# AS4409BS-Q1

P-Channel Enhancement Mode MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)MAX}$ | $I_D$ |
|---|---|---|
| -30V | 5.3mΩ@-20V | -18A |
| | 6mΩ@-10V | |
| | 10mΩ@-4.5V | |

## Feature

- Trench Power LV MOSFET technology
- High density cell design for low $R_{DS(ON)}$
- High speed switching
- Suffix "-Q1" for AEC-Q101

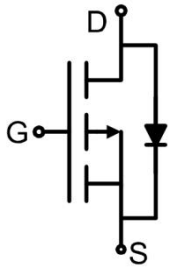
## Application

- Battery protection
- Power management
- Load switch

## Package

SOP-8

## 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 | $V_{GS}$ | ±25 | V |
| Continuous Drain Current | $I_D$ | -18 | A |
| Continuous Drain Current ($T_A$=100℃) | $I_D$ (100℃) | -11 | A |
| Pulsed Drain Current[1] | $I_{DM}$ | -200 | A |
| Power Dissipation[3] | $P_D$ | 3 | W |
| Single pulse avalanche energy[2] | $E_{AS}$ | 400 | mJ |
| Thermal Resistance from Junction to Ambient[4] | $R_{\theta JA}$ | 40 | ℃/W |
| Junction Temperature | $T_J$ | 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 | $I_{GSS}$ | $V_{GS}$ =±25V, $V_{DS}$ = 0V | | | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =-250μA | -1.0 | -1.8 | -2.5 | V |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS}$ =-20V, $I_D$ =-18A | | 4.0 | 5.3 | mΩ |
| | | $V_{GS}$ =-10V, $I_D$ =-15A | | 4.5 | 6 | |
| | | $V_{GS}$ =-4.5V, $I_D$ =-10A | | 7.5 | 10 | |
| **Dynamic characteristics[5]** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =-15V,$V_{GS}$ =0V,f =1MHz | | 3530 | | pF |
| Output Capacitance | $C_{oss}$ | | | 600 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 550 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ =-15V,$V_{GS}$ =-10V,$I_D$ =-18A | | 38 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 8 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 11 | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=-15V,$V_{GS}$=-10V, $I_D$ =-18A $R_{GEN}$=3Ω | | 6 | | nS |
| Turn-on rise time | $t_r$ | | | 10 | | |
| Turn-off delay time | $t_{d(off)}$ | | | 78 | | |
| Turn-off fall time | $t_f$ | | | 40 | | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward Current | $I_S$ | | | | -18 | A |
| Diode Forward voltage | $V_{SD}$ | $V_{GS}$ =0V, $I_S$=-18A | | -0.85 | -1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | IF =-18A,di/dt = 100A/μs | | 50 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 33 | | nC |

Notes:

1) Repetitive rating; pulse width limited by max. junction temperature.

2) $T_J$=25℃, $V_{DD}$=-25V, $V_G$=-10V, $R_G$=25Ω, L=2mH, IAS=-20A.

3) $P_d$ is based on max. junction temperature, using junction-case and junction-ambient thermal resistance.

4) The value of $R_{\theta JA}$ is measured with the device mounted on 1 $in^2$ FR-4 board with 2oz. Copper, in the still air environment with $T_A$ =25℃. The maximum allowed junction temperature of 150℃. The value in any given application depends on the user's specific board design.

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

## Typical Characteristics

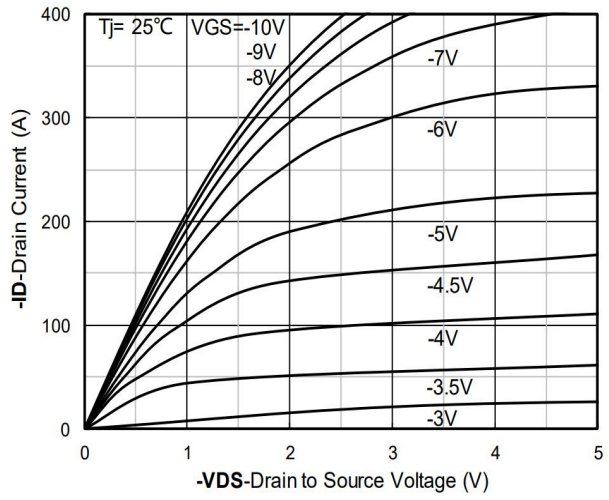



Figure 1. Output Characteristics

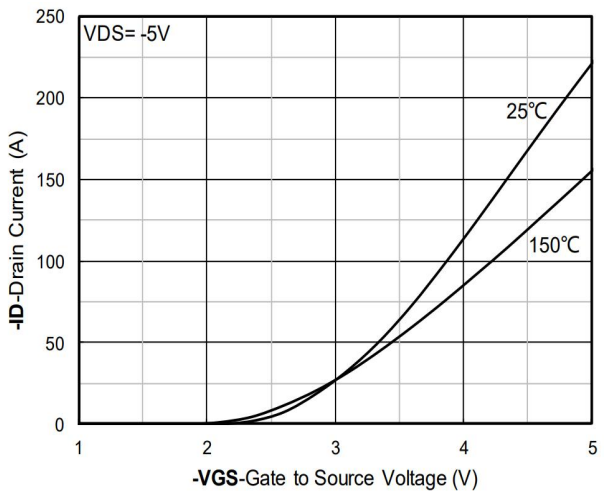



Figure 2. Transfer Characteristics

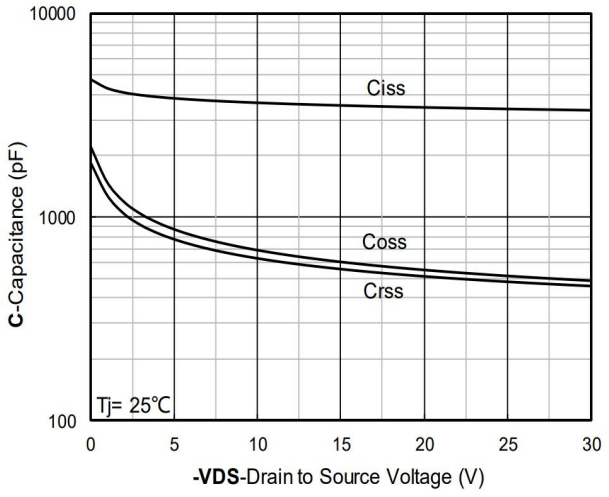



Figure 3. Capacitance Characteristics

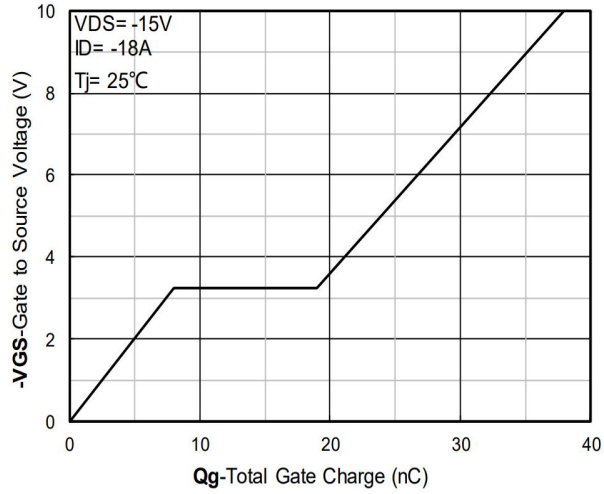



Figure 4. Gate Charge

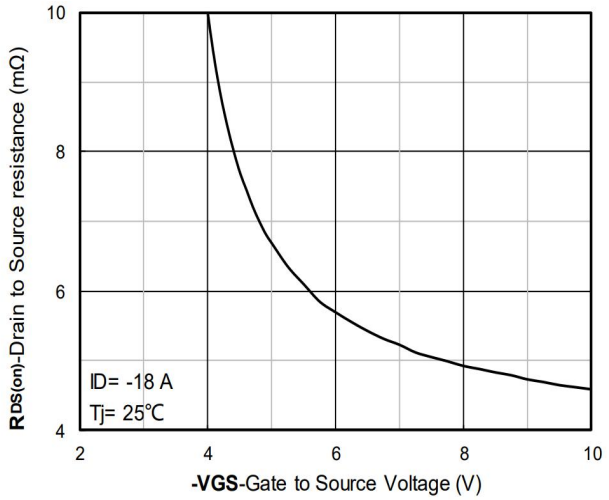



Figure 5. On-Resistance vs Gate to Source Voltage

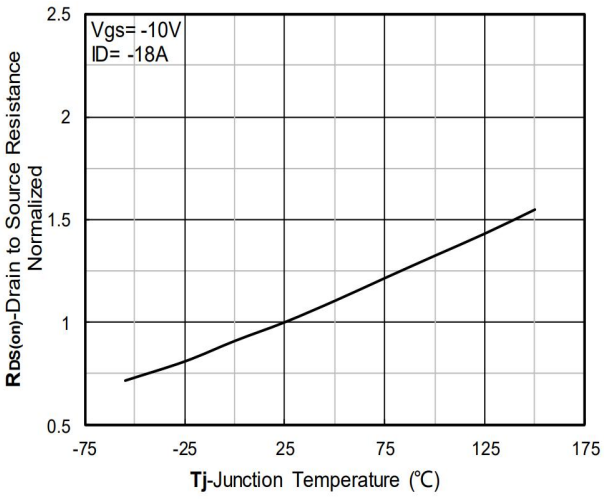



Figure 6. Normalized On-Resistance

## Typical Characteristics

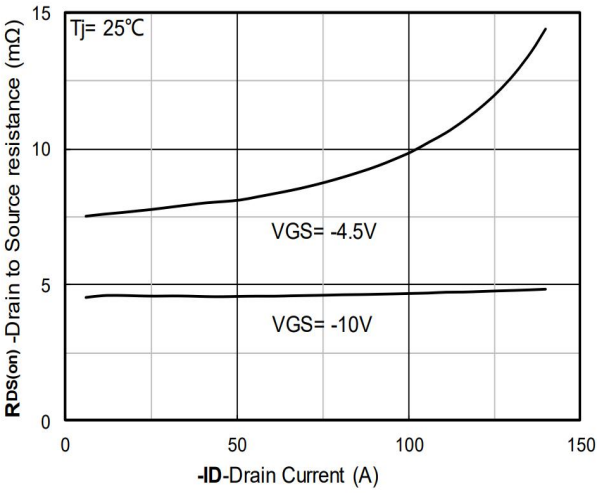



Figure 7. $R_{DS(on)}$ VS Drain Current

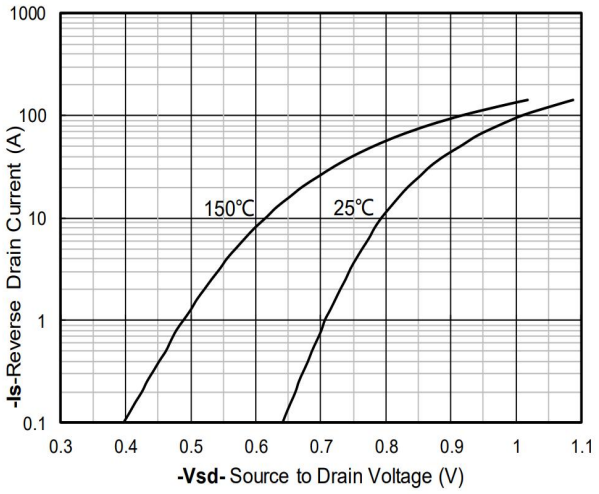



Figure 8. Forward characteristics of reverse diode

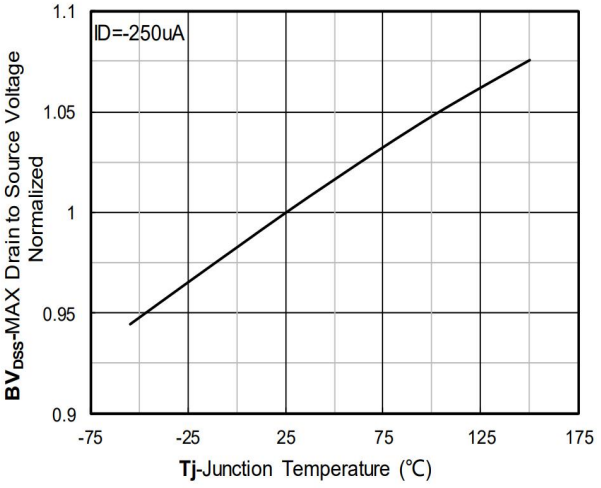



Figure 9. Normalized breakdown voltage

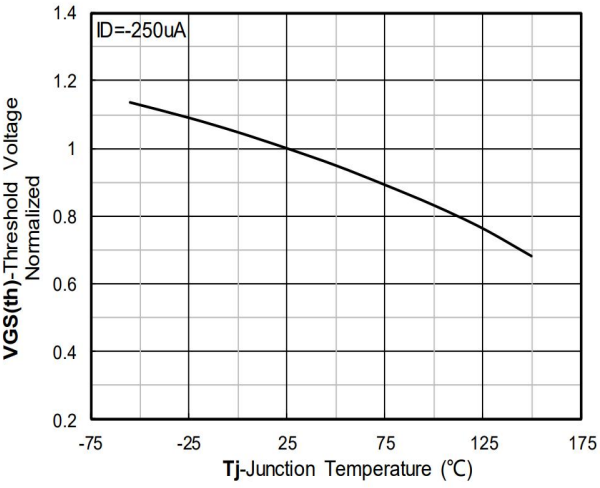



Figure 10. Normalized Threshold voltage

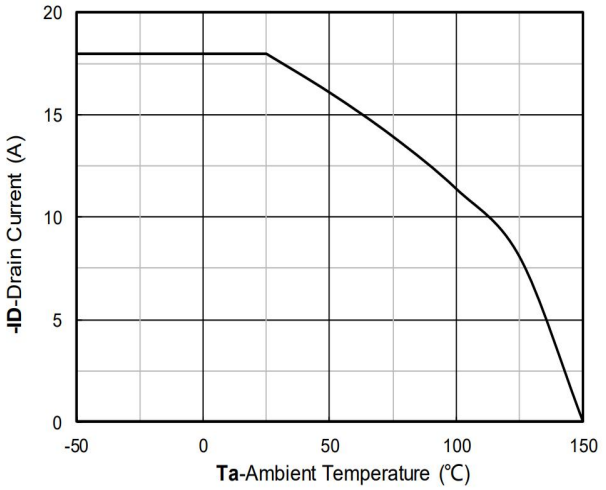



Figure 11. Current dissipation

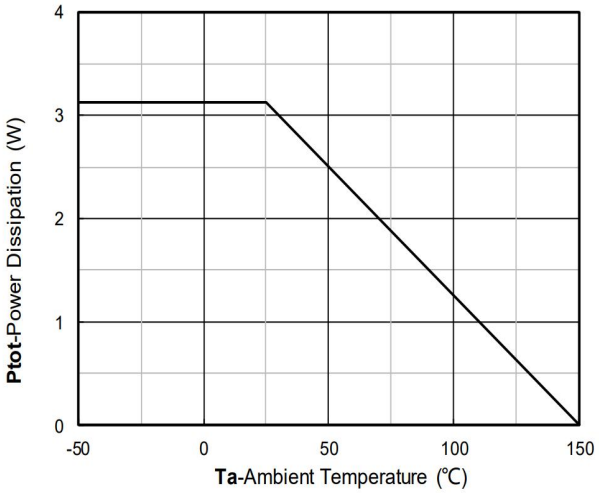



Figure 12. Power dissipation

## Typical Characteristics

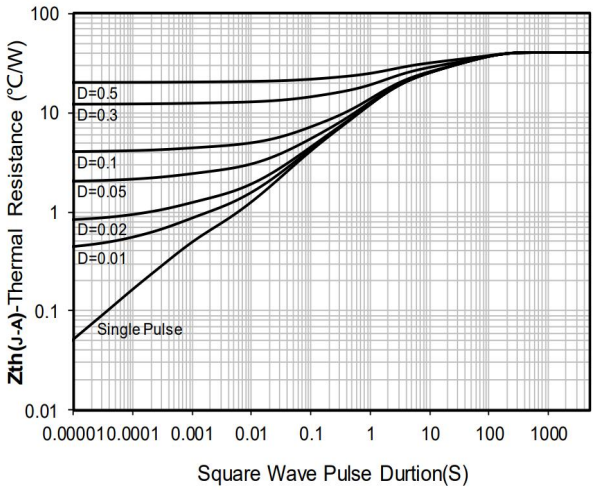



Figure 13. Maximum Transient Thermal Impedance

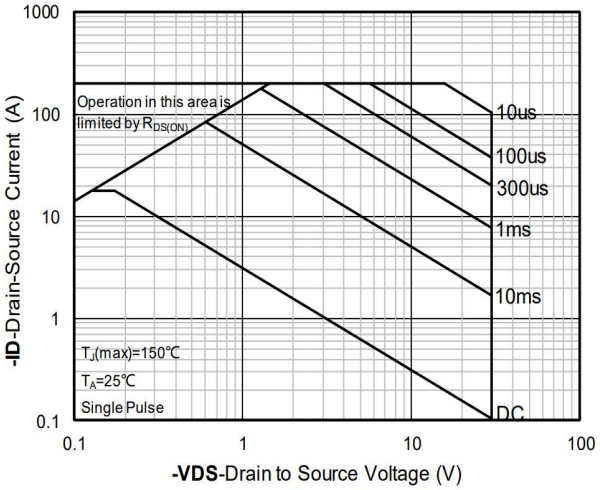
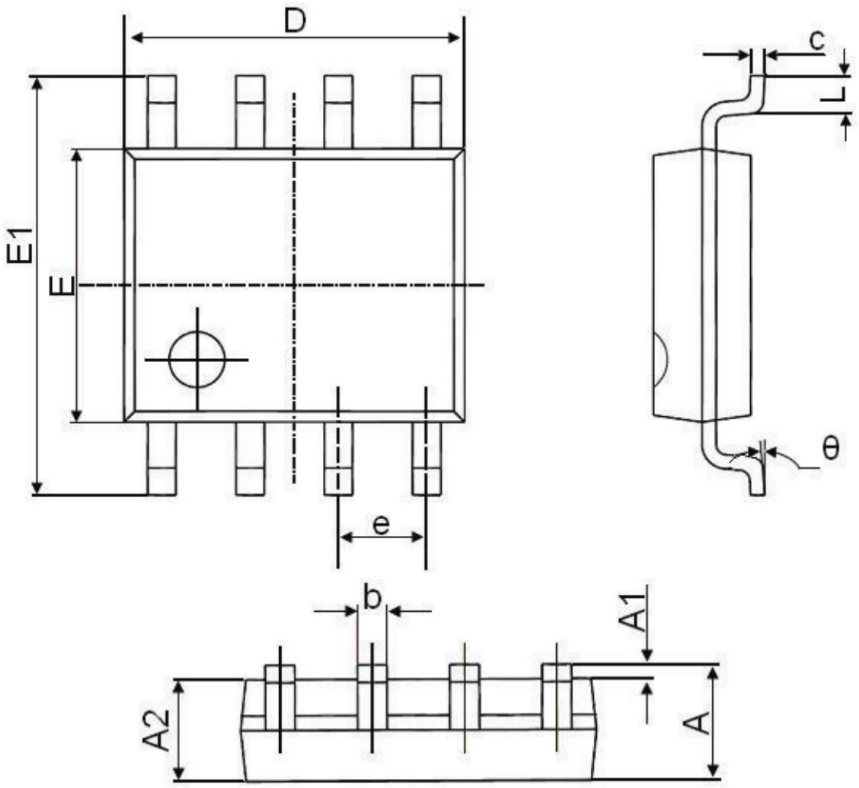



Figure 14. Safe Operation Area

## SOP-8 Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.007 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |