



## UT3416-H

Power MOSFET

### 6.7A, 20V N-CHANNEL MOSFET

#### DESCRIPTION

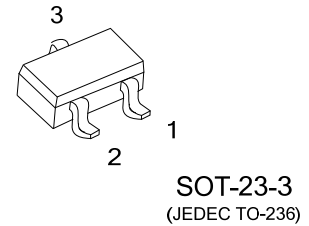
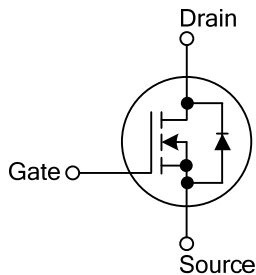
The UTC **UT3416-H** is an N-Channel MOSFET, it uses UTC's advanced technology to provide customers with a minimum on-state resistance and high switching speed, etc.

The UTC **UT3416-H** is suitable for high efficiency fast switching applications.

#### FEATURES

- \*  $R_{DS(ON)} < 19m\Omega$  @  $V_{GS}=4.5V$ ,  $I_D=4A$
- \* High switching speed
- \* Improved dv/dt capability

#### SYMBOL



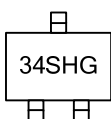
#### ORDERING INFORMATION

| Ordering Number | Package  | Packing   |
|-----------------|----------|-----------|
| UT3416G-AE2-R   | SOT-23-3 | Tape Reel |

Note: Pin Assignment: G: Gate D: Drain S: Source

|               |                  |                                   |
|---------------|------------------|-----------------------------------|
| UT3416G-AE2-R | (1)Packing Type  | (1) R: Tape Reel                  |
|               | (2)Package Type  | (2) AE2: SOT-23-3                 |
|               | (3)Green Package | (3) G: Halogen Free and Lead Free |

#### MARKING



### ■ ABSOLUTE MAXIMUM RATINGS ( $T_C=25^{\circ}\text{C}$ , unless otherwise noted)

| PARAMETER                 |                      |                       | SYMBOL           | RATINGS  | UNIT |
|---------------------------|----------------------|-----------------------|------------------|----------|------|
| Drain-Source Voltage      |                      |                       | V <sub>DSS</sub> | 20       | V    |
| Gate-Source Voltage       |                      |                       | V <sub>GSS</sub> | ±10      | V    |
| Drain Current             | Continuous           | T <sub>C</sub> =25°C  | I <sub>D</sub>   | 6.7      | A    |
|                           |                      | T <sub>C</sub> =100°C |                  | 4.2      | A    |
|                           | Pulsed (Note 1)      |                       | I <sub>DM</sub>  | 26.8     | A    |
| Power Dissipation         | T <sub>C</sub> =25°C |                       | P <sub>D</sub>   | 1.56     | W    |
|                           | Derate above 25°C    |                       |                  | 0.012    | W/°C |
| Junction Temperature      |                      |                       | T <sub>J</sub>   | -55~+150 | °C   |
| Storage Temperature Range |                      |                       | T <sub>STG</sub> | -55~+150 | °C   |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ THERMAL CHARACTERISTICS

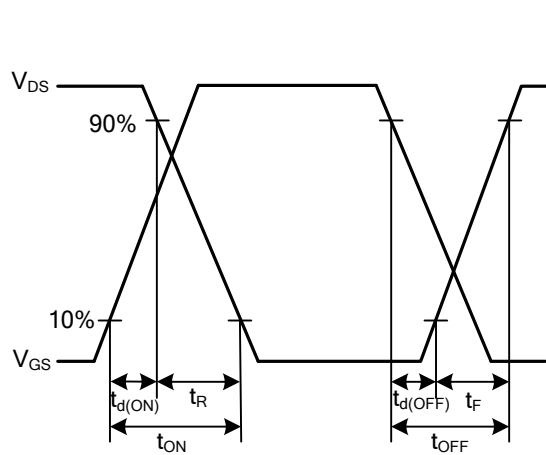
| PARAMETER           | SYMBOL        | RATINGS | UNIT                 |
|---------------------|---------------|---------|----------------------|
| Junction to Ambient | $\theta_{JA}$ | 80      | $^{\circ}\text{C/W}$ |

### ■ ELECTRICAL CHARACTERISTICS ( $T_J=25^{\circ}\text{C}$ , unless otherwise noted)

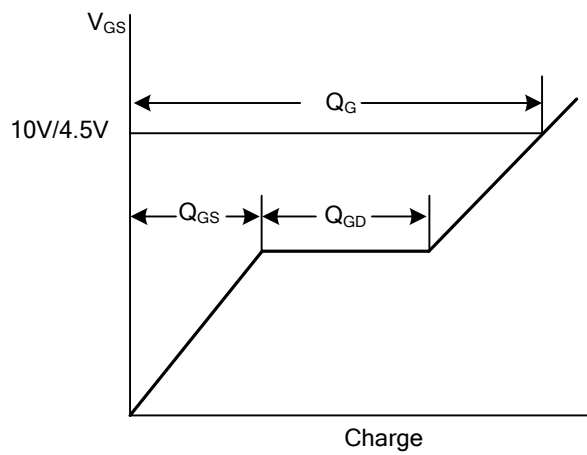
| PARAMETER                                       |         | SYMBOL                              | TEST CONDITIONS                                                                         | MIN | TYP  | MAX  | UNIT  |
|-------------------------------------------------|---------|-------------------------------------|-----------------------------------------------------------------------------------------|-----|------|------|-------|
| OFF CHARACTERISTICS                             |         |                                     |                                                                                         |     |      |      |       |
| Drain-Source Breakdown Voltage                  |         | BV <sub>DSS</sub>                   | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V                                              | 20  |      |      | V     |
| BV <sub>DSS</sub> Temperature Coefficient       |         | ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | Reference to 25°C, I <sub>D</sub> =1mA                                                  |     | 0.02 |      | V/°C  |
| Drain-Source Leakage Current                    |         | I <sub>DSS</sub>                    | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                         |     |      | 1    | μA    |
|                                                 |         |                                     | V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C                        |     |      | 10   | μA    |
| Gate-Source Leakage Current                     | Forward | I <sub>GSS</sub>                    | V <sub>GS</sub> =+10V, V <sub>DS</sub> =0V                                              |     |      | +100 | nA    |
|                                                 | Reverse |                                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =0V                                              |     |      | -100 | nA    |
| ON CHARACTERISTICS                              |         |                                     |                                                                                         |     |      |      |       |
| Gate Threshold Voltage                          |         | V <sub>GS(TH)</sub>                 | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                | 0.3 | 0.6  | 0.8  | V     |
| V <sub>GS(TH)</sub> Temperature Coefficient     |         | ΔV <sub>GS(TH)</sub>                |                                                                                         |     | 2    |      | mV/°C |
| Static Drain-Source On-State Resistance         |         | R <sub>DS(ON)</sub>                 | V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A                                               |     | 15   | 19   | mΩ    |
|                                                 |         |                                     | V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A                                               |     | 18   | 24   | mΩ    |
|                                                 |         |                                     | V <sub>GS</sub> =1.8V, I <sub>D</sub> =2A                                               |     | 23   | 32   | mΩ    |
| Forward Transconductance                        |         | g <sub>FS</sub>                     | V <sub>DS</sub> =10V, I <sub>D</sub> =4A                                                |     | 9.5  |      | S     |
| DYNAMIC PARAMETERS                              |         |                                     |                                                                                         |     |      |      |       |
| Input Capacitance                               |         | C <sub>ISS</sub>                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1.0MHz                                     |     | 600  | 870  | pF    |
| Output Capacitance                              |         | C <sub>OSS</sub>                    |                                                                                         |     | 70   | 100  | pF    |
| Reverse Transfer Capacitance                    |         | C <sub>RSS</sub>                    |                                                                                         |     | 45   | 65   | pF    |
| SWITCHING PARAMETERS                            |         |                                     |                                                                                         |     |      |      |       |
| Total Gate Charge (Note 2, 3)                   |         | Q <sub>G</sub>                      | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =4A                         |     | 5.8  | 8    | nC    |
| Gate to Source Charge (Note 2, 3)               |         | Q <sub>GS</sub>                     |                                                                                         |     | 0.6  | 1    | nC    |
| Gate to Drain Charge (Note 2, 3)                |         | Q <sub>GD</sub>                     |                                                                                         |     | 2    | 4    | nC    |
| Turn-ON Delay Time (Note 2, 3)                  |         | t <sub>D(ON)</sub>                  | V <sub>DD</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =1A,<br>R <sub>G</sub> =25Ω |     | 5.0  | 9    | ns    |
| Rise Time (Note 2, 3)                           |         | t <sub>R</sub>                      |                                                                                         |     | 14.4 | 27   | ns    |
| Turn-OFF Delay Time (Note 2, 3)                 |         | t <sub>D(OFF)</sub>                 |                                                                                         |     | 30.0 | 55   | ns    |
| Fall-Time (Note 2, 3)                           |         | t <sub>F</sub>                      |                                                                                         |     | 9.2  | 17   | ns    |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS |         |                                     |                                                                                         |     |      |      |       |
| Continuous Source Current                       |         | I <sub>S</sub>                      | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current                                      |     |      | 6.7  | A     |
| Pulsed Source Current                           |         | I <sub>SM</sub>                     |                                                                                         |     |      | 26.8 | A     |
| Drain-Source Diode Forward Voltage              |         | V <sub>SD</sub>                     | I <sub>S</sub> =1A, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                           |     |      | 1    | V     |

Notes: 1. Repetitive Rating: Pulsed width limited by maximum junction temperature.  
2. The data tested by pulsed, pulse width $\leq 300\mu\text{s}$ , duty cycle $\leq 2\%$ .  
3. Essentially independent of operating temperature.

## ■ TEST CIRCUITS AND WAVEFORMS

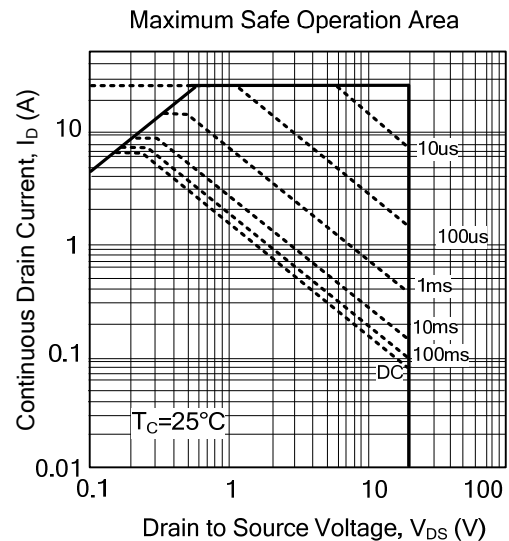
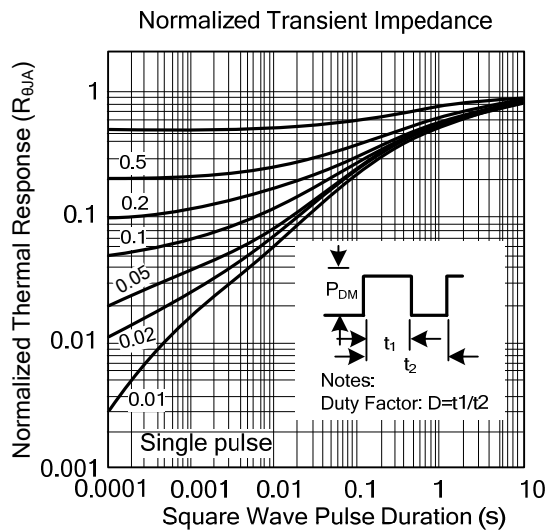
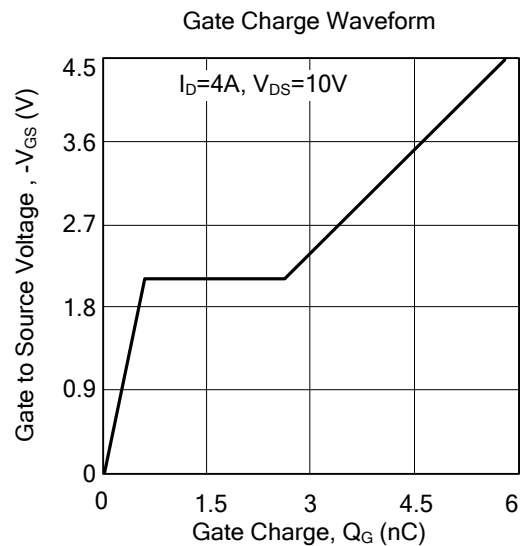
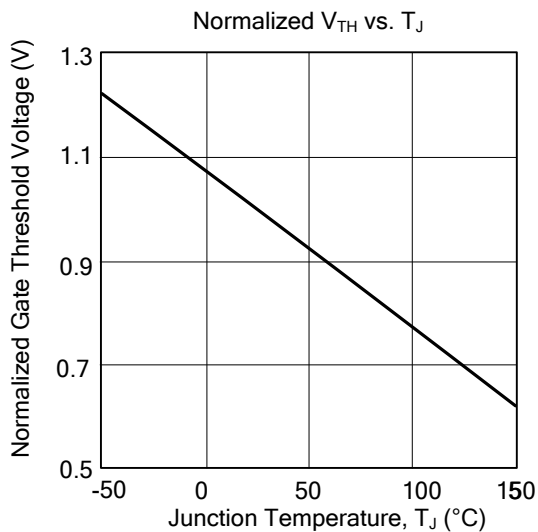
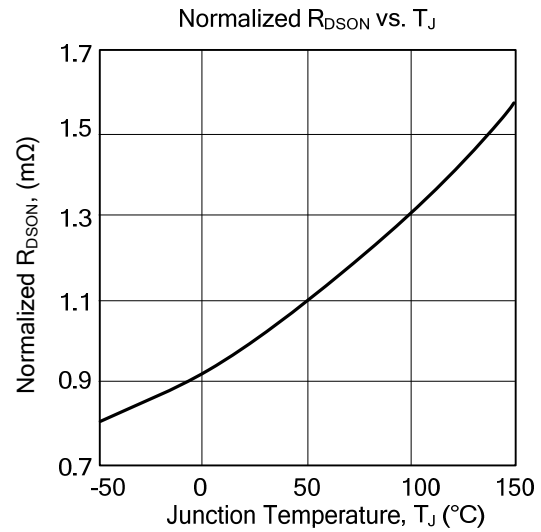
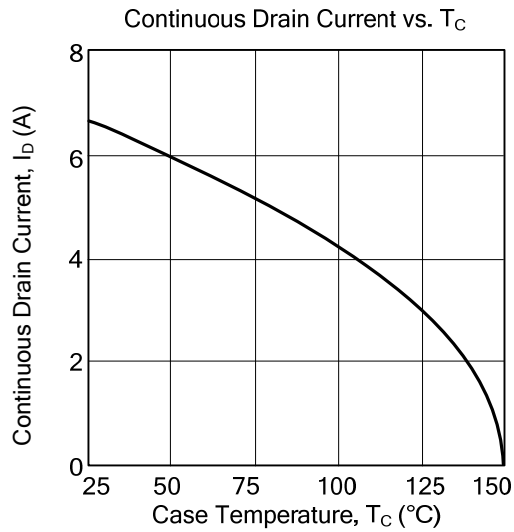


Switching Time Waveform



Gate Charge Waveforms

### ■ TYPICAL CHARACTERISTICS



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