

## FEATURES

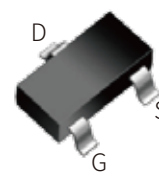
|  $V_{DS} = -20V, I_D = -4.1A$   $R_{DS(ON)} < 38\text{ m}\Omega$  @  $V_{GS} = -4.5V$

|  $R_{DS(ON)} < 53\text{m}\Omega$  @  $V_{GS} = -2.5V$

| High Power and current handing capability

| Lead free product is acquired

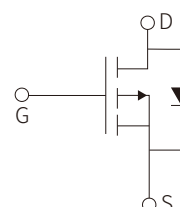
| Surface Mount Package



SOT-23



Marking



Schematic Symbol

## APPLICATION

| PWM applications

| Load switch

| Power management

| Video monitor

## APPROVALS

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

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

## ABSOLUTE MAXIMUM RATINGS

| Parameter                                                     | Symbol          | Value      | Unit               |
|---------------------------------------------------------------|-----------------|------------|--------------------|
| Drain-Source Voltage                                          | $V_{DS}$        | -20        | V                  |
| Gate Threshold Voltage                                        | $V_{GS}$        | $\pm 12$   | V                  |
| Maximum Drain Current - Continuous ( $T_c=25^\circ\text{C}$ ) | $I_D$           | -4.1       | A                  |
| Maximum Drain Current - Continuous( $T_c=70^\circ\text{C}$ )  |                 | -2.6       |                    |
| Pulsed Drain Current(Note1)                                   | $I_{DM}$        | -16        | A                  |
| Power Dissipation ( $T_c=25^\circ\text{C}$ )                  | $P_D$           | 1          | W                  |
| Thermal Resistance Junction- to- Ambient (Steady-State)       | $R_{\theta JA}$ | 125        | $^\circ\text{C/W}$ |
| Operating Junction and Storage Temperature Range              | $T_J, T_{STG}$  | -55 to 150 | $^\circ\text{C}$   |

## ELECTRICAL CHARACTERISTICS (Ta=25°C )

| Parameter                          | Symbol        | Test Conditions                                          | Min  | Typ  | Max       | Unit       |
|------------------------------------|---------------|----------------------------------------------------------|------|------|-----------|------------|
| Off Characteristics                |               |                                                          |      |      |           |            |
| Drain-Source Breakdown Voltage     | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=-250\mu A$                               | -20  |      |           | V          |
| Gate-Body Leakage Current          | $I_{GSS}$     | $V_{GS}=\pm 12V, V_{DS}=0V$                              |      |      | $\pm 100$ | nA         |
| Zero Gate Voltage Drain Current    | $I_{DSS}$     | $V_{DS}=-20V, V_{GS}=0V$                                 |      |      | -1        | $\mu A$    |
| On Characteristics                 |               |                                                          |      |      |           |            |
| Gate-Source Threshold Voltage      | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=-250\mu A$                           | -0.4 | -0.7 | -1.0      | V          |
| Drain-Source On-State Resistance   | $R_{DS(on)}$  | $V_{GS}=-4.5V, I_D=-4.1A$                                |      | 30   | 38        | m $\Omega$ |
|                                    |               | $V_{GS}=-2.5V, I_D=-3A$                                  |      | 38   | 53        | m $\Omega$ |
| Gate Resistance                    | Rg            | f=1MHz                                                   |      | 1    |           | $\Omega$   |
| Dynamic Characteristics            |               |                                                          |      |      |           |            |
| Input Capacitance                  | $C_{iss}$     | $V_{DS}=-10V, V_{GS}=0V, f=1MHz$                         |      | 830  |           | nF         |
| Output Capacitance                 | $C_{oss}$     |                                                          |      | 132  |           | nF         |
| Reverse Transfer Capacitance       | $C_{rss}$     |                                                          |      | 85   |           | nF         |
| Switching Characteristics          |               |                                                          |      |      |           |            |
| Turn-on Delay Time                 | $t_{d(on)}$   | $V_{DD}=-10V, I_D=-3.3A$<br>$V_{GEN}=-4.5V, R_G=1\Omega$ |      | 10   |           | ns         |
| Turn-on Rise Time                  | $t_r$         |                                                          |      | 32   |           | ns         |
| Turn-Off Delay Time                | $t_{d(off)}$  |                                                          |      | 50   |           | ns         |
| Turn-off Fall Time                 | $t_f$         |                                                          |      | 51   |           | ns         |
| Total Gate Charge                  | $Q_g$         | $V_{DS}=-10V, I_D=-2A$<br>$V_{GS}=-4.5V$                 |      | 8.8  |           | nC         |
| Gate-Source Charge                 | $Q_{gs}$      |                                                          |      | 1.4  |           | nC         |
| Gate-Drain Charge                  | $Q_{gd}$      |                                                          |      | 1.9  |           | nC         |
| Drain-Source Diode Characteristics |               |                                                          |      |      |           |            |
| Diode Forward Voltage              | $V_{SD}$      | $V_{GS}=0V, I_S=-4.1A$                                   |      | -0.8 | -1.2      | V          |

Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

## PARAMETER CHARACTERISTIC CURVE

Figure1: Output Characteristics

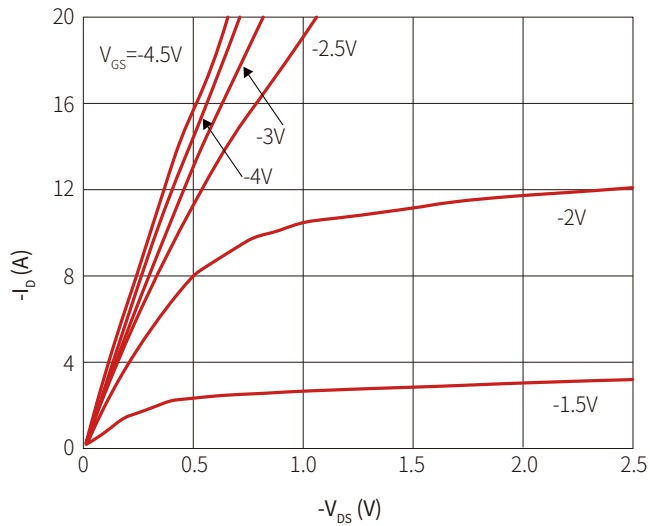


Figure2: Typical Transfer Characteristics

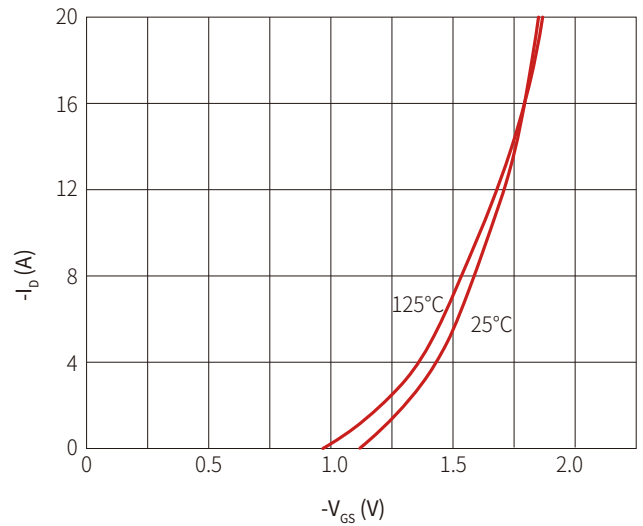


Figure3: On-resistance vs. Drain Current

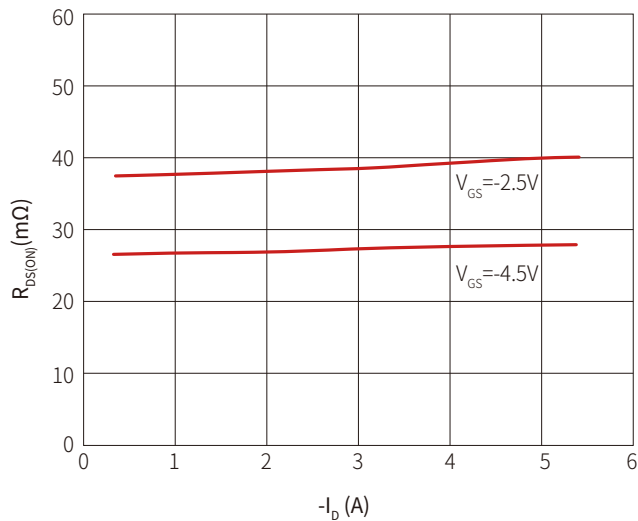
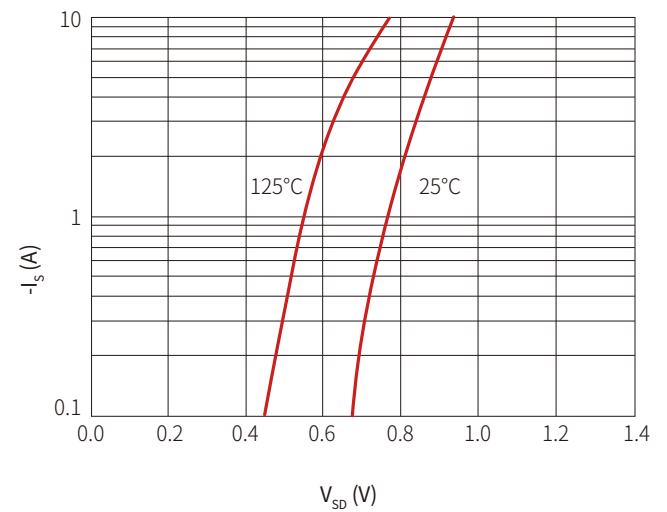
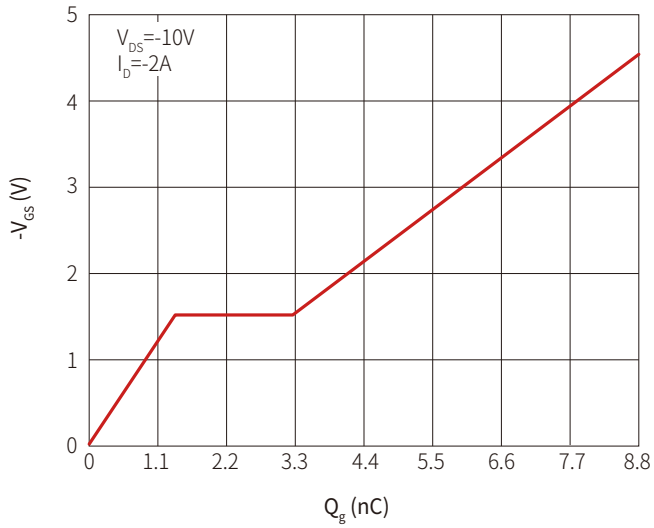
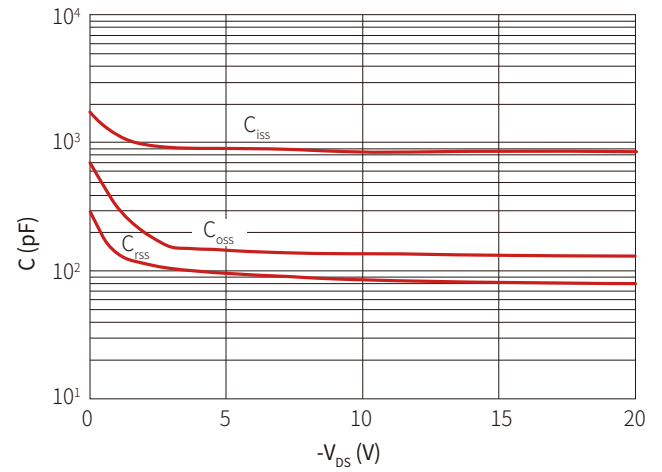
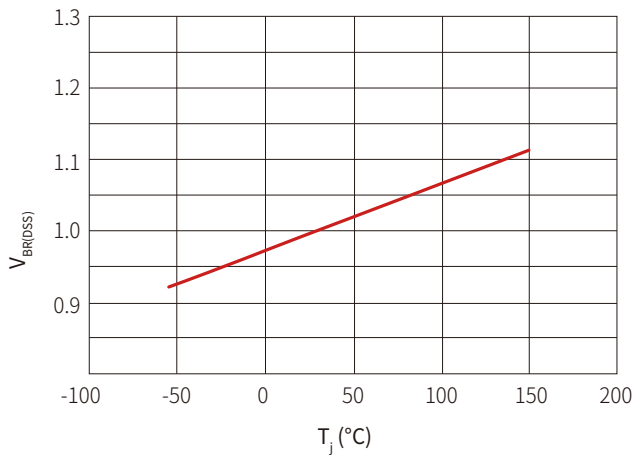
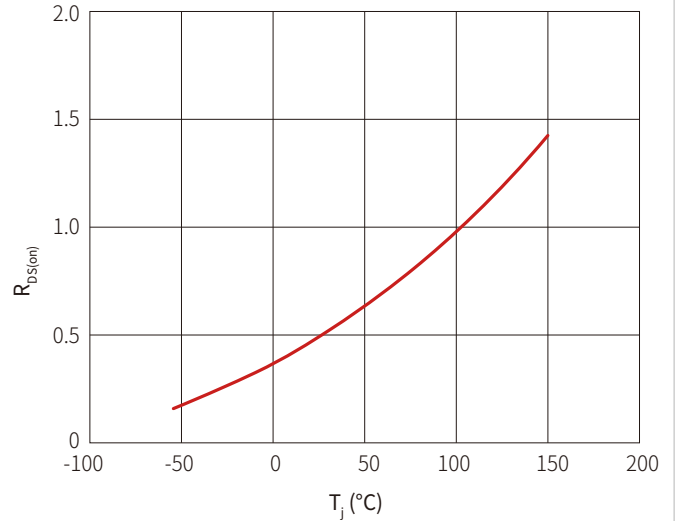
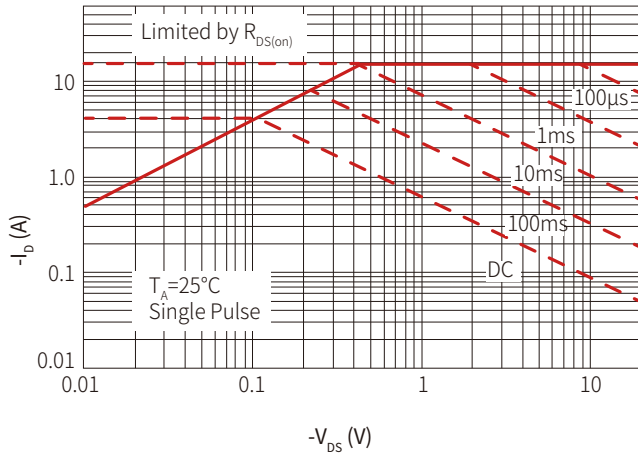
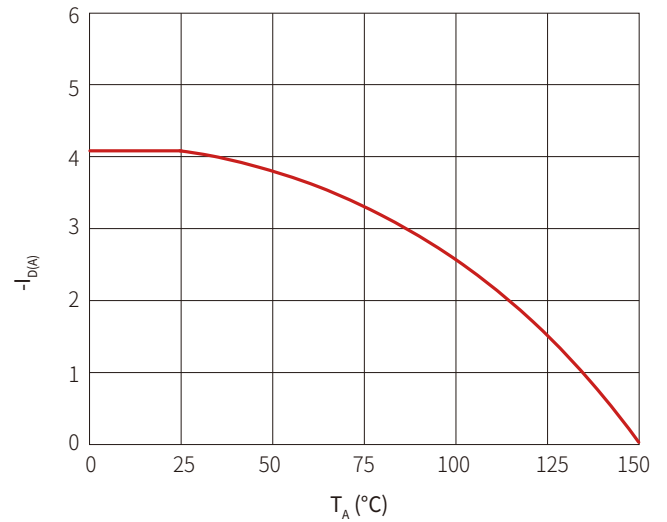
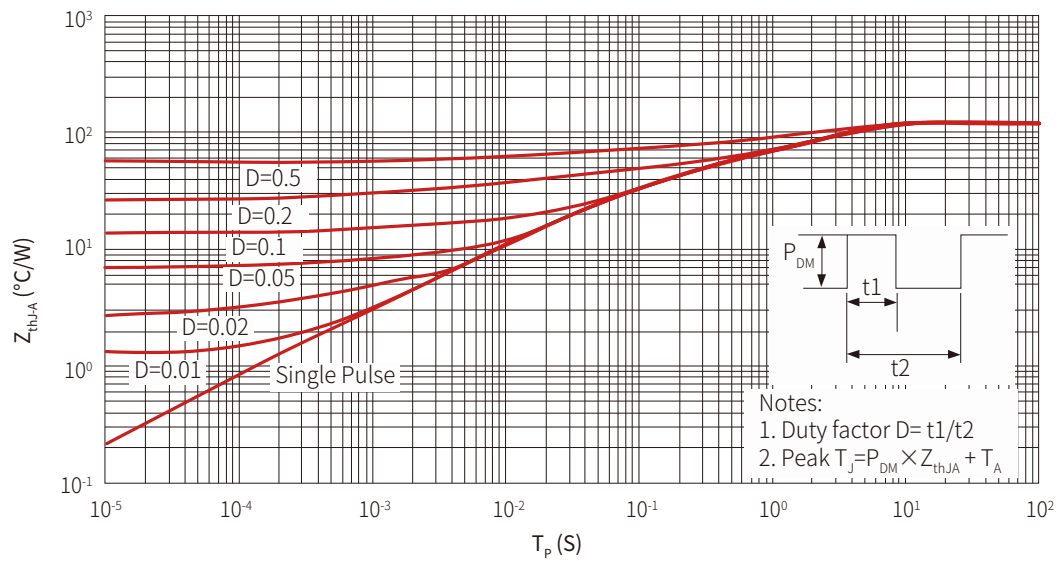


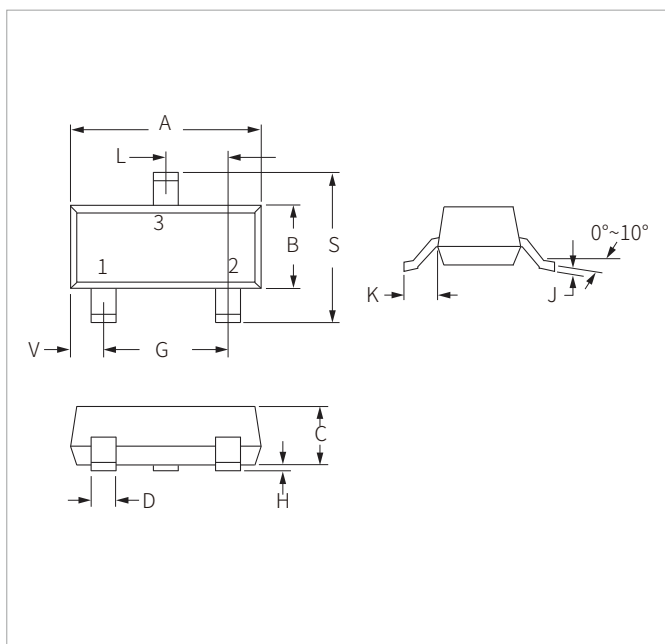
Figure 4: Body Diode Characteristics



**Figure 5: Gate Charge Characteristics**

**Figure 6: Capacitance Characteristics**

**Figure 7: Normalized Breakdown Voltage vs. Junction Temperature**

**Figure 8: Normalized on Resistance vs. Junction Temperature**


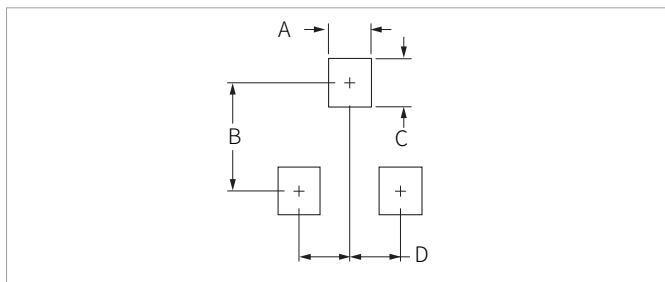
**Figure 9: Maximum Safe Operating Area**

**Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature**

**Figure 11: Maximum Effective Transient Thermal Impedance Junction-to-Ambient**


## SOT-23 PACKAGE INFORMATION



| Ref. | Millimeters |       | Inches |       |
|------|-------------|-------|--------|-------|
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 2.80        | 3.05  | 0.110  | 0.120 |
| B    | 1.20        | 1.40  | 0.047  | 0.055 |
| C    | 0.90        | 1.15  | 0.035  | 0.045 |
| D    | 0.37        | 0.50  | 0.015  | 0.020 |
| G    | 1.75        | 2.05  | 0.069  | 0.081 |
| H    | 0.01        | 0.100 | 0.001  | 0.004 |
| J    | 0.085       | 0.180 | 0.003  | 0.007 |
| K    | 0.35        | 0.69  | 0.014  | 0.029 |
| L    | 0.89        | 1.02  | 0.035  | 0.040 |
| S    | 2.10        | 2.65  | 0.083  | 0.104 |
| V    | 0.45        | 0.60  | 0.018  | 0.024 |

## RECOMMENDED PAD LAYOUT DIMENSIONS



| Ref. | Millimeters |      | Inches |       |
|------|-------------|------|--------|-------|
|      | Min         | Max  | Min    | Max   |
| A    | 0.71        | 0.97 | 0.028  | 0.038 |
| B    | 1.88        | 2.13 | 0.074  | 0.084 |
| C    | 0.71        | 0.97 | 0.028  | 0.038 |
| D    | 0.81        | 1.07 | 0.032  | 0.042 |

## ORDERING INFORMATION

| Part Number | Component Package | QTY/Reel | Reel Size |
|-------------|-------------------|----------|-----------|
| SPM4N02S    | SOT-23            | 3000PCS  | 7"        |

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