



## -20V -4A P-channel MOSFET

### Features

- $V_{DS} = -20V$ ,  $I_D = -4A$
- $R_{DS(ON)} = 38m\Omega$  (Typ.) @  $V_{GS} = -4.5V$   
 $R_{DS(ON)} = 48m\Omega$  (Typ.) @  $V_{GS} = -2.5V$
- High Power and Current Handling Capability
- Lead Free Product is Acquired
- Surface Mount Package
- ESD Rating: HBM 2.0KV

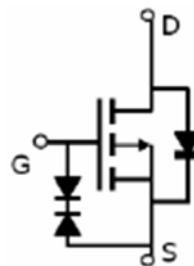
### Application

- PWM Applications
- Load Switch
- Power Management

### Package



SOT-23



### Absolute Maximum Ratings (T<sub>C</sub>=25°C unless otherwise specified)

| Symbol                            | Parameter                               | Max.                   | Units |
|-----------------------------------|---|------------------------|-------|
| V <sub>DSS</sub>                  | Drain-Source Voltage                    | -20                    | V     |
| V <sub>GSS</sub>                  | Gate-Source Voltage                     | ±8                     | V     |
| I <sub>D</sub>                    | Continuous Drain Current                | T <sub>C</sub> = 25°C  | -4    |
|                                   |   | T <sub>C</sub> = 100°C | -2.6  |
| I <sub>DM</sub>                   | Pulsed Drain Current <sup>note1</sup>   | -20                    | A     |
| P <sub>D</sub>                    | Power Dissipation                       | T <sub>A</sub> = 25°C  | 1.67  |
| R <sub>θJA</sub>                  | Thermal Resistance, Junction to Ambient | 75                     | °C/W  |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range | -55 to +150            | °C    |

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

| Symbol  | Parameter   | Test Condition   | Min. | Typ. | Max.     | Units      |
|---|---|--|------|------|----------|------------|
| <b>Off Characteristic</b>                                     |   |  |      |      |          |            |
| $V_{(BR)DSS}$   | Drain-Source Breakdown Voltage                            | $V_{GS}=0V, I_D = -250\mu A$   | -20  | -    | -        | V          |
| $I_{DSS}$   | Zero Gate Voltage Drain Current                           | $V_{DS} = -20V, V_{GS} = 0V,$  | -    | -    | -1       | $\mu A$    |
| $I_{GSS}$   | Gate to Body Leakage Current                              | $V_{DS} = 0V, V_{GS} = \pm 8V$   | -    | -    | $\pm 10$ | $\mu A$    |
| <b>On Characteristics</b>                                     |   |  |      |      |          |            |
| $V_{GS(th)}$  | Gate Threshold Voltage                                    | $V_{DS} = V_{GS}, I_D = -250\mu A$                                       | -0.4 | -    | -1.0     | V          |
| $R_{DS(on)}$  | Static Drain-Source on-Resistance<br><small>note2</small> | $V_{GS} = -4.5V, I_D = -4A$  | -    | 38   | 48       | m $\Omega$ |
|   |   | $V_{GS} = -2.5V, I_D = -3A$  | -    | 48   | 65       |            |
| $g_{FS}$  | Forward Transconductance                                  | $V_{DS} = -5V, I_D = -4A$  | 8    | -    | -        | S          |
| <b>Dynamic Characteristics</b>                                |   |  |      |      |          |            |
| $C_{iss}$   | Input Capacitance   | $V_{DS} = -10V, V_{GS} = 0V,$<br>$f = 1.0MHz$                            | -    | 950  | -        | pF         |
| $C_{oss}$   | Output Capacitance  |  | -    | 165  | -        | pF         |
| $C_{rss}$   | Reverse Transfer Capacitance                              |  | -    | 120  | -        | pF         |
| $Q_g$   | Total Gate Charge   | $V_{DS} = -10V, I_D = -4A,$<br>$V_{GS} = -4.5V$                          | -    | 12   | -        | nC         |
| $Q_{gs}$  | Gate-Source Charge  |  | -    | 1.4  | -        | nC         |
| $Q_{gd}$  | Gate-Drain("Miller") Charge                               |  | -    | 3.6  | -        | nC         |
| <b>Switching Characteristics</b>                              |   |  |      |      |          |            |
| $t_{d(on)}$   | Turn-on Delay Time  | $V_{DD} = -10V, V_{GS} = -4.5A,$<br>$R_L = 2.5\Omega, R_{GEN} = 3\Omega$ | -    | 12   | -        | ns         |
| $t_r$   | Turn-on Rise Time   |  | -    | 10   | -        | ns         |
| $t_{d(off)}$  | Turn-off Delay Time                                       |  | -    | 19   | -        | ns         |
| $t_f$   | Turn-off Fall Time  |  | -    | 25   | -        | ns         |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |   |  |      |      |          |            |
| $I_S$   | Maximum Continuous Drain to Source Diode Forward Current  |  | -    | -    | -4       | A          |
| $I_{SM}$  | Maximum Pulsed Drain to Source Diode Forward Current      |  | -    | -    | -20      | A          |
| $V_{SD}$  | Drain to Source Diode Forward Voltage                     | $V_{GS} = 0V, I_S = -4A$   | -    | -    | -1.2     | V          |

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

2. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$



Typical Performance Characteristics

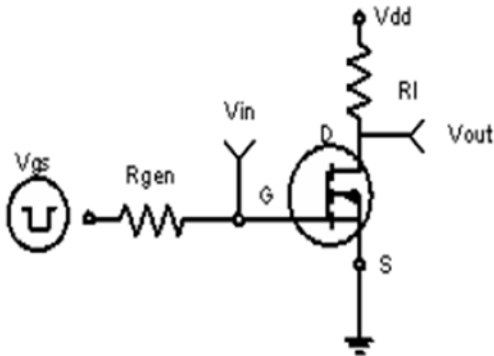


Figure1 :Switching Test Circuit

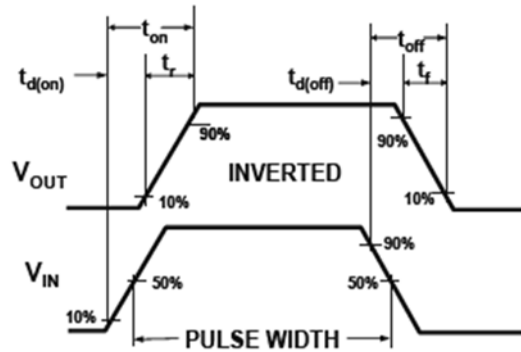
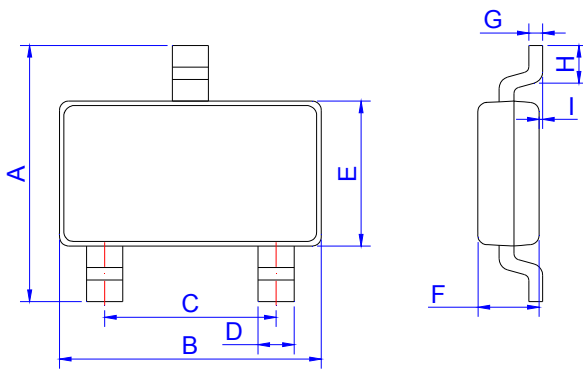


Figure2:Switching Waveforms

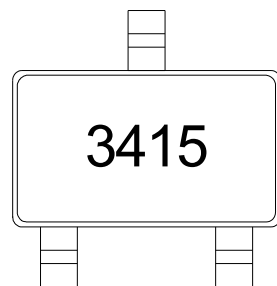
Package Mechanical Data



SOT-23

| Ref. | Dimensions  |      |      |           |       |       |
|------|-------------|------|------|-----------|-------|-------|
|      | Millimeters |      |      | Inches    |       |       |
|      | Min.        | Typ. | Max. | Min.      | Typ.  | Max.  |
| A    | 2.30        | 2.40 | 2.50 | 0.091     | 0.095 | 0.098 |
| B    | 2.80        | 2.90 | 3.00 | 0.110     | 0.114 | 0.118 |
| C    | 1.90 REF    |      |      | 0.075 REF |       |       |
| D    | 0.35        | 0.40 | 0.45 | 0.014     | 0.016 | 0.018 |
| E    | 1.20        | 1.30 | 1.40 | 0.047     | 0.051 | 0.055 |
| F    | 0.90        | 1.00 | 1.10 | 0.035     | 0.039 | 0.043 |
| G    |             | 0.10 | 0.15 |           | 0.004 | 0.006 |
| H    | 0.20        |      |      | 0.008     |       |       |
| I    | 0           |      | 0.10 | 0         |       | 0.004 |

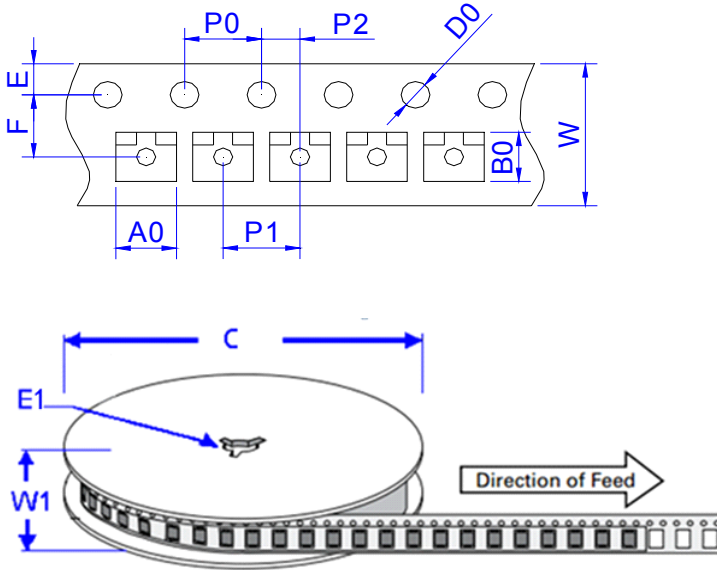
Marking



3415: Device Code



### Package Information-SOT-23



| Ref. | Dimensions  |               |
|------|-------------|---------------|
|      | Millimeters | Inches        |
| A0   | 3.15 ± 0.3  | 0.124 ± 0.012 |
| B0   | 2.77 ± 0.3  | 0.109 ± 0.012 |
| C    | 178         | 7.0           |
| D0   | 1.50±0.1    | 0.059 ± 0.004 |
| E    | 1.75 ± 0.2  | 0.069 ± 0.008 |
| E1   | 13.3±0.3    | 0.524± 0.012  |
| F    | 3.5 ± 0.2   | 0.138 ± 0.008 |
| P0   | 4.00 ± 0.2  | 0.157 ± 0.008 |
| P1   | 4.00 ± 0.2  | 0.157 ± 0.008 |
| P2   | 2.00 ± 0.2  | 0.079 ± 0.008 |
| W    | 8.00 ± 0.2  | 0.315 ± 0.008 |
| W1   | 11.5±1.0    | 0.453 ± 0.039 |

### Ordering Information-SOT-23

| OUTLINE | PACKAGE TYPE | QUANTITY REEL | DESCRIPTION      |
|---------|--------------|---------------|------------------|
| TAPING  | SOT-23       | 3,000pcs      | 7 inch reel pack |