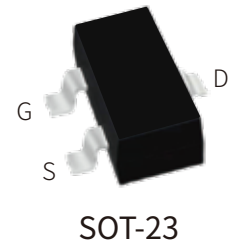


## FEATURES

- | Low on-resistance:  $R_{DS(ON)} \leq 160\text{m}\Omega @ V_{GS}=10\text{V}$
- | For Low power DC to DC converter application
- | For Load switch application
- | Surface Mount device



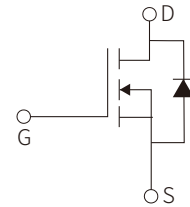
## APPLICATION

- | Case: SOT-23
- | Case Material: Molded Plastic. UL flammability
- | Classification Rating: 94V-0



## APPROVALS

|      |                                    |
|------|------------------------------------|
| RoHS | Compliance with 2011/65/EU         |
| HF   | Compliance with IEC61249-2-21:2003 |



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

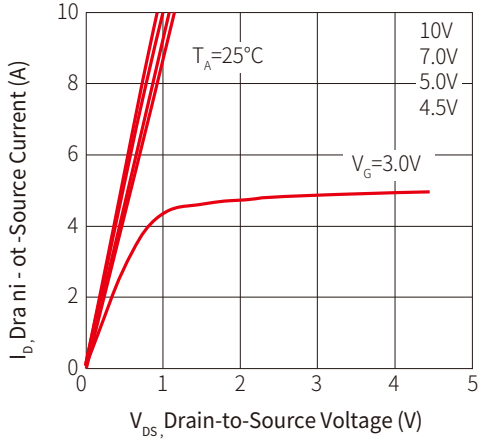
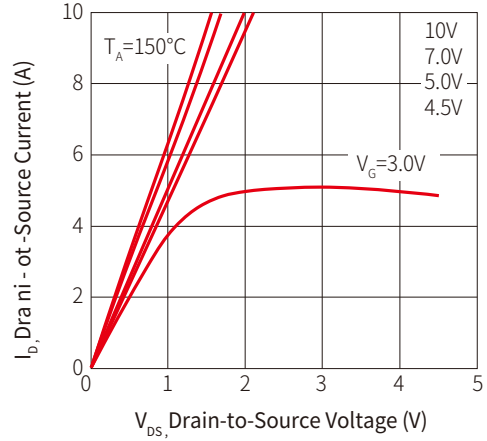
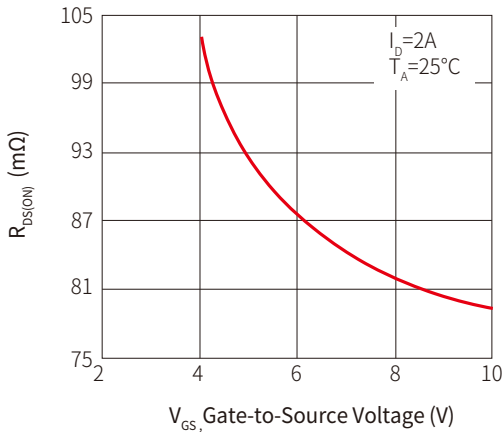
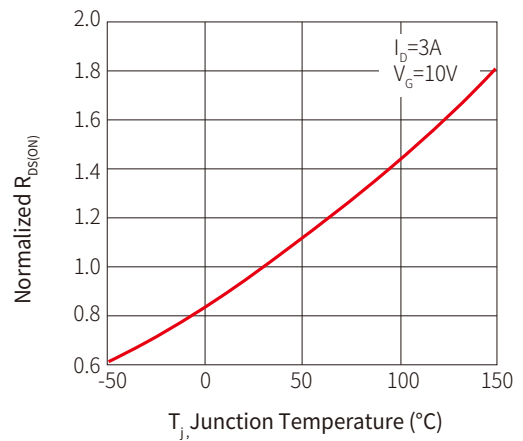
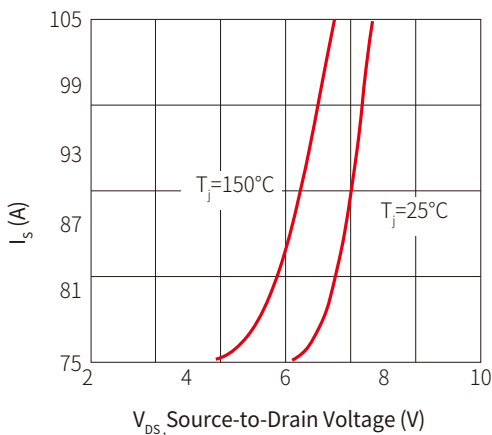
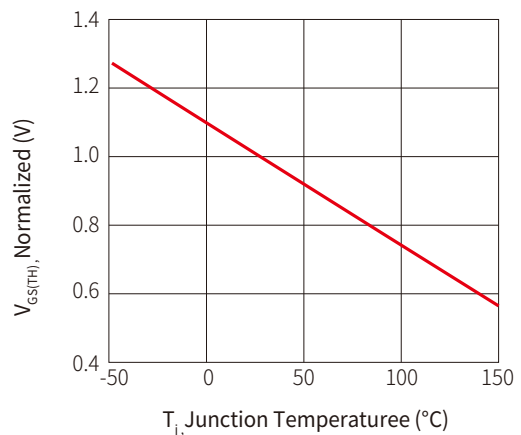
| Parameter                                   | Symbol          | Value      | Unit                      |
|---|-----------------|------------|---------------------------|
| Drain-Source Voltage                        | $V_{DS}$        | 60         | V                         |
| Drain Current-Continuous                    | $I_D$           | 3          | A                         |
| Drain Current-Continuous                    | $I_D$           | 2.3        | A                         |
| Pulsed Drain Voltage (Note 1)               | $I_{DM}$        | 10         | A                         |
| Gate-Source Voltage                         | $V_{GS}$        | $\pm 20$   | V                         |
| Power dissipation                           | $P_D$           | 1.38       | W                         |
| Thermal resistance from Junction to ambient | $R_{\theta JA}$ | 90         | $^\circ\text{C}/\text{W}$ |
| Junction temperature                        | $T_J$           | 150        | $^\circ\text{C}$          |
| Storage temperature                         | $T_{STG}$       | -55 to 150 | $^\circ\text{C}$          |

## ELECTRICAL CHARACTERISTICS(T<sub>a</sub>=25°C)

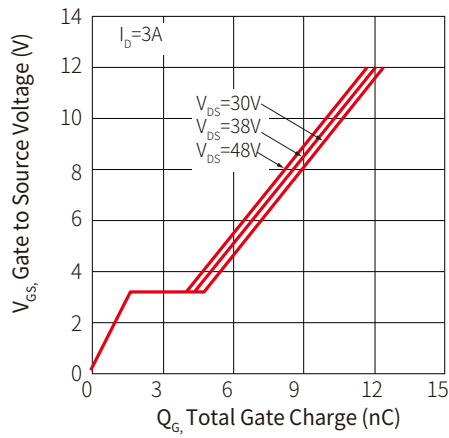
| Parameter                                | Symbol              | Test Conditions   | Min. | Typ. | Max. | Unit |
|--|---------------------|---|------|------|------|------|
| Drain-source Breakdown Voltage           | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA  | 60   |      |      | V    |
| Zero Gate Voltage Drain Current          | I <sub>DSS</sub>    | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V   |      |      | 10   | μA   |
| Gate-Body Leakage                        | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V  |      |      | ±100 | nA   |
| Gate Threshold Voltage (Note1)           | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA  | 1    |      | 3.0  | V    |
| Static Drain-Source On-Resistance(Note1) | R <sub>DS(on)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =2A  |      |      | 160  | mΩ   |
|  |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =1.7A   |      |      | 220  |      |
| Forward Transconductance(Note1)          | g <sub>FS</sub>     | V <sub>DS</sub> =5V, I <sub>D</sub> =3A   |      | 5    |      | S    |
| Input Capacitance                        | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz   |      | 490  | 780  | pF   |
| Output Capacitance                       | C <sub>oss</sub>    |   |      | 55   |      |      |
| Reverse Transfer Capacitance             | C <sub>rss</sub>    |   |      | 40   |      |      |
| Turn-On Delay Time                       | t <sub>d(on)</sub>  | V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω<br>V <sub>DS</sub> =30V, I <sub>D</sub> =1A<br>R <sub>D</sub> =30Ω |      | 6    |      | ns   |
| Turn-On Rise Time                        | t <sub>r</sub>      |   |      | 5    |      |      |
| Turn-Off Delay Time                      | t <sub>d(off)</sub> |   |      | 16   |      |      |
| Turn-Off Fall Time                       | t <sub>f</sub>      |   |      | 3    |      |      |
| Diode forward voltage (note 1)           | V <sub>SD</sub>     | I <sub>S</sub> =1.2A, V <sub>GS</sub> =0V   |      |      | 1.2  | V    |
| Total Gate Charge                        | Q <sub>g</sub>      | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =48V, I <sub>D</sub> =3A   |      | 6    | 10   | nC   |
| Gate Source Charge                       | Q <sub>gs</sub>     |   |      | 1.6  |      |      |
| Gate Drain Charge                        | Q <sub>gd</sub>     |   |      | 3    |      |      |
| Reverse Recovery Time                    | t <sub>rr</sub>     | I <sub>S</sub> =3A, V <sub>GS</sub> =0V<br>di/dt=100A/us  |      | 25   |      | ns   |
| Reverse Recovery Charge                  | Q <sub>rr</sub>     |   |      | 26   |      | nC   |

Note:1. Pulse test ; Pulse width ≤400μs, Duty cycle ≤ 2%

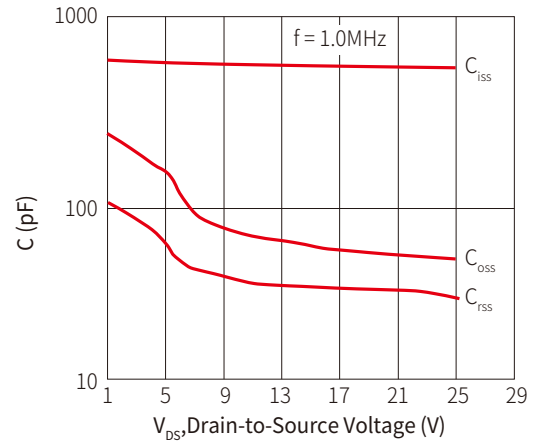
# PARAMETER CHARACTERISTIC CURVE

**Fig 1: Typical Output Characteristics**

**Figure 2: Typical Output Characteristics**

**Figure 3: On-Resistance v.s. Gate Voltage**

**Figure 4: Normalized OnResistance**

**Figure 5: Forward Characteristics of Reverse Diode**

**Figure 6: Gate Threshold Voltage v.s. Junction Temperature**


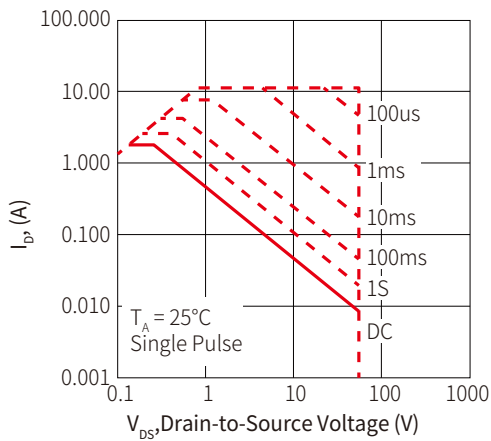
**Figure 7: Gate Charge Characteristics**



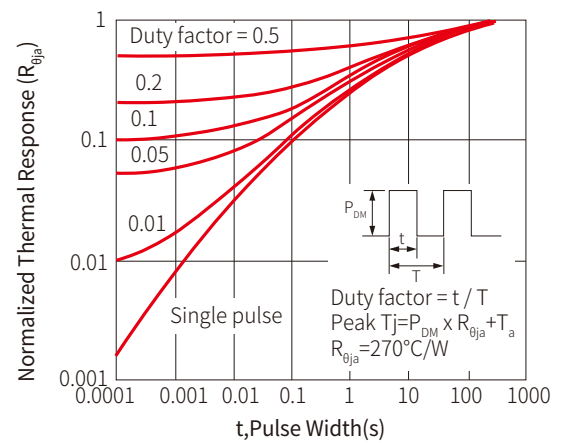
**Figure 8: Typical Capacitance Characteristics**



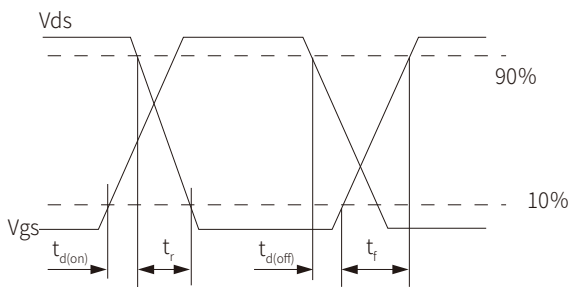
**Figure 9: Maximum Safe Operation Area**



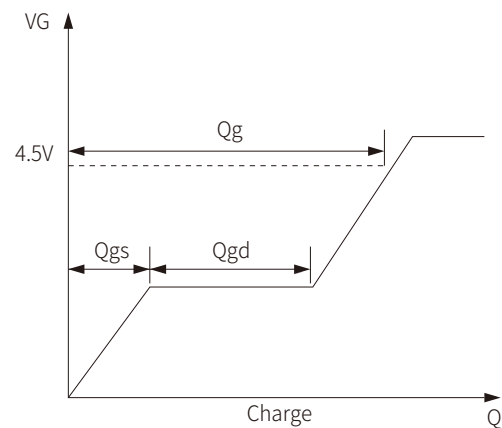
**Figure 10: Effective Transient Thermal Impedance**



**Figure 11: Switching Time Circuit**

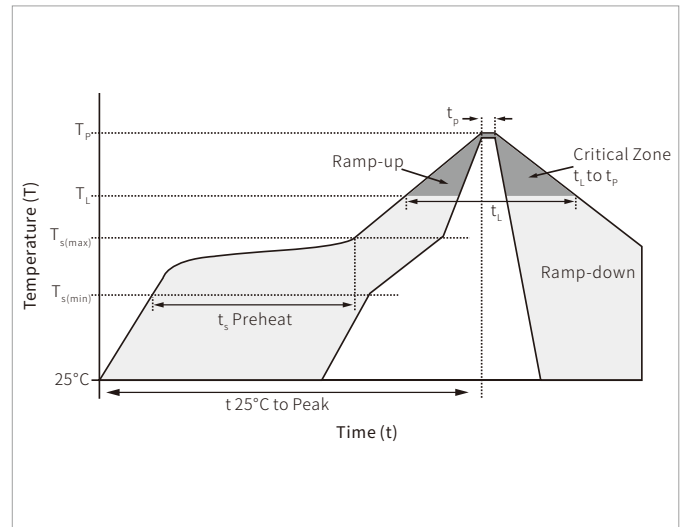


**Figure 12: Gate Charge Waveform**

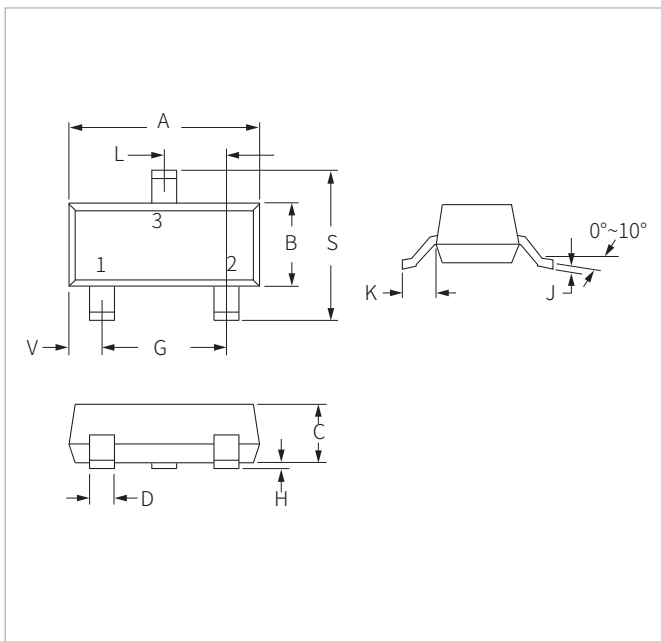


## SOLDERING PARAMETERS

| Reflow Condition                                       |                                  | Lead-free assembly |
|--|----------------------------------|--------------------|
| Pre Heat   | Temperature Max ( $T_{s(min)}$ ) | 150°C              |
|  | Temperature Max ( $T_{s(max)}$ ) | 200°C              |
|  | Time (min to max) ( $t_s$ )      | 60 – 180 secs      |
| Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak) |                                  | 3°C/second max     |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                  | 3°C/second max     |
| Reflow   | Temperature ( $T_L$ ) (Liquidus) | 217°C              |
|  | Time (min to max) ( $t_r$ )      | 60 – 150 seconds   |
| Peak Temperature ( $T_p$ )                             |                                  | 260°C              |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                  | 20 – 40 seconds    |
| Ramp-down Rate   |                                  | 6°C/second max     |
| Time 25°C to peak Temperature ( $T_p$ )                |                                  | 8 minutes max.     |
| Do not exceed  |                                  | 260°C              |

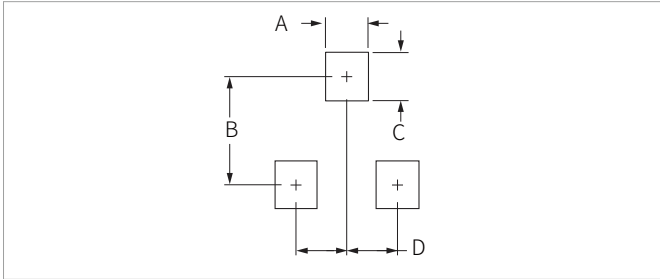


## SOT-23 PACKAGE INFORMATION



| 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 |
|-------------|-------------------|----------|-----------|
| SNM2308S    | SOT-23            | 3000PCS  | 7"        |

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