | W1            |
|--------|--------|---------------|---------------|---------------|---------------|---------------|---------------|--------------------------|---------------|
|        | (mm)   | 1.75 ± 0.10   | 3.50 ± 0.10   | 4.00 ± 0.10   | 4.00 ± 0.10   | 2.00 ± 0.10   | 0.20 ± 0.05   | 8.00 + 0.30<br>- 0.10    | 12.30 ± 1.00  |
|        | (inch) | 0.069 ± 0.004 | 0.138 ± 0.004 | 0.157 ± 0.004 | 0.157 ± 0.004 | 0.079 ± 0.004 | 0.008 ± 0.002 | 0.315 + 0.012<br>- 0.004 | 0.484 ± 0.039 |

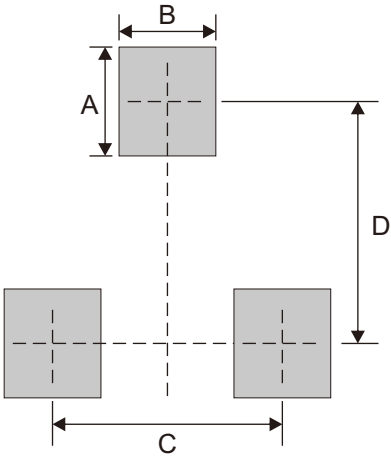
Marking Code

| Part Number  | Marking Code |
|--------------|--------------|
| ACMSP2301-HF | S1           |



Suggested P.C.B. PAD Layout

| SIZE | SOT-23 |        |
|------|--------|--------|
|      | (mm)   | (inch) |
| A    | 0.80   | 0.031  |
| B    | 0.60   | 0.024  |
| C    | 1.90   | 0.075  |
| D    | 2.02   | 0.080  |



Standard Packaging

| Case Type | REEL PACK  |                  |
|-----------|------------|------------------|
|           | REEL (pcs) | Reel Size (inch) |
| SOT-23    | 3,000      | 7                |