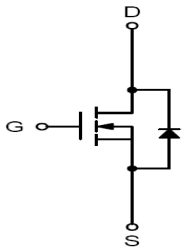
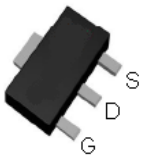
# P-channel Enhancement Mode MOSFET 3401 DATASHEET

The 3401 uses advanced trench technology to provide excellent RDS(ON) and low gate charge. This device is suitable for use as a load switch or in PWM applications.




Top View SOT-89

## GENERAL FEATURES

- RDS(ON) <70mΩ @VGS=-4.5V
  RDS(ON) <60mΩ @ VGS=-10V
- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

## Application

- PWM applications
- Load switch
- Power management

ABSOLUTE MAXIMUM RATINGS($T_A$=25℃unless otherwise noted)

| Symbol | Parameter | | Rating | Unit |
|---|---|---|---|---|
| **Common Ratings ($T_C$=25°C Unless Otherwise Noted)** | | | | |
| $V_{GS}$ | Gate-Source Voltage | | ±12 | V |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | | -30 | V |
| $T_J$ | Maximum Junction Temperature | | 175 | °C |
| $T_{STG}$ | Storage Temperature Range | | -50 to 150 | °C |
| $I_S$ | Diode Continuous Forward Current① | $T_C$=25°C | -4.2 | A |
| $I_{DM}$ | Pulse Drain Current Tested① | $T_C$=25°C | -16 | A |
| $I_D$ | Continuous Drain Current($V_{GS}$=-10V)① | $T_C$=25°C | -4.2 | A |

## ELECTRICAL CHARACTERISTICS ($T_A$=25℃unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V ID=-250UA | -30 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | VDS=-24V, VGS=0V | | | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±12V,$V_{DS}$=0V | | | ±100 | nA |
| ON CHARACTERISTICS (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=VGS, ID=-250UA | -0.6 | | -1.8 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | VGS=-10V ID=-4A | | 46 | | mΩ |
| | | VGS=-4.5V ID=-2A | | 52 | | mΩ |
| DYNAMIC CHARACTERISTICS (Note4) | | | | | | |
| Input Capacitance | $C_{iss}$ | VDS=-15V,VGS=0V,F=1.0MHZ | | 580 | | PF |
| Output Capacitance | $C_{oss}$ | | | 125 | | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 85 | | PF |
| SWITCHING CHARACTERISTICS (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=-15V, $R_{GEN}$=6Ω, ID=-1A, $R_L$=15Ω, $V_{GEN}$=-10V | | 10 | | nS |
| Turn-on Rise Time | $t_r$ | | | 10 | | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 36 | | nS |
| Turn-Off Fall Time | $t_f$ | | | 25 | | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=-15V, $I_D$=-5.5A, $V_{GS}$=-10V | | 12 | | nC |
| Gate-Source Charge | $Q_{gs}$ | $V_{DS}$=-15V, $I_D$=-5.5A, $V_{GS}$=-4.5V | | 2 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | $V_{DS}$=-15V, $I_D$=-5.5A, $V_{GS}$=-10V | | 3 | | nC |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,Is=-1A | | -0.8 | -1.3 | V |

# NOTES:

a. Surface Mounted on FR4 Board, t ≤10 sec.
b. Pulse Test：Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
c. Guaranteed by design, not subject to production testing.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

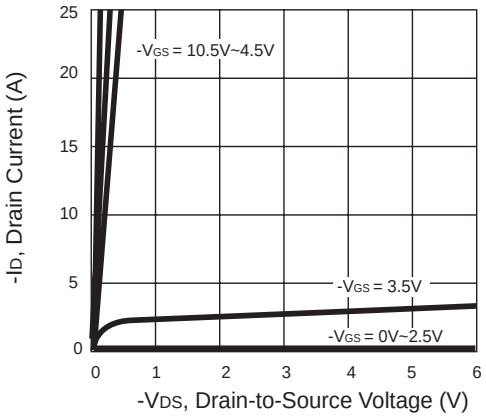



Figure 1. Output Characteristics

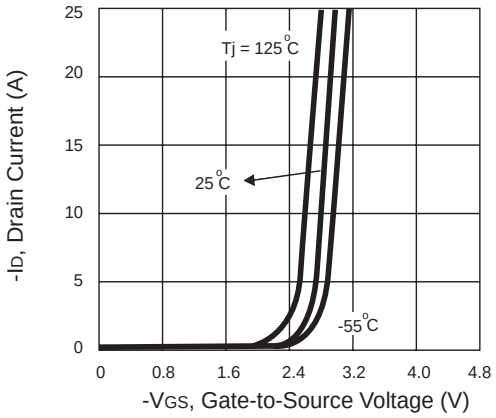



Figure 2. Thansfer Characteristics

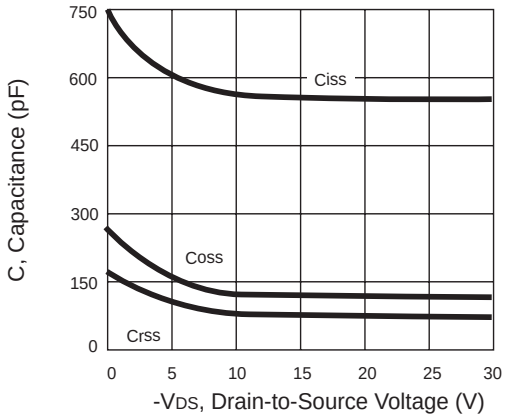



Figure 3. Capacitance

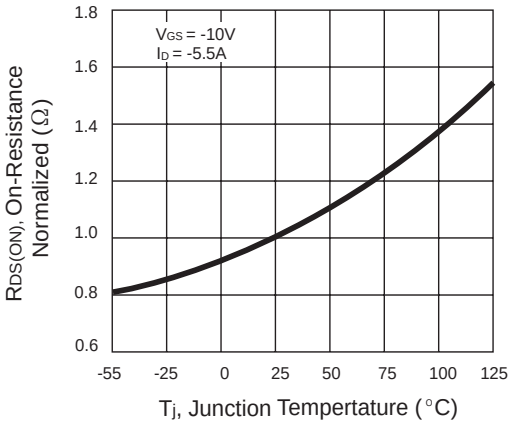



Figure 4. On-Resistance Variation with Temperature

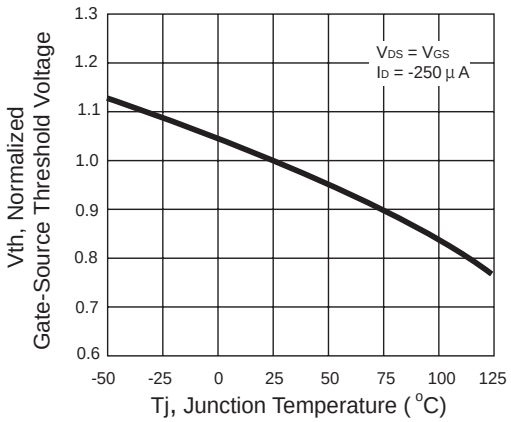



Figure 5. Gate Threshold Variation with Temperature

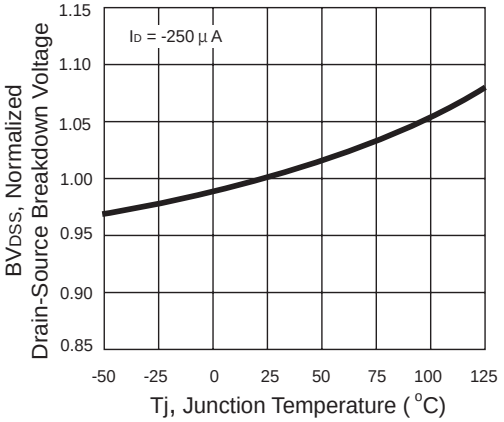



Figure 6. Breakdown Voltage Variation with Temperature

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

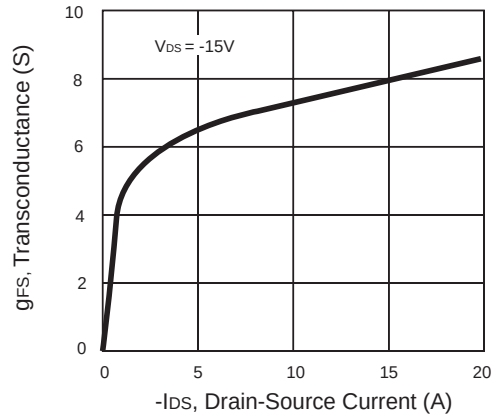



Figure 7. Transconductance Variation with Drain Current

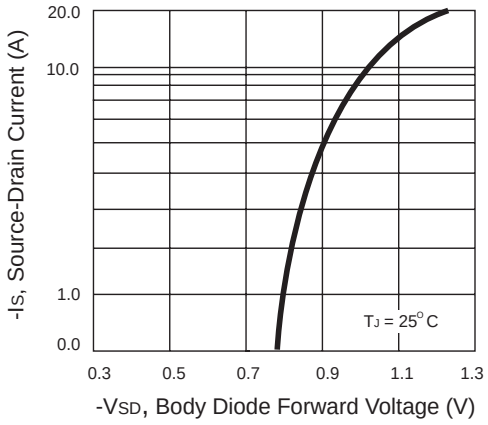



Figure 8. Body Diode Forward Voltage Variation with Source Current

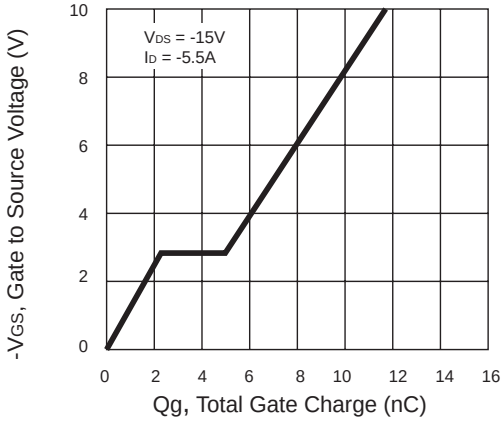



Figure 9. Gate Charge

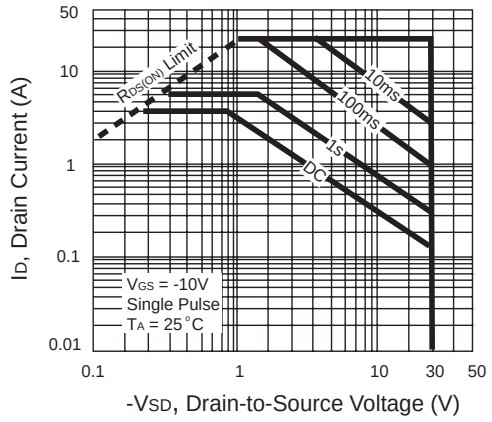



Figure 10. Maximum Safe Operating Area

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

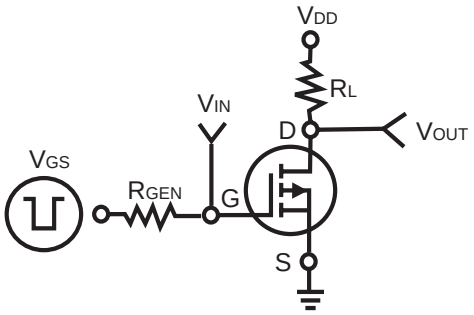



Figure 11. Switching Test Circuit

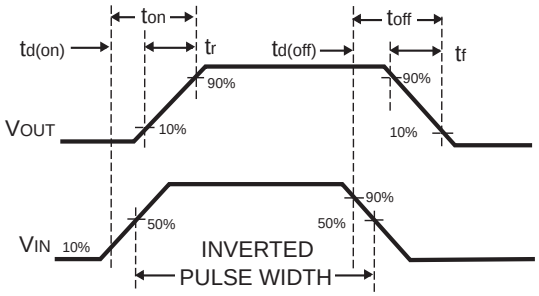



Figure 12. Switching Waveforms

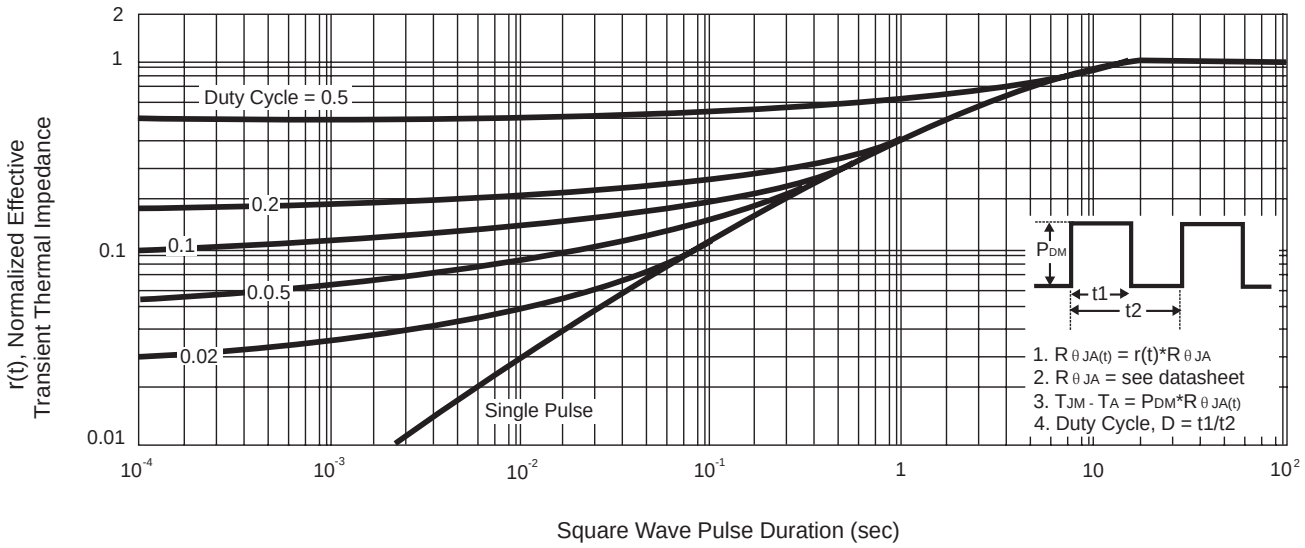
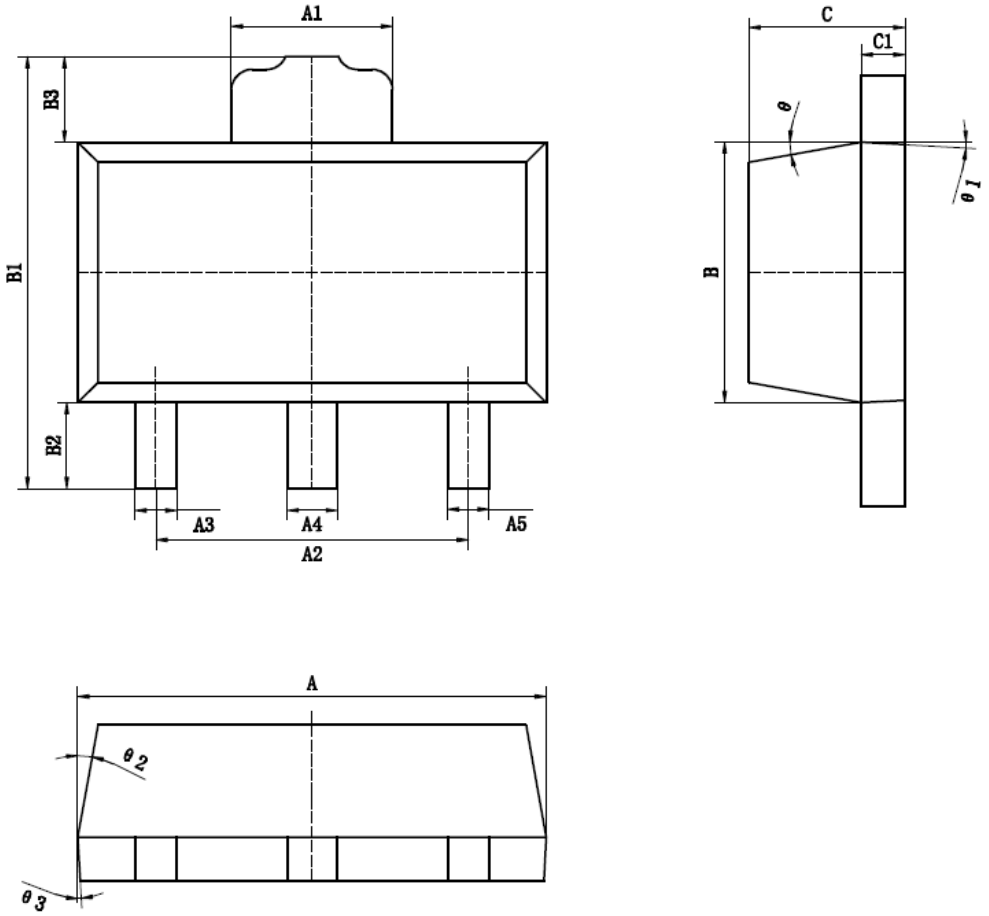



Figure 13. Normalized Thermal Transient Impedance Curve

## Package Information

SOT89-3 Package




| 尺寸 / 标注 | 最小(mm) | 最大(mm) | 尺寸 / 标注 | 最小(mm) | 最大(mm) |
|---|---|---|---|---|---|
| A | 4.40 | 4.60 | B3 | 0.82 | 0.83 |
| A1 | 1.65 | 1.75 | C | 1.40 | 1.60 |
| A2 | 2.95 | 3.05 | C1 | 0.35 | 0.45 |
| A3 | 0.35 | 0.45 | θ | 6° TYP4 | |
| A4 | 0.43 | 0.53 | θ1 | 3° TYP4 | |
| A5 | 0.35 | 0.45 | θ2 | 6° TYP4 | |
| B | 2.40 | 2.60 | θ3 | 3° TYP4 | |
| B1 | 4.05 | 4.25 | | | |
| B2 | 0.82 | 0.83 | | | |