

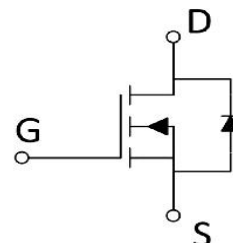
## -20V<sub>DS</sub> P-Channel Enhancement Mode MOSFET

### Features

- $V_{DS}=-20V, I_D=-2.3A$
- $R_{DS(ON)}=112m\Omega$  (TYP.)  $V_{GS}=4.5V$
- Reliable and Rugged
- Avalanche Rated
- Low On-Resistance

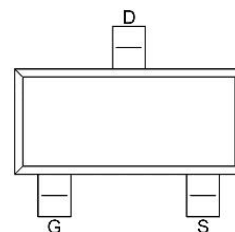


### SOT-23



### Applications

- Portable device
- Switch switching
- Load Switch
- Power management in portable/desktop PCs
- DC/DC conversion



### Ordering Information

| Device  | Package |         | Marking | Package Qty. |
|---------|---------|---------|---------|--------------|
| HM2301E | SOT-23  | Pb-Free | S1      | 3000pcs/Reel |

### Absolute Maximum Ratings ( $T_C=25^{\circ}C$ , unless otherwise noted)

| Parameter                                      | Symbol         | Value   | Unit        |
|------------------------------------------------|----------------|---------|-------------|
| Drain-Source Voltage ( $V_{GS}=0V$ )           | $V_{DS}$       | -20     | V           |
| Gate-Source Voltage ( $V_{GS}=0V$ , static)    | $V_{GS}$       | $\pm 8$ | V           |
| Continuous Drain Current ( $T_C=25^{\circ}C$ ) | $I_D$          | -2.3    | A           |
| Pulsed Drain Current                           | $I_{DM}$       | 10      | A           |
| Maximum Power Dissipation                      | $P_D$          | 0.4     | W           |
| Operating, Storage Temperature Range           | $T_J, T_{STG}$ | -55~150 | $^{\circ}C$ |

### Thermal Characteristics

| Parameter                               | Symbol          | Min. | Typ. | Max. | Unit          |
|-----------------------------------------|-----------------|------|------|------|---------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | -    | 60   | -    | $^{\circ}C/W$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | -    | 125  | -    | $^{\circ}C/W$ |

## Electrical Characteristics

| Parameter                        | Symbol       | Test Conditions               | Min. | Typ. | Max.      | Unit       |
|----------------------------------|--------------|-------------------------------|------|------|-----------|------------|
| Drain-Source Breakdown Voltage   | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$     | -20  | -    | -         | V          |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    | $V_{DS}=24V, V_{GS}=0V$       | -    | -    | 1         | $\mu A$    |
| Gate -Source Leakage Current     | $I_{GSS}$    | $V_{GS}=\pm 12V, V_{DS}=0V$   | -    | -    | $\pm 100$ | nA         |
| Gate Threshold Voltage           | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 0.4  | 0.7  | 1         | V          |
| Drain-Source On-stage Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=5.8A$        | -    | 90   | 115       | m $\Omega$ |
|                                  |              | $V_{GS}=4.5V, I_D=5A$         | -    | 110  | 150       |            |

## Dynamic Characteristics

| Parameter                    | Symbol       | Test Conditions                                                  | Min. | Typ. | Max. | Unit     |
|------------------------------|--------------|------------------------------------------------------------------|------|------|------|----------|
| Input capacitance            | $C_{iss}$    | $V_{DS}=15V$<br>$V_{GS}=0V$<br>$f=1MHz$                          | -    | 405  | -    | pF       |
| Output capacitance           | $C_{oss}$    |                                                                  | -    | 75   | -    |          |
| Reverse transfer capacitance | $C_{rss}$    |                                                                  | -    | 55   | -    |          |
| Gate Resistance              | $R_g$        | $f=1MHz$                                                         | -    | 6    | -    | $\Omega$ |
| Total Gate Charge            | $Q_g$        | $V_{DS}=15V$<br>$V_{GS}=4.5V$<br>$I_D=5.8A$                      | -    | 5.5  | -    | nC       |
| Gate Source Charge           | $Q_{gs}$     |                                                                  | -    | 3.3  | -    |          |
| Gate Drain Charge            | $Q_{gd}$     |                                                                  | -    | 0.7  | -    |          |
| Turn-on delay Time           | $t_{d(on)}$  | $V_{GS}=10V$<br>$V_{DS}=15V$<br>$R_L=2.7\Omega$<br>$R_G=3\Omega$ | -    | 11   | -    | ns       |
| Rise time                    | $t_r$        |                                                                  | -    | 35   | -    |          |
| Turn-off delay Time          | $t_{d(off)}$ |                                                                  | -    | 30   | -    |          |
| Fall time                    | $t_f$        |                                                                  | -    | 10   | -    |          |

## Reverse Diode Characteristics

| Parameter                  | Symbol   | Test Conditions                                | Min. | Typ. | Max. | Unit |
|----------------------------|----------|------------------------------------------------|------|------|------|------|
| Body Diode Forward Voltage | $V_{SD}$ | $V_{GS}=0V, I_{SD}=1A$                         | -    | 0.8  | 1.2  | V    |
| Reverse Recovery Time      | $t_{rr}$ | $V_{GS}=0V, I_{SD}=5A$<br>$d_i/d_t=100A/\mu s$ | -    | 16   | -    | ns   |
| Reverse Recovery Charge    | $Q_{rr}$ |                                                | -    | 9    | -    | nC   |

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