

## 20V P-Channel MOSFET

### Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---------------|-----------------|-------|
| -20V          | 32mΩ@-4.5V      | -4.3A |
|               | 40mΩ@-4.5V      |       |

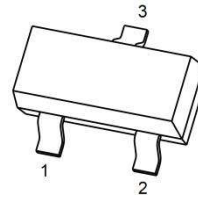
### Features

- Low Gate Charge
- High Power and current handling capability
- Lead free product is acquired

### Applications

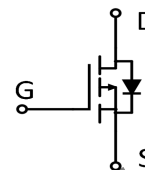
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

#### SOT-23

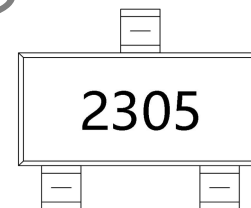


PIN1:GATE  
PIN2:SOURCE  
PIN3:DRAIN

#### Schematic diagram



#### Marking



### Absolute Maximum rating ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Parameter                               |                           | Symbol          | Value       | Units              |
|-----------------------------------------|---------------------------|-----------------|-------------|--------------------|
| Drain-Source Voltage                    |                           | $V_{DSS}$       | -20         | V                  |
| Drain Current                           | $T_C = 25^\circ\text{C}$  | $I_D$           | -4.3        | A                  |
|                                         | $T_C = 100^\circ\text{C}$ |                 | -2.7        | A                  |
| Drain Current - Pulsed                  |                           | $I_{DM}$        | -17         | A                  |
| Gate-Source Voltage                     |                           | $V_{GS}$        | $\pm 12$    | V                  |
| Avalanche energy <sup>1</sup>           |                           | $E_{AS}$        | 25          | mJ                 |
| Power Dissipation                       | $T_A = 25^\circ\text{C}$  | $P_D$           | 1.1         | W                  |
| Thermal Resistance, Junction-to-Ambient |                           | $R_{\theta JA}$ | 112         | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range |                           | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$   |

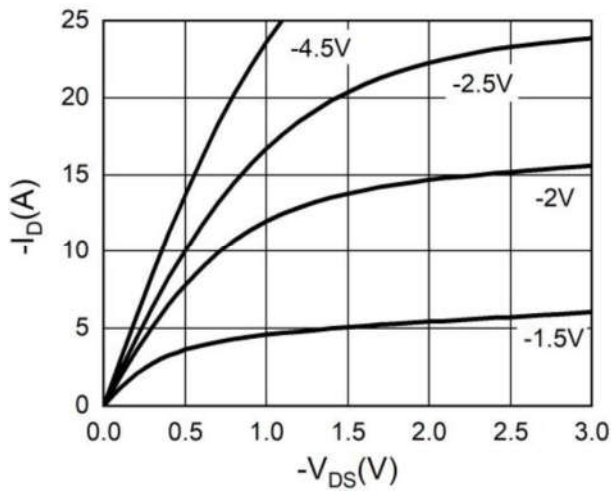
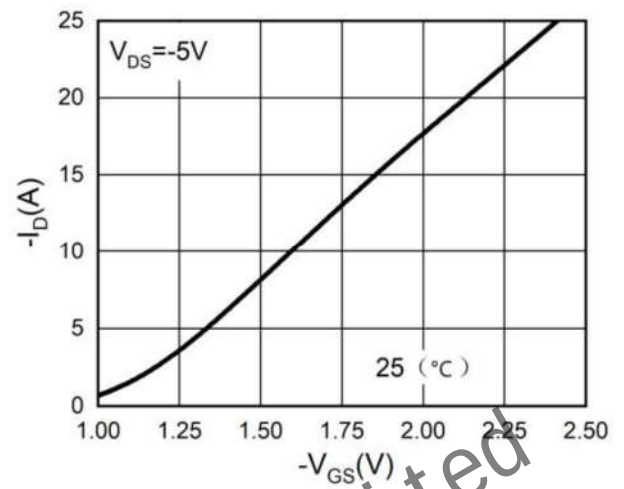
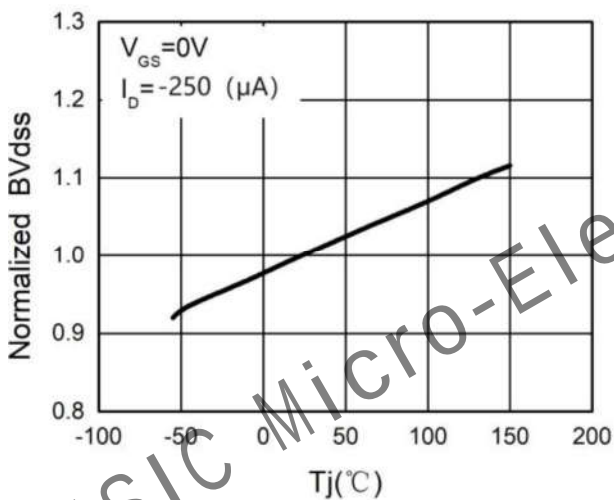
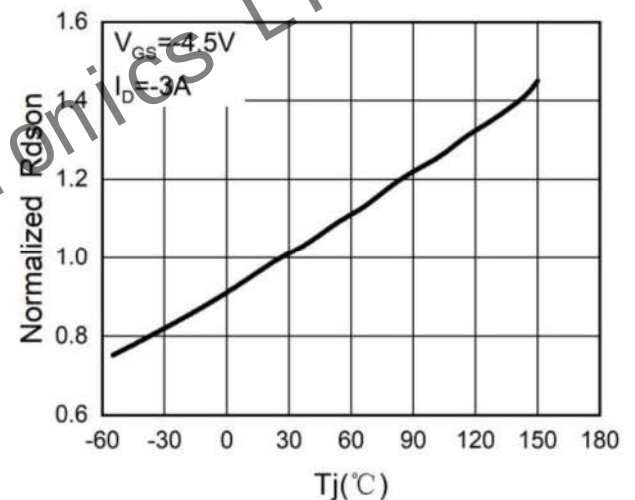
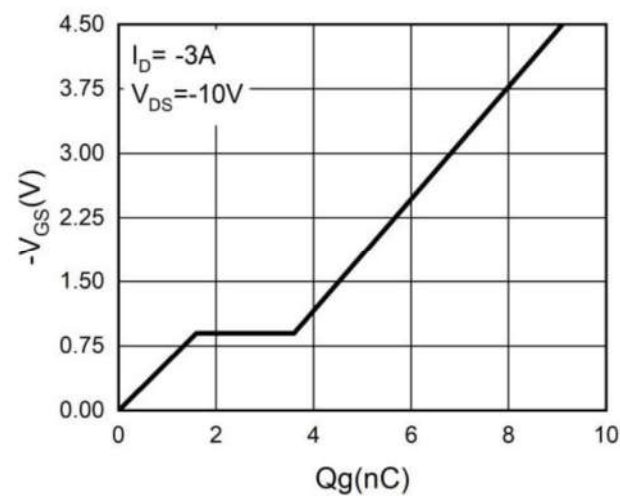
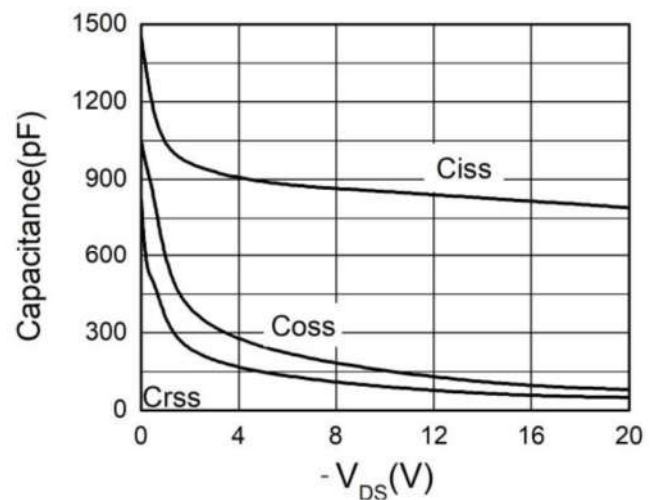
**Electrical Characteristics ( $T_A = 25^\circ\text{C}$  unless otherwise noted)**

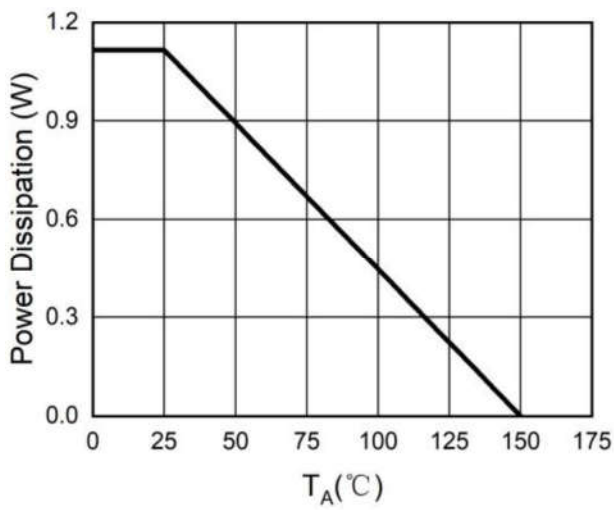
| Parameter                             | Symbol              | Condition                                                                                    | Min  | Typ  | Max  | Unit |
|---------------------------------------|---------------------|----------------------------------------------------------------------------------------------|------|------|------|------|
| Off Characteristics                   |                     |                                                                                              |      |      |      |      |
| Drain - Source Breakdown Voltage      | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                                | -20  |      |      | V    |
| Zero Gate Voltage Drain Current       | I <sub>DSS</sub>    | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V                                                 |      |      | -1   | μA   |
| Gate - Body Leakage Current           | I <sub>GSS</sub>    | V <sub>GS</sub> = ±12V, 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                                  | -0.5 | -0.7 | -1.0 | V    |
| Drain-source On-resistance            | R <sub>DS(on)</sub> | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3A                                                |      | 32   | 42   | mΩ   |
|                                       |                     | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -2A                                                |      | 40   | 55   |      |
| Dynamic Characteristics               |                     |                                                                                              |      |      |      |      |
| Input Capacitance                     | C <sub>iss</sub>    | V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V,<br>f= 1.0MHz                                   |      | 850  |      | pF   |
| Output Capacitance                    | C <sub>oss</sub>    |                                                                                              |      | 150  |      |      |
| Reverse Transfer Capacitance          | C <sub>rss</sub>    |                                                                                              |      | 90   |      |      |
| Switching Characteristics             |                     |                                                                                              |      |      |      |      |
| Total Gate Charge                     | Q <sub>g</sub>      | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-2A                            |      | 11   |      | nC   |
| Gate-source Charge                    | Q <sub>gs</sub>     |                                                                                              |      | 2    |      |      |
| Gate-drain Charge                     | Q <sub>gd</sub>     |                                                                                              |      | 2    |      |      |
| Turn-on Delay Time                    | t <sub>d(on)</sub>  | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-15V, R <sub>L</sub> =2.5Ω,<br>R <sub>GEN</sub> =3Ω |      | 10   |      | ns   |
| Turn-on Rise Time                     | t <sub>r</sub>      |                                                                                              |      | 35   |      |      |
| Turn-off Delay Time                   | t <sub>d(off)</sub> |                                                                                              |      | 55   |      |      |
| Turn-off Fall Time                    | t <sub>f</sub>      |                                                                                              |      | 51   |      |      |
| Source - Drain Diode Characteristics  |                     |                                                                                              |      |      |      |      |
| Drain to Source Diode Forward Voltage | V <sub>SD</sub>     | V <sub>GS</sub> = 0V, I <sub>SD</sub> =-3A, T <sub>J</sub> = 25℃                             |      |      | -1.2 | V    |

Note:

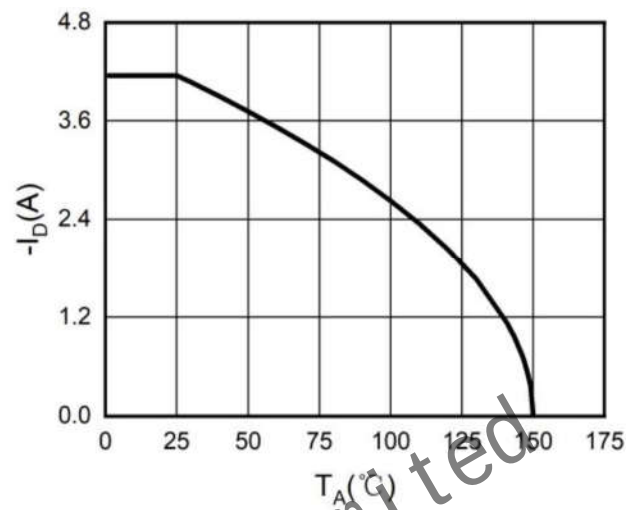
1.  $E_{AS}$  condition:  $T_J = 25^\circ\text{C}, V_{DD} = 20V, V_G = -4.5V, R_g = 25\Omega, L = 0.5mH$ .

## Typical Characteristic

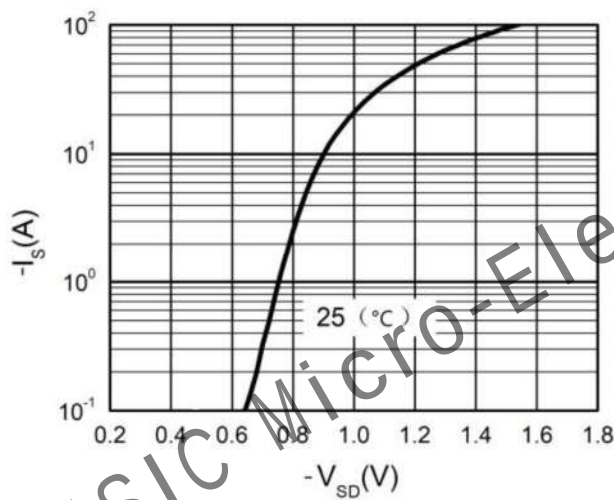

**Output Characteristics**

**Transfer Characteristics**

**BV<sub>DS</sub> vs Junction Temperature**

**R<sub>DS(ON)</sub> vs Junction Temperature**

**Gate Charge Characteristics**

**Capacitance Characteristics**



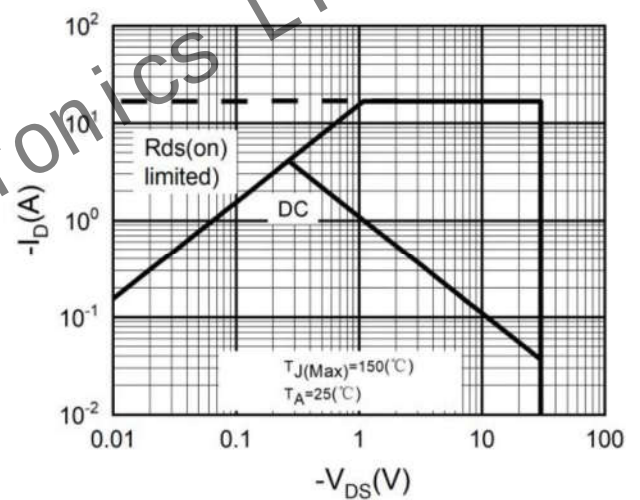
Power Dissipation



Drain Current



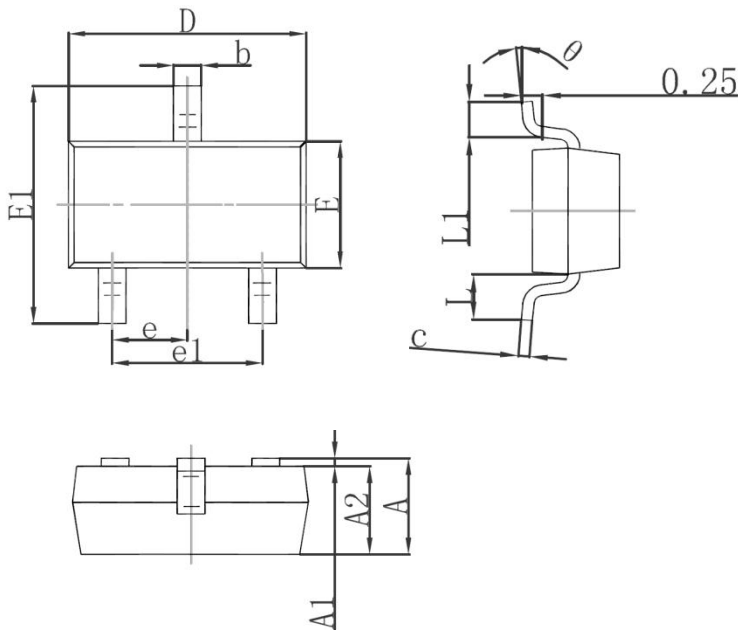
Body-Diode Characteristics



Maximum Safe Operating Area

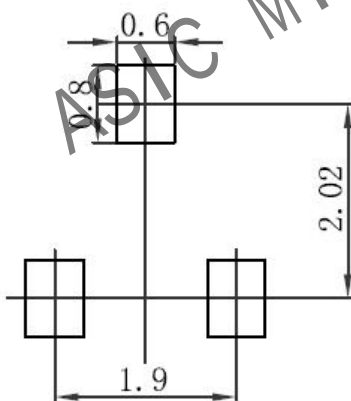
## Dimension

### SOT-23



| Symbol | Millimeters |       | Inches    |       |
|--------|-------------|-------|-----------|-------|
|        | Min.        | Max.  | Min.      | Max.  |
| A      | 0.900       | 1.150 | 0.035     | 0.045 |
| A1     | 0.000       | 0.100 | 0.000     | 0.004 |
| A2     | 0.900       | 1.050 | 0.035     | 0.041 |
| b      | 0.300       | 0.500 | 0.012     | 0.020 |
| c      | 0.080       | 0.150 | 0.003     | 0.006 |
| D      | 2.800       | 3.000 | 0.110     | 0.118 |
| E      | 1.200       | 1.400 | 0.047     | 0.055 |
| E1     | 2.250       | 2.550 | 0.089     | 0.100 |
| e      | 0.950 TYP   |       | 0.037 TYP |       |
| e1     | 1.800       | 2.000 | 0.071     | 0.079 |
| L      | 0.550 REF   |       | 0.022 REF |       |
| L1     | 0.300       | 0.500 | 0.012     | 0.020 |
| θ      | 0°          | 8°    | 0°        | 8°    |

## Recommended Land Pattern



### Note:

1. Controlling dimension: in millimeters
2. General tolerance:  $\pm 0.05\text{mm}$
3. The pad layout is for reference only
4. Unit: mm