# AT3401MQSA-Q1

P-Channel Enhancement Mode MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)MAX}$ | $I_D$ |
|---|---|---|
| -30V | 55mΩ@-10V | -4.4A |
| | 66mΩ@-4.5V | |
| | 94mΩ@-2.5V | |

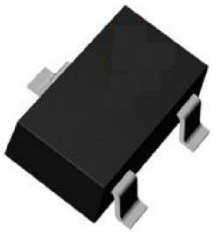
## Feature

- Trench Power LV MOSFET technology
- High density cell design for Low $R_{DS(ON)}$
- High Speed switching
- Suffix “-Q1” for AEC-Q101

## Application

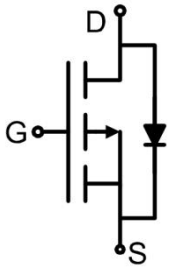
- Battery protection
- Power management
- Load switch

## Package

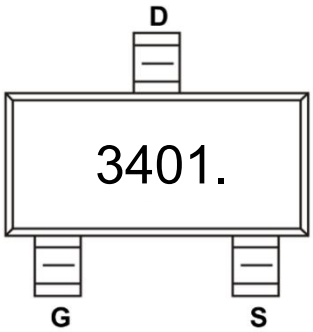


SOT-23

## Circuit diagram




## Marking



## Absolute maximum ratings ($T_A$=25℃ unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | -30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±12 | V |
| Continuous Drain Current | $I_D$ | -4.4 | A |
| Continuous Drain Current ($T_A$=70℃) | $I_D$ (70℃) | -3.5 | A |
| Pulsed Drain Current[1)] | $I_{DM}$ | -27 | A |
| Power Dissipation | $P_D$ | 1.2 | W |
| Thermal Resistance Junction-to-Ambient[2)] | $R_{\theta JA}$ | 104 | ℃/W |
| Operating Junction Temperature | $T_J$ | -55 ~ +150 | ℃ |
| Storage Temperature | $T_{STG}$ | -55 ~ +150 | ℃ |

## Electrical characteristics ($T_J$=25 °C, unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ =0V, $I_D$ =-250μA | -30 | | | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ =-30V, $V_{GS}$ =0V | | | -1 | μA |
| Gate-body leakage current | $I_{GSS}$ | $V_{DS}$ =0V, $V_{GS}$ =±12V | | | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =-250μA | -0.6 | -0.9 | -1.4 | V |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS}$ =-10V, $I_D$ =-4.4A | | 40 | 55 | mΩ |
| | | $V_{GS}$ =-4.5V, $I_D$ =-4A | | 47 | 66 | |
| | | $V_{GS}$ =-2.5V, $I_D$ =-2A | | 60 | 94 | |
| **Dynamic characteristics[3)]** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =-15V, $V_{GS}$ =0V, f =1MHz | | 1040 | | pF |
| Output Capacitance | $C_{oss}$ | | | 80 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 68 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ =-15V, $V_{GS}$ =-10V $I_D$ =-4.4A | | 22 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 3.28 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 2.11 | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DS}$ =-15V, $V_{GS}$ =-10V $I_D$ =-4.4A, $R_G$ =3Ω | | 4.4 | | nS |
| Turn-on rise time | $t_r$ | | | 26 | | |
| Turn-off delay time | $t_{d(off)}$ | | | 49.2 | | |
| Turn-off fall time | $t_f$ | | | 42.8 | | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward Current | $I_S$ | | | | -4.4 | A |
| Diode Forward voltage | $V_{SD}$ | $V_{GS}$ =0V, $I_S$ =-4.4A | | | -1.2 | V |
| Reverse Recovery Time | $T_{rr}$ | $I_F$ =-4.4A, di/dt =100 A/μs | | 16 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 10 | | nC |

Notes:

1) Pulse Test: Pulse Width ≤300μs, Duty Cycle ≤2%.

2) $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance, where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design, while $R_{\theta JA}$ is determined by the board design. The maximum rating presented here is based on mounting on a 1 in 2 pad of 2oz copper

3) Guaranteed by design, not subject to production testing.

## Typical Characteristics

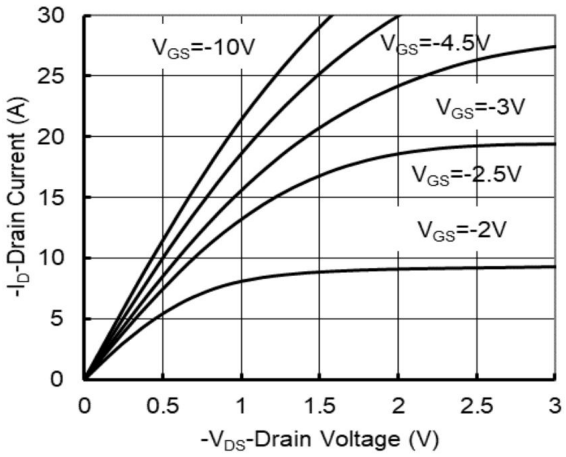



**Figure1. Output Characteristics**

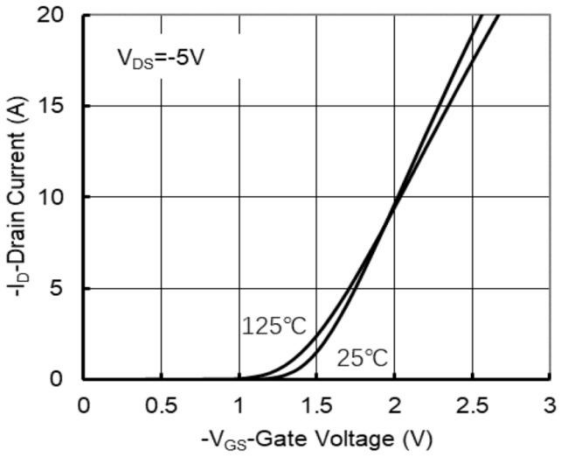



**Figure2. Transfer Characteristics**

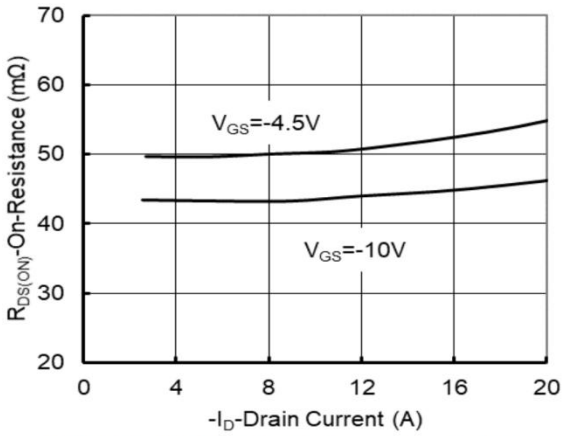



**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

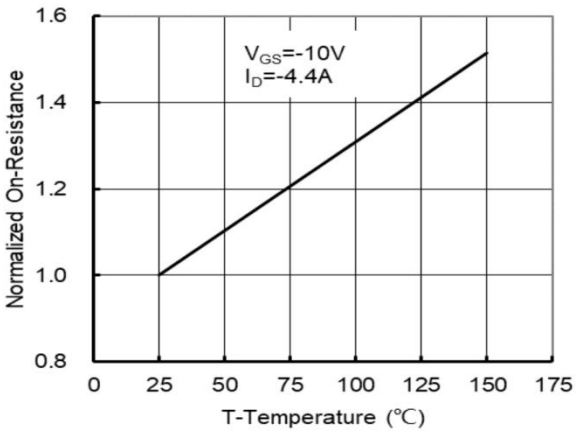



**Figure 4: On-Resistance vs. Junction Temperature**

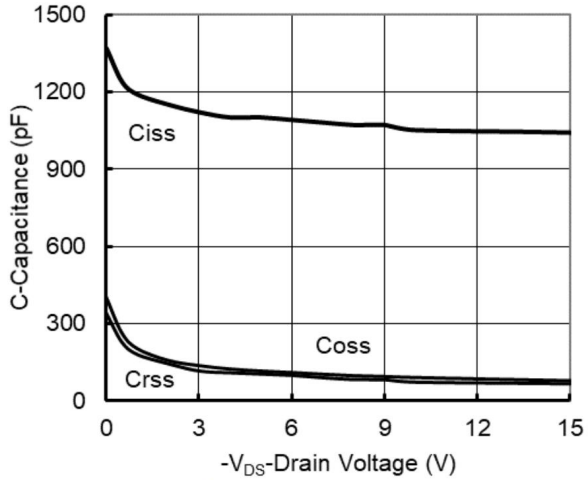



**Figure5. Capacitance Characteristics**

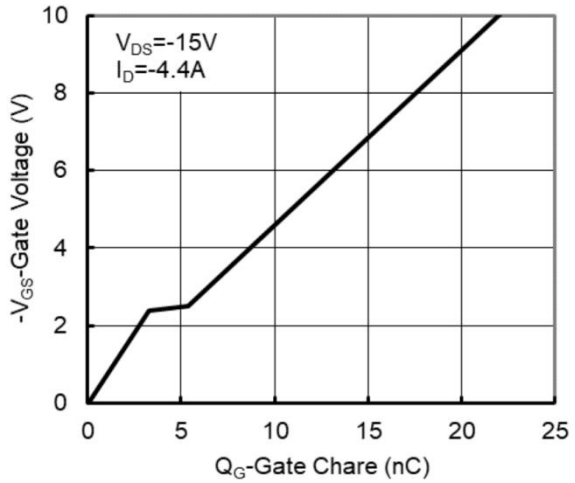



**Figure6. Gate Charge**

## Typical Characteristics

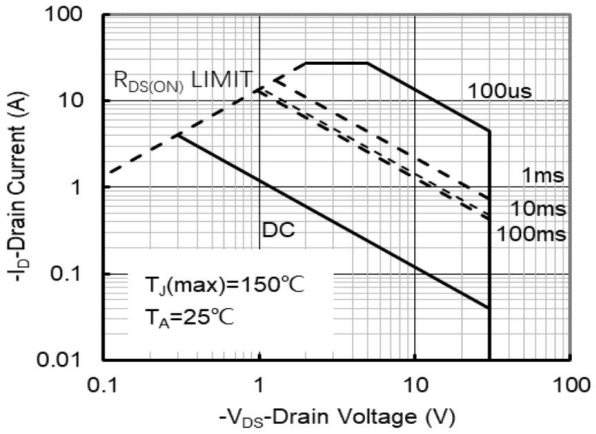



**Figure7. Safe Operation Area**

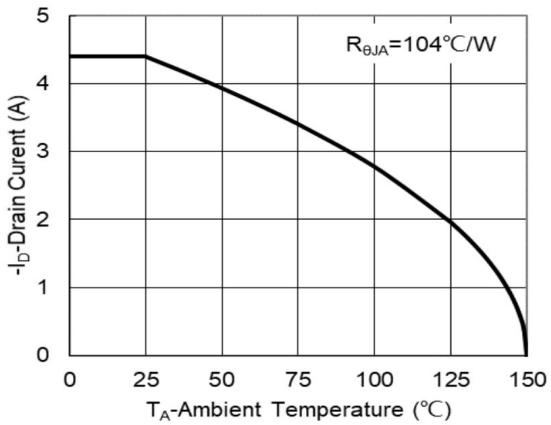



**Figure8. Maximum Continuous Drain Current vs Ambient Temperature**

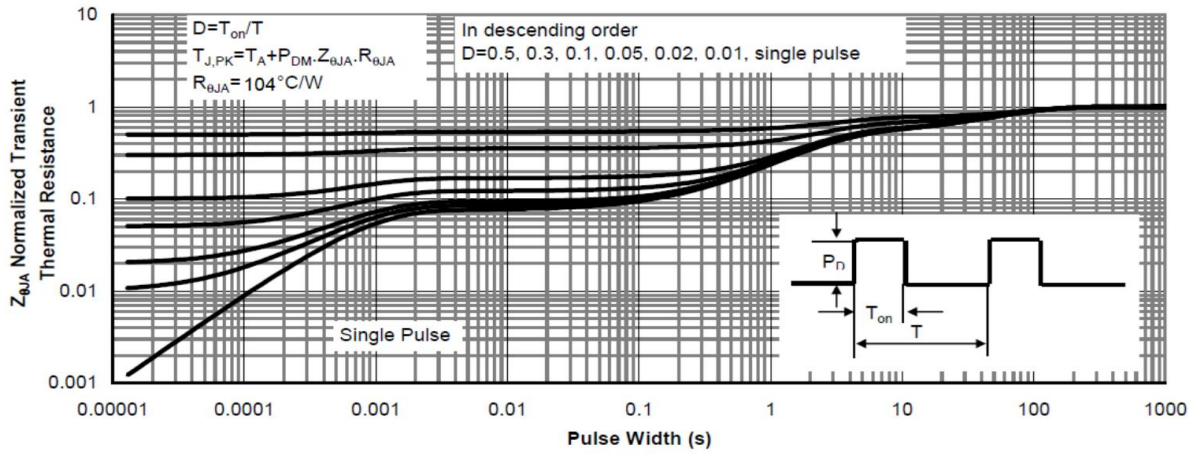
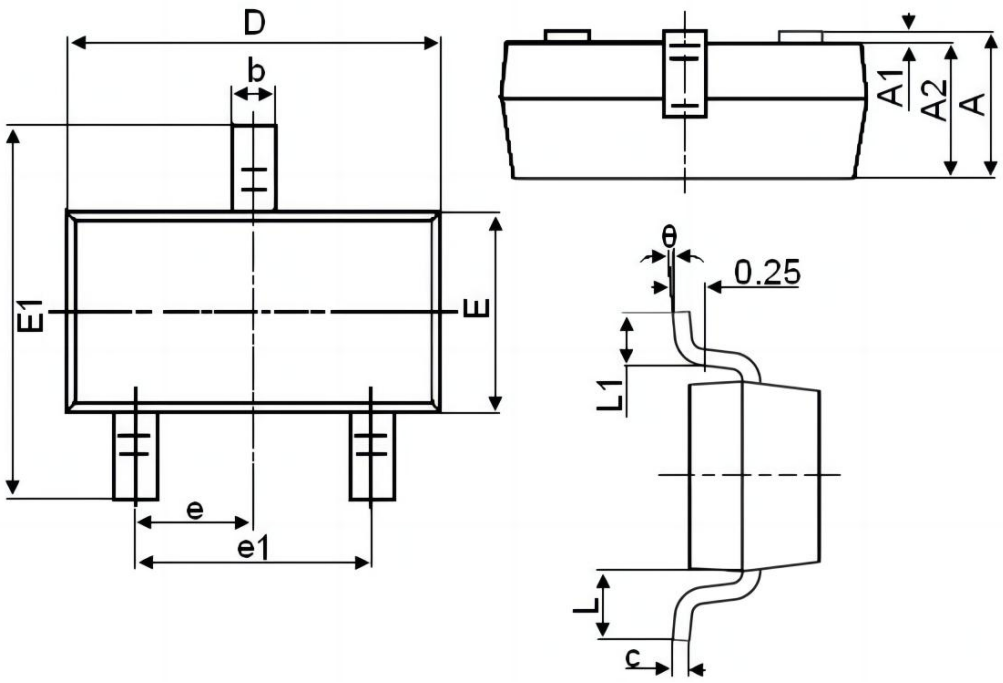



**Figure9. Normalized Maximum Transient Thermal Impedance**

## SOT-23 Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.150 | 0.035 | 0.045 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.050 | 0.035 | 0.041 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.080 | 0.200 | 0.003 | 0.008 |
| D | 2.800 | 3.000 | 0.110 | 0.118 |
| E | 1.200 | 1.400 | 0.047 | 0.055 |
| E1 | 2.250 | 2.550 | 0.089 | 0.100 |
| e | 0.950 TYP. | | 0.037 TYP. | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.550 REF. | | 0.022 REF. | |
| L1 | 0.300 | 0.500 | 0.012 | 0.020 |
| θ | 0° | 8° | 0° | 8° |