

## FEATURES

|  $V_{DS} = -60V, I_D = -4A$

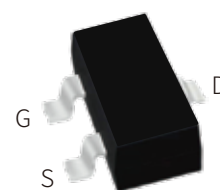
$R_{DS(ON)} < 110m\Omega @ V_{GS} = -10V$

$R_{DS(ON)} < 150m\Omega @ V_{GS} = -4.5V$

| High density cell design for ultra low  $R_{dson}$

| Fully characterized avalanche voltage and current

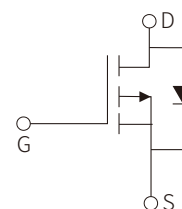
| Excellent package for good heat dissipation



SOT-23-3L



Marking



Schematic Symbol

## APPLICATIONS

| Low Switch

| PWM application

## APPROVALS

**RoHS** Compliance with 2011/65/EU

**HF** Compliance with IEC61249-2-21:2003

## ABSOLUTE MAXIMUM RATINGS( $T_a = 25^\circ C$ )

| Parameter                                      | Symbol          | Value      | Unit         |
|------------------------------------------------|-----------------|------------|--------------|
| Drain-Source Voltage                           | $V_{DS}$        | -60        | V            |
| Drain Current-Continuous                       | $I_D$           | -4         | A            |
| Pulsed Drain Current                           | $I_{DM}$        | -12        | A            |
| Gate-Source Voltage                            | $V_{GS}$        | $\pm 20$   | V            |
| Maximum Power Dissipation                      | $P_D$           | 1.5        | W            |
| Thermal Resistance Junction—to—Ambient (Note2) | $R_{\theta JA}$ | 83.3       | $^\circ C/W$ |
| Junction temperature                           | $T_J$           | -55 ~ +150 | $^\circ C$   |
| Storage temperature                            | $T_{STG}$       | -55 ~ +150 | $^\circ C$   |

## ELECTRICAL CHARACTERISTICS( $T_a=25^{\circ}\text{C}$ )

| Parameter                                                                      | Symbol              | Test Conditions                                                                        | Min.  | Typ. | Max. | Unit |
|--------------------------------------------------------------------------------|---------------------|----------------------------------------------------------------------------------------|-------|------|------|------|
| Off Characteristics                                                            |                     |                                                                                        |       |      |      |      |
| Drain-source Breakdown Voltage                                                 | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V,I <sub>D</sub> =-250μA                                             | -60   |      |      | V    |
| Zero Gate Voltage Drain Current                                                | I <sub>DSS</sub>    | V <sub>DS</sub> =-60V,V <sub>GS</sub> =0V                                              |       |      | -1   | μA   |
| Gate–Body Leakage                                                              | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V                                              |       |      | ±100 | nA   |
| Gate Threshold Voltage                                                         | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =-250μA                               | -1.28 | -1.6 | -3.0 | V    |
| Drain-Source On–Resistance(Note3)                                              | R <sub>DS(on)</sub> | V <sub>GS</sub> =-10V,I <sub>D</sub> =-4A                                              |       | 73   | 110  | mΩ   |
|                                                                                |                     | V <sub>GS</sub> =-4.5V,I <sub>D</sub> =-3A                                             |       | 92   | 150  |      |
| Forward Transconductance                                                       | gFS                 | V <sub>DS</sub> =-5V,I <sub>D</sub> =-4A                                               |       | 10   |      | S    |
| Dynamic Electrical Characteristics @T,= 25°C (unless otherwise stated) (Note4) |                     |                                                                                        |       |      |      |      |
| Input Capacitance                                                              | C <sub>iss</sub>    | V <sub>DS</sub> =-30V,V <sub>GS</sub> =0V,f=1MHz                                       |       | 930  |      | pF   |
| Output Capacitance                                                             | C <sub>oss</sub>    |                                                                                        |       | 85   |      |      |
| Reverse Transfer Capacitance                                                   | C <sub>rss</sub>    |                                                                                        |       | 35   |      |      |
| Total Gate Charge                                                              | Q <sub>g</sub>      | V <sub>GS</sub> =-10V,V <sub>DS</sub> =-30V,I <sub>D</sub> =-4A                        |       | 25   |      | nC   |
| Gate Source Charge                                                             | Q <sub>gs</sub>     |                                                                                        |       | 3    |      |      |
| Gate Drain Charge                                                              | Q <sub>gd</sub>     |                                                                                        |       | 7    |      |      |
| Switching Characteristics (Note4)                                              |                     |                                                                                        |       |      |      |      |
| Turn–On Delay Time                                                             | t <sub>d(on)</sub>  | V <sub>DD</sub> =-30V,R <sub>L</sub> =7.5Ω<br>R <sub>G</sub> =3Ω,V <sub>GS</sub> =-10V |       | 8    |      | ns   |
| Turn–On Rise Time                                                              | t <sub>r</sub>      |                                                                                        |       | 4    |      |      |
| Turn–Off Delay Time                                                            | t <sub>d(off)</sub> |                                                                                        |       | 32   |      |      |
| Turn–Off Fall Time                                                             | t <sub>f</sub>      |                                                                                        |       | 7    |      |      |
| Drain-Source Diode Characteristics                                             |                     |                                                                                        |       |      |      |      |
| Diode forward voltage(Note 3)                                                  | V <sub>SD</sub>     | I <sub>S</sub> =-4A,V <sub>GS</sub> =0V                                                |       |      | -1.2 | V    |
| Diode Forward Current (Note 2)                                                 | I <sub>S</sub>      |                                                                                        |       |      | -4   | A    |
| Reverse Recovery Time                                                          | t <sub>rr</sub>     | T <sub>J</sub> =25°C,I <sub>F</sub> =-4A<br>di/dt = -100A/μs <sup>(Note3)</sup>        |       | 25   |      | nS   |
| Reverse Recovery Charge                                                        | Q <sub>rr</sub>     |                                                                                        |       | 31   |      | nC   |

Note:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec
3. Pulse Test: pulse width  $\leq 300 \mu s$ , duty cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production testing.

# PARAMETER CHARACTERISTIC CURVE

**Fig 1: Output Characteristics**

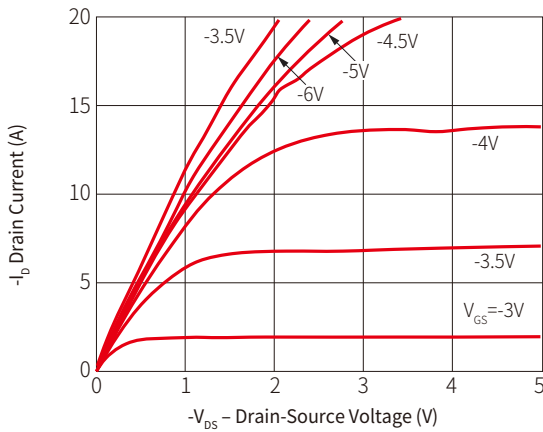


**Figure 2: Transfer Characteristics**

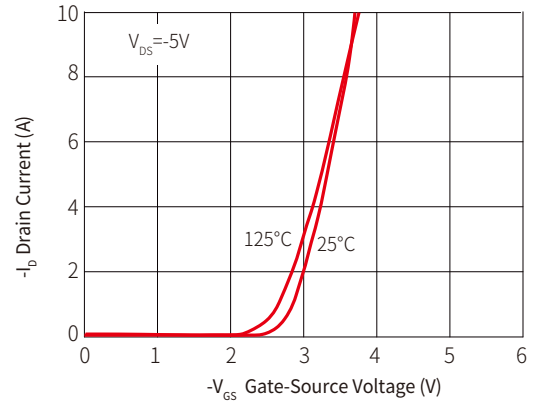


**Figure 3: Rdson- Drain Current**

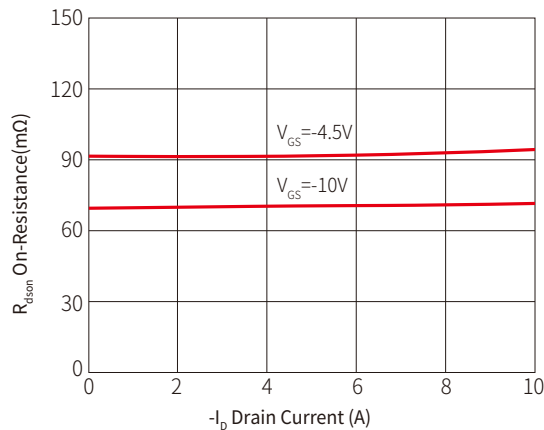


**Figure 4: Rdson-Junction Temperature**

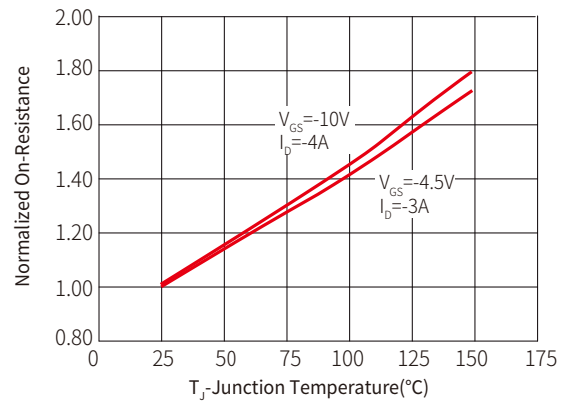


**Figure 5: Gate Charge**

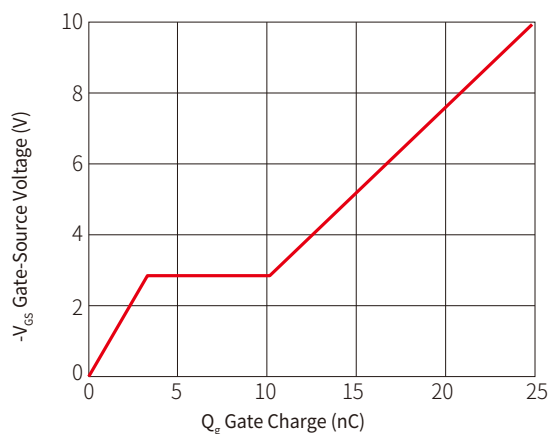


**Figure 6: Source- Drain Diode Forward**

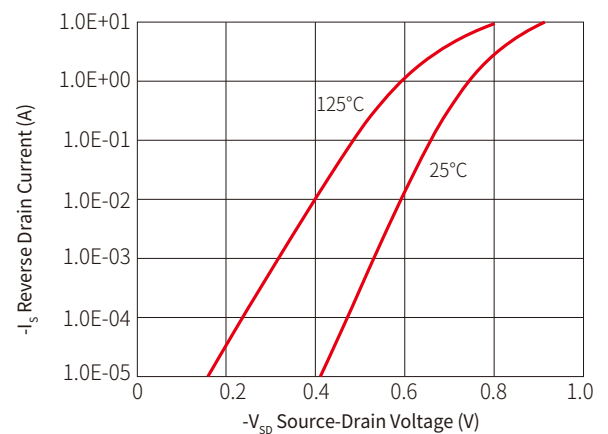
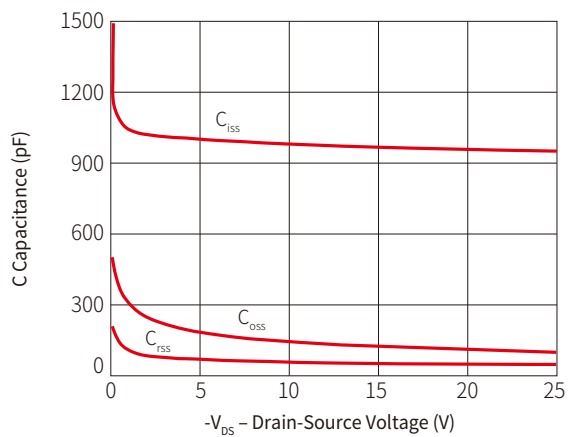
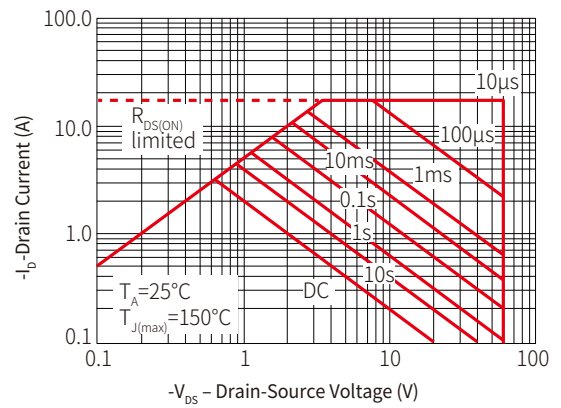
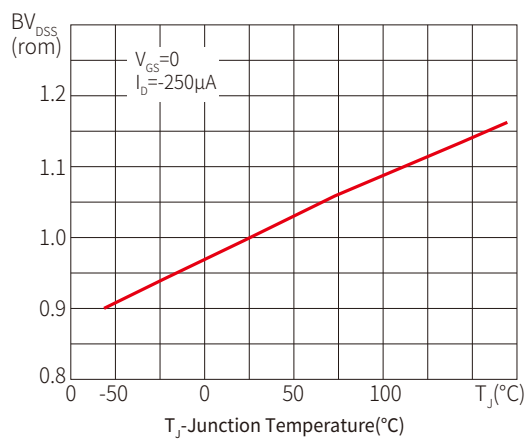
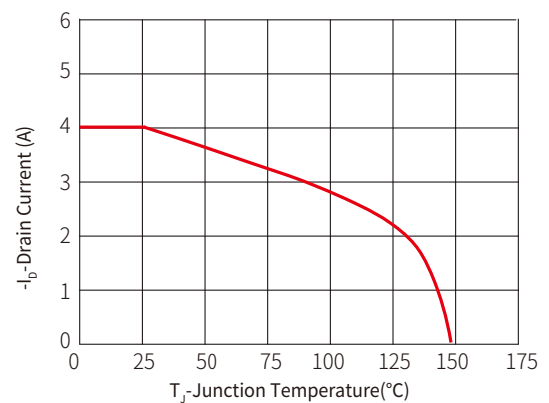
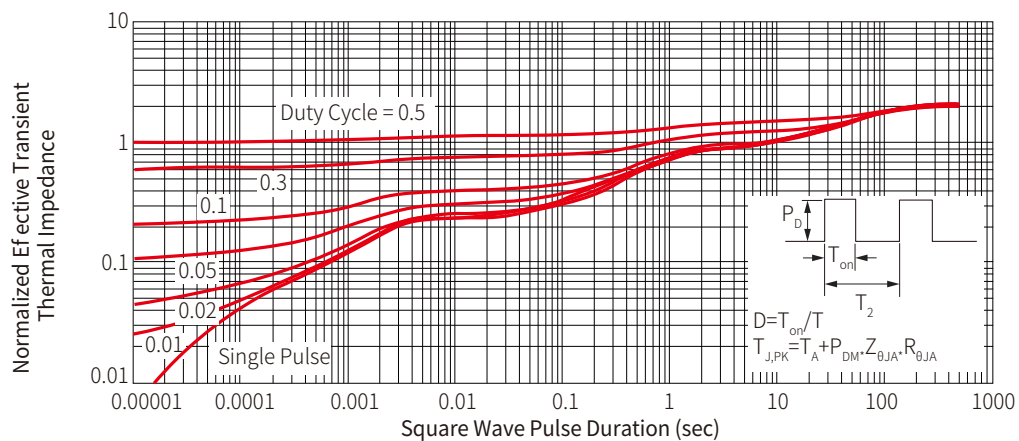
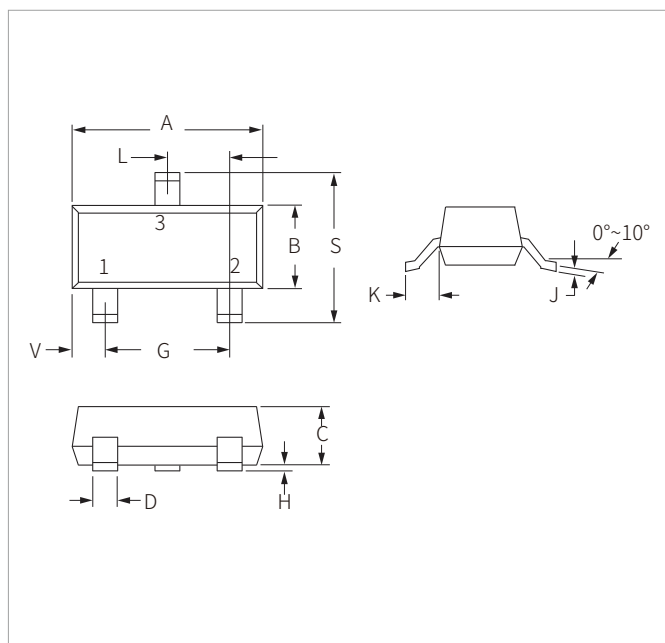


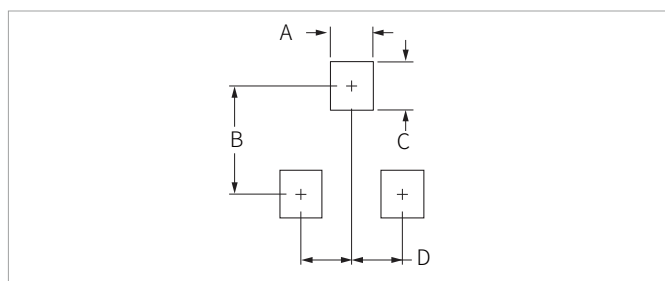
**Figure 7: Capacitance vs  $V_{DS}$** 

**Figure 8: Safe Operation Area**

**Figure 9:  $BV_{DSS}$  vs Junction Temperature**

**Figure 10:  $I_D$  Current De-rating**

**Figure 11: Normalized Maximum Transient Thermal Impedance**


## SOT-23-3L PACKAGE INFORMATION



| Ref. | Millimeters |      | Inches |       |
|------|-------------|------|--------|-------|
|      | Min.        | Max. | Min.   | Max.  |
| A    | 2.80        | 3.15 | 0.110  | 0.124 |
| B    | 1.50        | 1.70 | 0.060  | 0.070 |
| C    | 1.00        | 1.30 | 0.039  | 0.051 |
| D    | 0.37        | 0.50 | 0.015  | 0.020 |
| G    | 1.78        | 2.10 | 0.070  | 0.083 |
| H    | 0.01        | 0.15 | 0.001  | 0.006 |
| J    | 0.08        | 0.18 | 0.003  | 0.007 |
| K    | 0.35        | 0.69 | 0.014  | 0.029 |
| L    | 0.89        | 1.02 | 0.035  | 0.040 |
| S    | 2.60        | 3.00 | 0.102  | 0.118 |
| V    | 0.45        | 0.60 | 0.018  | 0.024 |

## RECOMMENDED PAD LAYOUT DIMENSIONS



| Ref. | Millimeters |      | Inches |       |
|------|-------------|------|--------|-------|
|      | Min.        | Max. | Min.   | Max.  |
| A    | 0.70        | 1.00 | 0.028  | 0.039 |
| B    | 2.30        | 2.50 | 0.090  | 0.098 |
| C    | 0.70        | 1.00 | 0.028  | 0.039 |
| D    | 0.80        | 1.10 | 0.032  | 0.043 |

## ORDERING INFORMATION

| Part Number | Component Package | QTY/Reel | Reel Size |
|-------------|-------------------|----------|-----------|
| SPM4P06A    | SOT-23-3L         | 3000PCS  | 7"        |

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