

# FMOS2302A1-Q1

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# FMOS2302A1-Q1

## 3A 20V N-Channel Enhancement Mode Field Effect Transistor

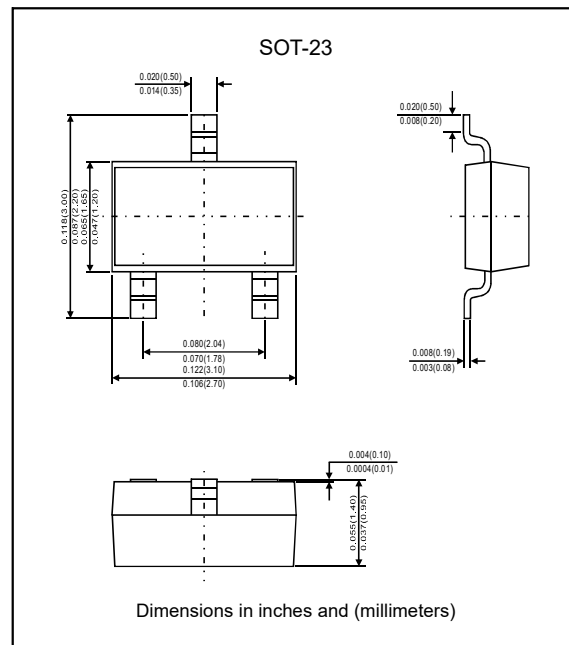
### Features

- $V_{DS} = 20V$ ,  $I_D = 3A$ .
- $R_{DS(ON)} \leq 60m\Omega$ , @  $V_{GS} = 4.5V$ .
- $R_{DS(ON)} \leq 115m\Omega$ , @  $V_{GS} = 2.5V$ .
- Lead free product is acquired.
- We declare that the material of product compliance with RoHS requirements.
- Qualified to AEC-Q101 standards for high reliability.
- Suffix "-H" indicates Halogen-free part, ex.FMOS2302A1-Q1-H.

### Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-23
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position : Any
- Weight : Approximated 0.008 gram

### Package outline



### Maximum ratings ( $T_c = 25^\circ C$ unless otherwise noted)

| Parameter                                                    | Symbol          | Ratings     | Unit         |
|--------------------------------------------------------------|-----------------|-------------|--------------|
| Drain-source voltage                                         | $V_{DS}$        | 20          | V            |
| Gate-source voltage                                          | $V_{GS}$        | $\pm 8$     | V            |
| Continuous drain current <sup>A</sup> ( $T_c = 25^\circ C$ ) | $I_D$           | 3           | A            |
| Continuous source-drain diode current                        | $I_S$           | 0.6         | A            |
| Power dissipation ( $T_A = 25^\circ C$ )                     | $P_D$           | 0.35        | W            |
| Thermal resistance form junction to ambient ( $t \leq 5s$ )  | $R_{\theta JA}$ | 357         | $^\circ C/W$ |
| Operating Junction temperature range                         | $T_j$           | +150        | $^\circ C$   |
| Storage temperature range                                    | $T_{STG}$       | -55 to +150 | $^\circ C$   |

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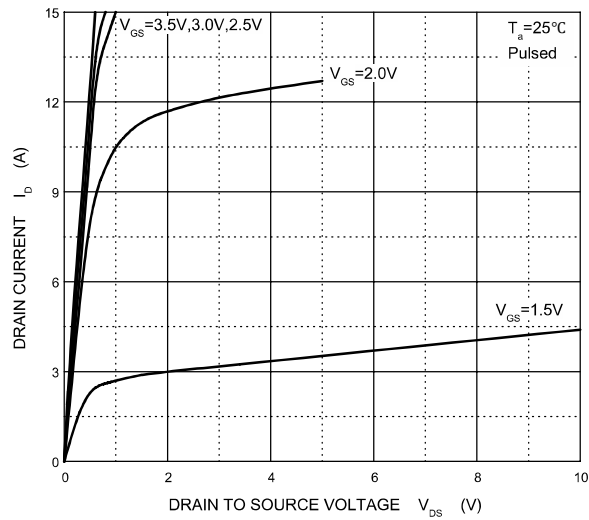
**Electrical characteristics** (At  $T_j=25^{\circ}\text{C}$  unless otherwise specified)

| Parameter                                      | Symbol       | Conditions                                                          | Min. | Typ. | Max.      | Unit       |
|------------------------------------------------|--------------|---------------------------------------------------------------------|------|------|-----------|------------|
| Off characteristics                            |              |                                                                     |      |      |           |            |
| Drain-source breakdown voltage                 | $BV_{DSS}$   | $I_D=10\mu A, V_{GS}=0V$                                            | 20   |      |           | V          |
| Drain-source leakage current                   | $I_{DSS}$    | $V_{DS}=20V, V_{GS}=0V$                                             |      |      | 1         | $\mu A$    |
| Gate-source leakage current                    | $I_{GSS}$    | $V_{GS}=\pm 8V, V_{DS}=0V$                                          |      |      | $\pm 100$ | nA         |
| On characteristics                             |              |                                                                     |      |      |           |            |
| Gate threshold voltage                         | $V_{GS(TH)}$ | $V_{DS}=V_{GS}, I_D=50\mu A$                                        | 0.5  | 0.95 | 1.25      | V          |
| Static drain-source on-resistance              | $R_{DS(ON)}$ | $V_{GS}=4.5V, I_D=3.0A$                                             |      | 45   | 60        | m $\Omega$ |
|                                                |              | $V_{GS}=2.5V, I_D=2.0A$                                             |      | 70   | 115       |            |
| Dynamic Parameters                             |              |                                                                     |      |      |           |            |
| Input capacitance                              | $C_{iss}$    | $V_{GS}=0V, V_{DS}=10V, f=1.0MHz$                                   |      | 300  |           | pF         |
| Output capacitance                             | $C_{oss}$    |                                                                     |      | 120  |           |            |
| Reverse transfer capacitance                   | $C_{rss}$    |                                                                     |      | 80   |           |            |
| Switching parameters                           |              |                                                                     |      |      |           |            |
| Total gate charge                              | $Q_g$        | $V_{GS}=4.5V, V_{DS}=10V, I_D=3.6A$                                 |      | 4.0  |           | nC         |
| Gate to source charge                          | $Q_{gs}$     |                                                                     |      | 0.65 |           |            |
| Gate to Drain charge                           | $Q_{gd}$     |                                                                     |      | 1.5  |           |            |
| Turn-on delay time                             | $t_{D(ON)}$  | $V_{DS}=10V, V_{GS}=4.5V, I_D=3.6A$<br>$R_G=6\Omega, R_L=5.5\Omega$ |      | 7    |           | ns         |
| Rise time                                      | $t_r$        |                                                                     |      | 55   |           |            |
| Turn-off delay time                            | $t_{D(OFF)}$ |                                                                     |      | 16   |           |            |
| Fall time                                      | $t_f$        |                                                                     |      | 10   |           |            |
| Source-drain diode ratings and characteristics |              |                                                                     |      |      |           |            |
| Drain - source diode forward voltage (Note 1)  | $V_{SD}$     | $V_{DS}=0V, I_D=0.94A$                                              |      | 0.76 | 1.2       | V          |

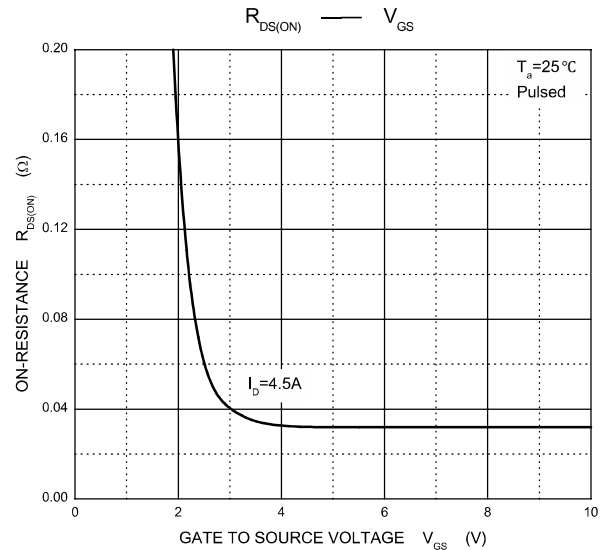
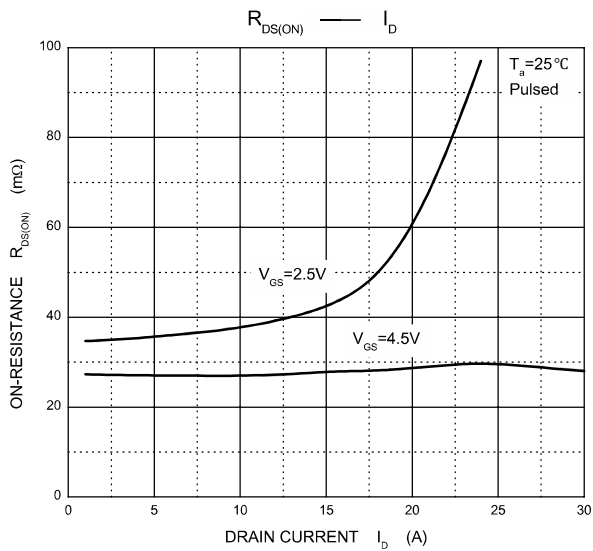
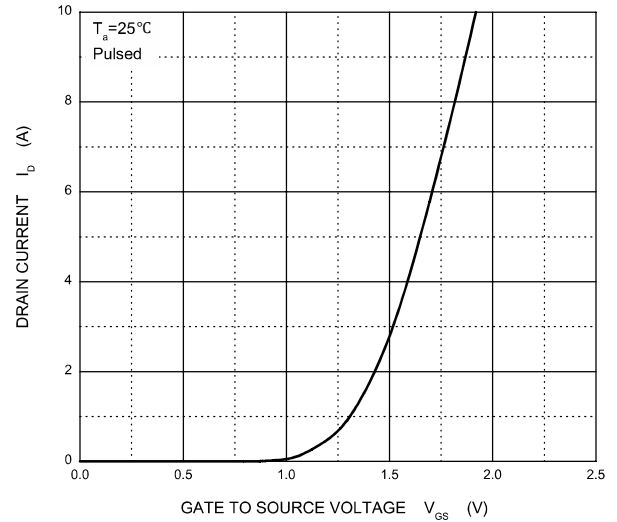
Note : 1. Pulse Test : pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .  
 2. These parameters have no way to verify.

## Typical Performance Characteristics (FMOS2302A1-Q1)

Output Characteristics

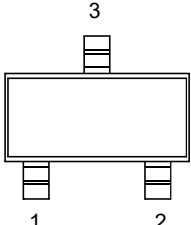
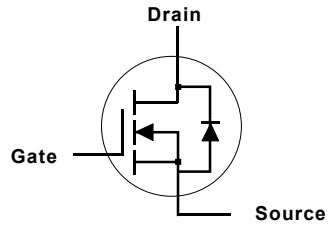


Transfer Characteristics



## FMOS2302A1-Q1

## Pinning information

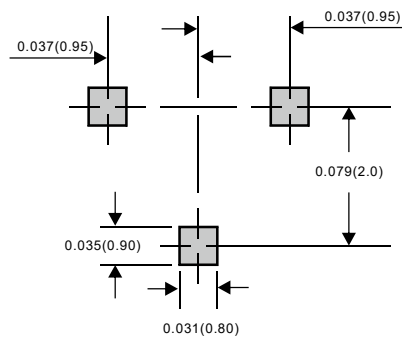
| Pin                                       | Simplified outline                                                                | Symbol                                                                              |
|-------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Pin 1 Gate<br>Pin 2 Source<br>Pin 3 Drain |  |  |

## Marking

| Type number   | Marking code |
|---------------|--------------|
| FMOS2302A1-Q1 | 2302         |

## Suggested solder pad layout

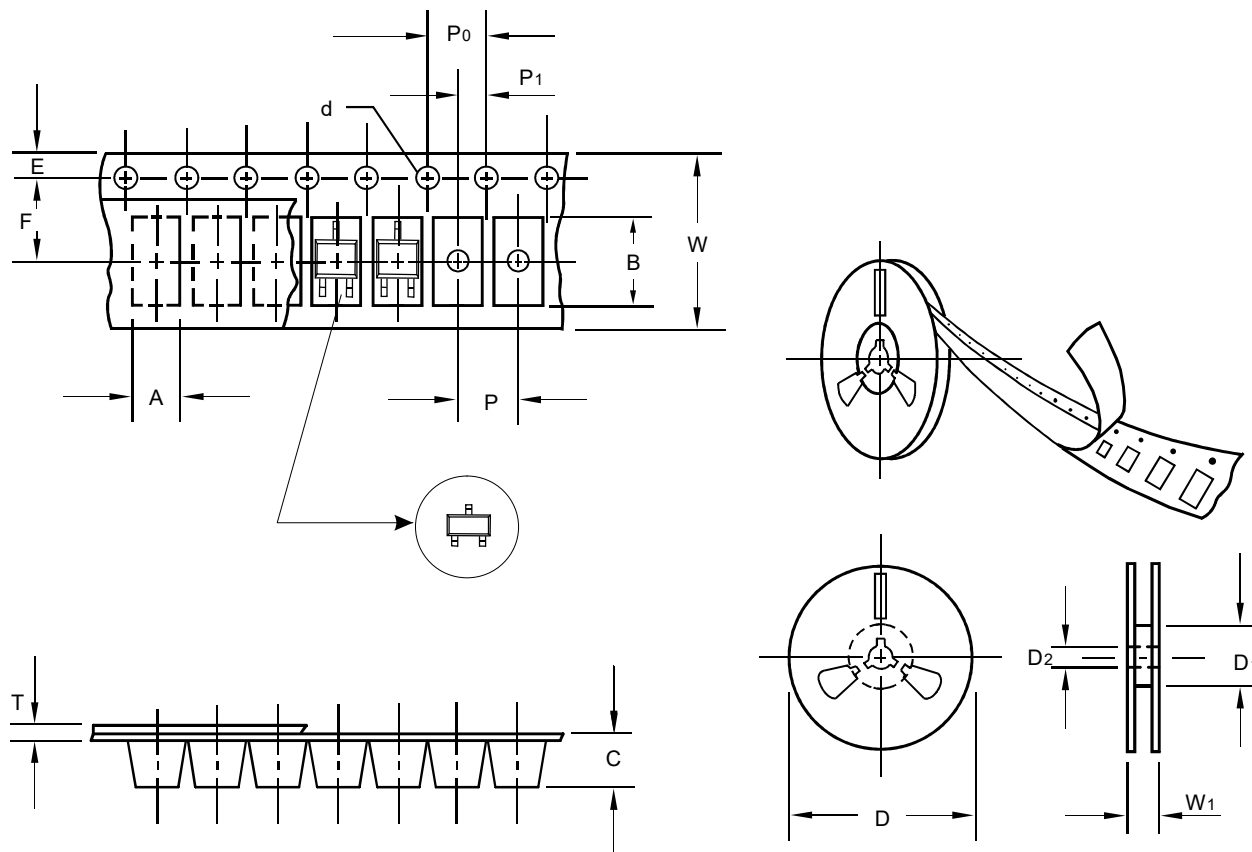
## SOT-23



Dimensions in inches and (millimeters)

## FMOS2302A1-Q1

## Packing information



unit:mm

| Item                      | Symbol | Tolerance | SOT-23 |
|---------------------------|--------|-----------|--------|
| Carrier width             | A      | 0.1       | 3.15   |
| Carrier length            | B      | 0.1       | 2.77   |
| Carrier depth             | C      | 0.1       | 1.22   |
| Sprocket hole             | d      | 0.1       | 1.50   |
| 13" Reel outside diameter | D      | 2.0       | -      |
| 13" Reel inner diameter   | D1     | min       | -      |
| 7" Reel outside diameter  | D      | 2.0       | 178.00 |
| 7" Reel inner diameter    | D1     | min       | 54.40  |
| Feed hole diameter        | D2     | 0.5       | 13.00  |
| Sprocket hole position    | E      | 0.1       | 1.75   |
| Punch hole position       | F      | 0.1       | 3.50   |
| Punch hole pitch          | P      | 0.1       | 4.00   |
| Sprocket hole pitch       | P0     | 0.1       | 4.00   |
| Embossment center         | P1     | 0.1       | 2.00   |
| Overall tape thickness    | T      | 0.1       | 0.23   |
| Tape width                | W      | 0.3       | 8.00   |
| Reel width                | W1     | 1.0       | 11.40  |

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

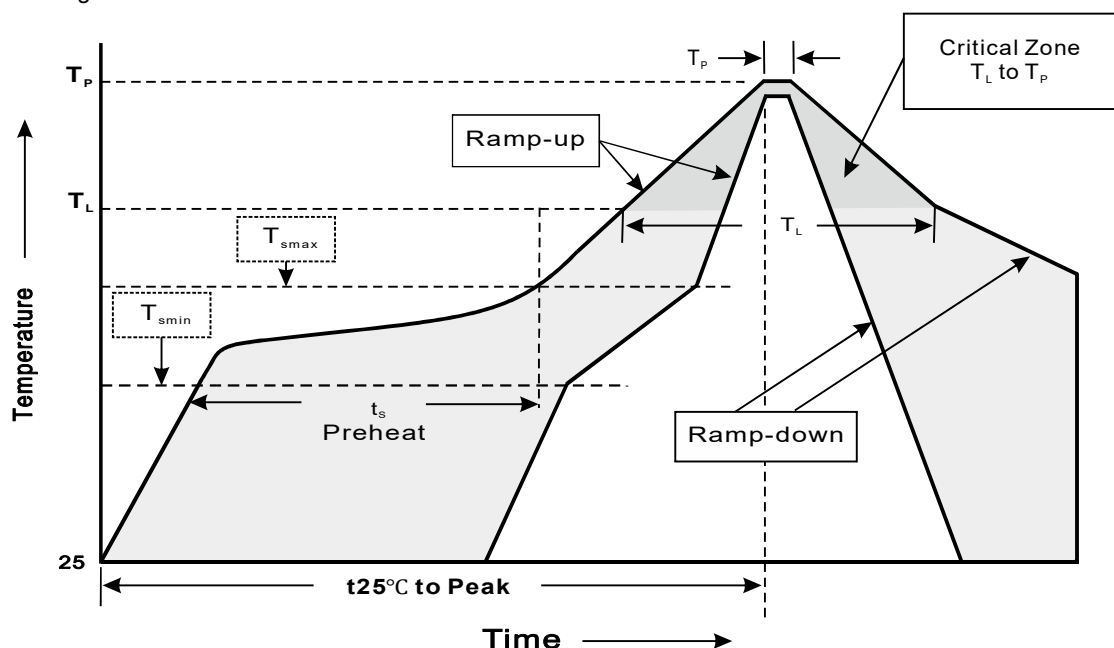
## FMOS2302A1-Q1

## Reel packing

| PACKAGE | REEL SIZE | REEL (pcs) | COMPONENT SPACING (m/m) | BOX (pcs) | INNER BOX (m/m) | REEL DIA, (m/m) | CARTON SIZE (m/m) | CARTON (pcs) | APPROX. GROSS WEIGHT (kg) |
|---------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|---------------------------|
| SOT-23  | 7"        | 3,000      | 4.0                     | 30,000    | 183*123*183     | 178             | 382*257*387       | 240,000      | 11.6                      |

## Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



## 3.Reflow soldering

| Profile feature                                                                                               | Soldering Condition           |
|---------------------------------------------------------------------------------------------------------------|-------------------------------|
| Average ramp-up rate ( $T_L$ to $T_p$ )                                                                       | < 3°C/sec                     |
| Preheat<br>-Temperature Min ( $T_{smin}$ )<br>-Temperature Max ( $T_{smax}$ )<br>-Time (min to max) ( $t_s$ ) | 150°C<br>200°C<br>60 ~ 120sec |
| $T_{smax}$ to $T_L$<br>-Ramp-up rate                                                                          | < 3°C/sec                     |
| Time maintained above:<br>-Temperature ( $T_L$ )<br>-Time( $T_L$ )                                            | 217°C<br>60 ~ 260 sec         |
| Peak Temperature( $T_p$ )                                                                                     | 255°C -0/+5°C                 |
| Time within 5°C of actual peak Temperature( $T_p$ )                                                           | 10 ~ 30sec                    |
| Ramp-down rate                                                                                                | < 6°C/sec                     |
| Time 25°C to peak temperature                                                                                 | < 6 minutes                   |