



## UF840K-MTQ

Power MOSFET

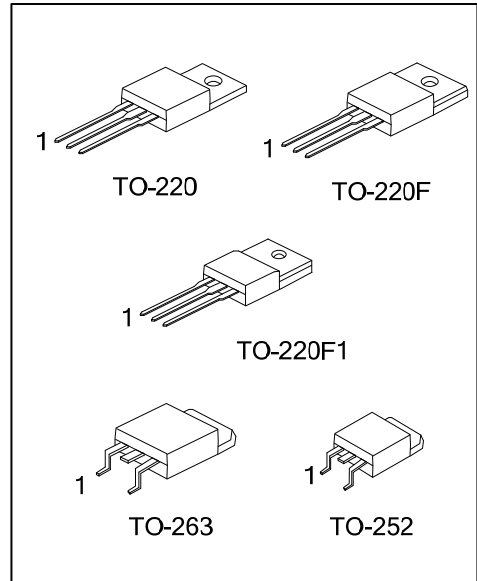
### 8A, 500V N-CHANNEL POWER MOSFET

#### DESCRIPTION

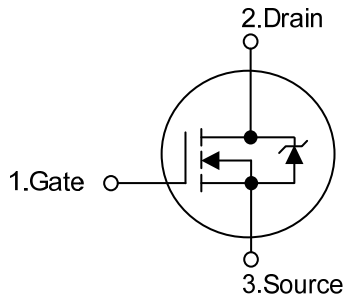
The N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.

#### FEATURES

- \* Low  $R_{DS(ON)} < 0.87\Omega @ V_{GS}=10V, I_D = 4.4A$
- \* Single Pulse Avalanche Energy Rated
- \* Fast Switching Speeds
- \* Linear Transfer Characteristics
- \* High Input Impedance



#### SYMBOL



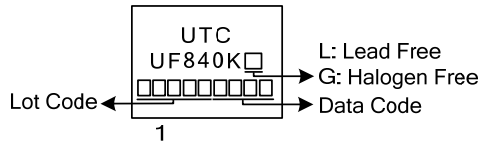
#### ORDERING INFORMATION

| Ordering Number |               | Package  | Pin Assignment |   |   | Packing   |
|-----------------|---------------|----------|----------------|---|---|-----------|
| Lead Free       | Halogen-Free  |          | 1              | 2 | 3 |           |
| UF840KL-TA3-R   | UF840KG-TA3-R | TO-220   | G              | D | S | Tube      |
| UF840KL-TF3-R   | UF840KG-TF3-R | TO-220F  | G              | D | S | Tube      |
| UF840KL-TF1-T   | UF840KG-TF1-T | TO-220F1 | G              | D | S | Tube      |
| UF840KL-TN3-R   | UF840KG-TN3-R | TO-252   | G              | D | S | Tape Reel |
| UF840KL-TQ2-T   | UF840KG-TQ2-T | TO-263   | G              | D | S | Tube      |
| UF840KL-TQ2-R   | UF840KG-TQ2-R | TO-263   | G              | D | S | Tape Reel |

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

|  |   |
|--|---|
| <p>UF840KG-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p> | <p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TN3: TO-252, TQ2: TO-263</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|---|

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless Otherwise Specified)

| PARAMETER   |                   | SYMBOL    | RATINGS    | UNIT             |
|---|-------------------|-----------|------------|------------------|
| Drain to Source Voltage ( $T_J = 25^\circ\text{C} \sim 125^\circ\text{C}$ )                             |                   | $V_{DSS}$ | 500        | V                |
| Drain to Gate Voltage ( $R_{GS} = 20\text{k}\Omega$ , $T_J = 25^\circ\text{C} \sim 125^\circ\text{C}$ ) |                   | $V_{DGR}$ | 500        | V                |
| Gate to Source Voltage  |                   | $V_{GSS}$ | $\pm 30$   | V                |
| Drain Current (Note 2)  | Continuous        | $I_D$     | 8.0        | A                |
|   | Pulsed            | $I_{DM}$  | 32         | A                |
| Single Pulse Avalanche Energy (Note 3)  |                   | $E_{AS}$  | 336        | mJ               |
| Peak Diode Recovery dv/dt (Note 4)  |                   | dv/dt     | 3.3        | V/ns             |
| Power Dissipation   | TO-220/TO-263     | $P_D$     | 134        | W                |
|   | TO-220F/ TO-220F1 |           | 44         | W                |
|   | TO-252            |           | 107        | W                |
| Junction Temperature  |                   | $T_J$     | +150       | $^\circ\text{C}$ |
| Storage Temperature   |                   | $T_{STG}$ | -55 ~ +150 | $^\circ\text{C}$ |

Notes: 1. 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.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3.  $L = 10\text{mH}$ ,  $I_{AS} = 8.0\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$ .

4.  $I_{SD} \leq 8.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$ .

■ THERMAL RESISTANCES CHARACTERISTICS

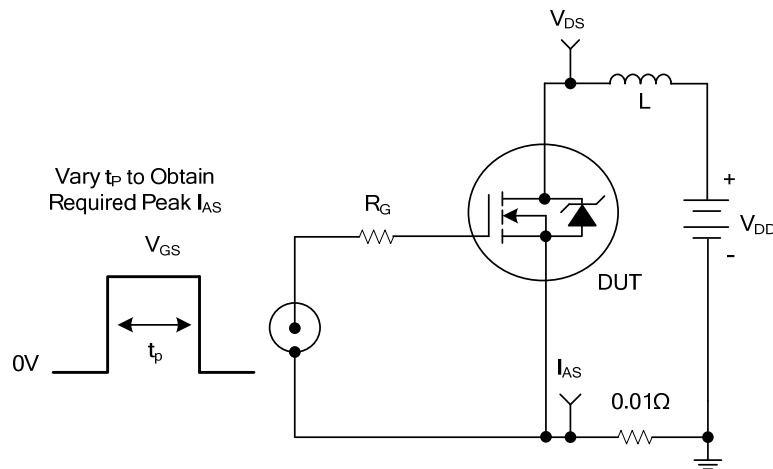
| PARAMETER           |                  | SYMBOL        | RATINGS | UNIT                      |
|---------------------|------------------|---------------|---------|---------------------------|
| Junction to Ambient | TO-220/TO-220F   | $\theta_{JA}$ | 62.5    | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F1/TO-263  |               |         |                           |
|                     | TO-252           |               |         |                           |
| Junction to Case    | TO-220/TO-263    | $\theta_{JC}$ | 0.93    | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F/TO-220F1 |               |         |                           |
|                     | TO-252           |               |         |                           |

■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> =25°C, unless otherwise specified)

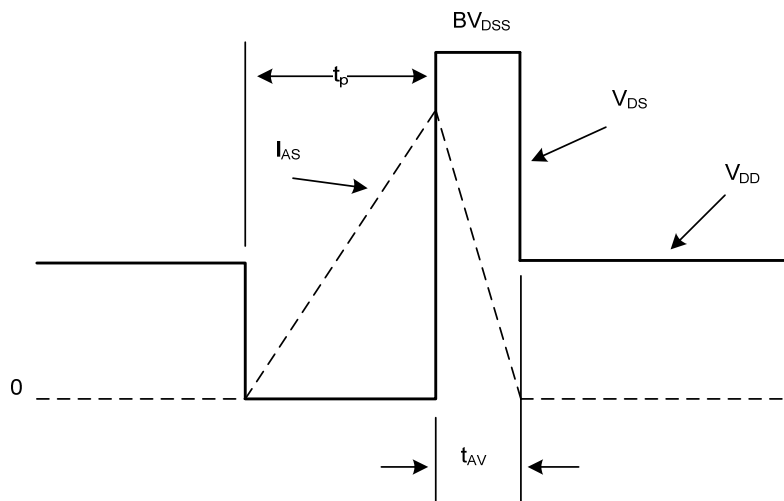
| PARAMETER  | SYMBOL              | TEST CONDITIONS  | MIN | TYP  | MAX  | UNIT |
|--|---------------------|--|-----|------|------|------|
| <b>OFF CHARACTERISTICS</b>                             |                     |  |     |      |      |      |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>   | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V   | 500 |      |      | V    |
| Drain-Source Leakage Current                           | I <sub>DSS</sub>    | V <sub>DS</sub> =Rated BV <sub>DSS</sub> , V <sub>GS</sub> = 0V                                      |     |      | 25   | μA   |
| Gate-Source Leakage Current                            | Forward             | I <sub>GSS</sub>   |     |      | +100 | nA   |
|  | Reverse             |  |     |      |      |      |
|  |                     | V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V   |     |      | -100 | nA   |
| <b>ON CHARACTERISTICS</b>                              |                     |  |     |      |      |      |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> = 250μA  | 2.0 |      | 4.0  | V    |
| Static Drain-Source On-State Resistance                | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =4.4A   |     |      | 0.87 | Ω    |
| <b>DYNAMIC PARAMETERS</b>                              |                     |  |     |      |      |      |
| Input Capacitance                                      | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz  |     | 920  |      | pF   |
| Output Capacitance                                     | C <sub>OSS</sub>    |  |     | 105  |      | pF   |
| Reverse Transfer Capacitance                           | C <sub>RSS</sub>    |  |     | 10   |      | pF   |
| <b>SWITCHING PARAMETERS</b>                            |                     |  |     |      |      |      |
| Total Gate Charge (Note 1)                             | Q <sub>G</sub>      | V <sub>DS</sub> =400V, V <sub>GS</sub> =10V, I <sub>D</sub> =8A,<br>I <sub>G</sub> =10mA (Note 1, 2) |     | 24   |      | nC   |
| Gate to Source Charge                                  | Q <sub>GS</sub>     |  |     | 3    |      | nC   |
| Gate to Drain Charge                                   | Q <sub>GD</sub>     |  |     | 2    |      | nC   |
| Turn-on Delay Time (Note 1)                            | t <sub>D(ON)</sub>  | V <sub>DS</sub> =250V, V <sub>GS</sub> =10V, I <sub>D</sub> =8A,<br>R <sub>G</sub> =25Ω (Note 1, 2)  |     | 4.8  |      | ns   |
| Rise Time  | t <sub>R</sub>      |  |     | 11.6 |      | ns   |
| Turn-off Delay Time                                    | t <sub>D(OFF)</sub> |  |     | 56   |      | ns   |
| Fall-Time  | t <sub>F</sub>      |  |     | 20   |      | ns   |
| <b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b> |                     |  |     |      |      |      |
| Maximum Body-Diode Continuous Current                  | I <sub>S</sub>      |  |     |      | 8    | A    |
| Maximum Body-Diode Pulsed Current                      | I <sub>SM</sub>     |  |     |      | 32   | A    |
| Drain-Source Diode Forward Voltage (Note 1)            | V <sub>SD</sub>     | I <sub>S</sub> =8.0A, V <sub>GS</sub> =0V  |     |      | 2    | V    |
| Reverse Recovery Time (Note 1)                         | t <sub>rr</sub>     | I <sub>S</sub> =8.0A, V <sub>GS</sub> =0V,<br>dI <sub>F</sub> /dt=100A/μs                            |     | 312  |      | nS   |
| Reverse Recovery Charge                                | Q <sub>rr</sub>     |  |     |      | 3.1  |      |

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.  
 2. Essentially independent of operating temperature.

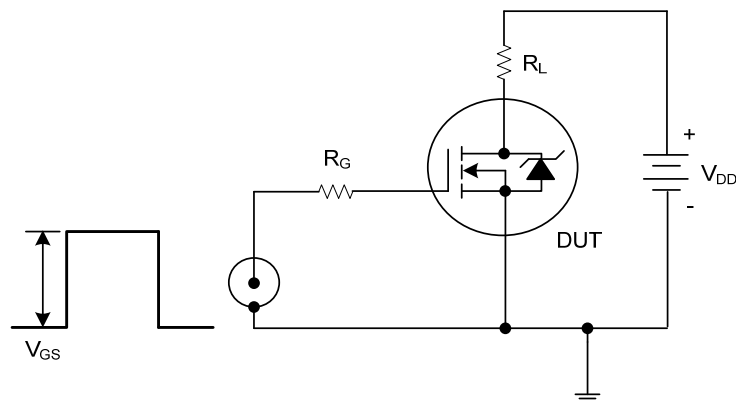
## TEST CIRCUITS AND WAVEFORMS



**Unclamped Energy Test Circuit**

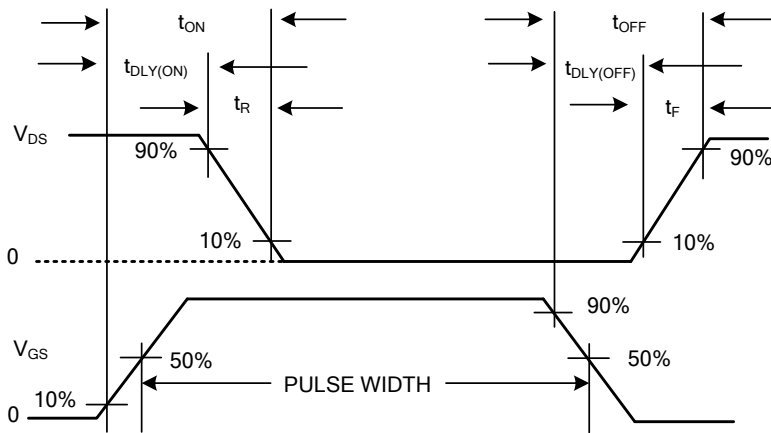


**Unclamped Energy Waveforms**

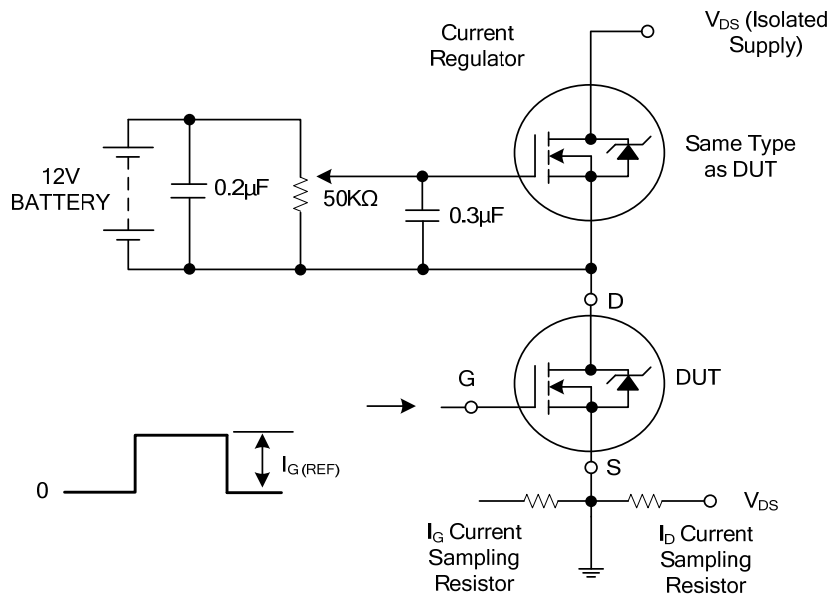


**Switching Time Test Circuit**

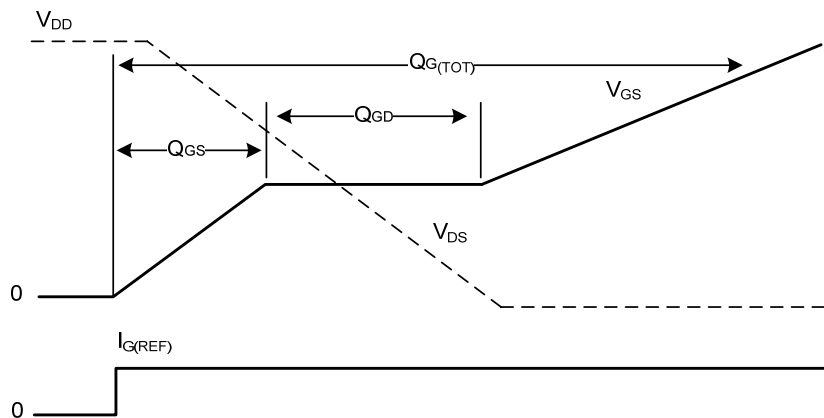
## ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



**Resistive Switching Waveforms**

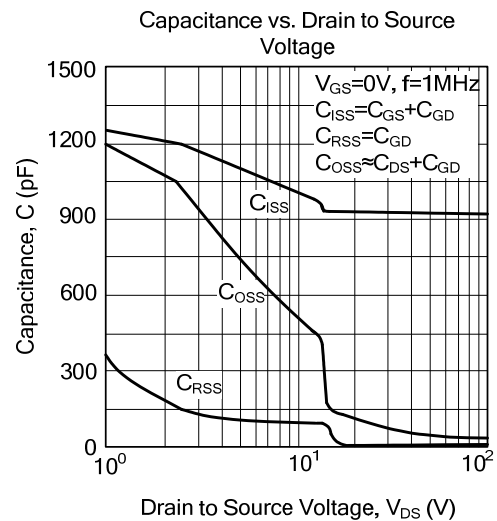
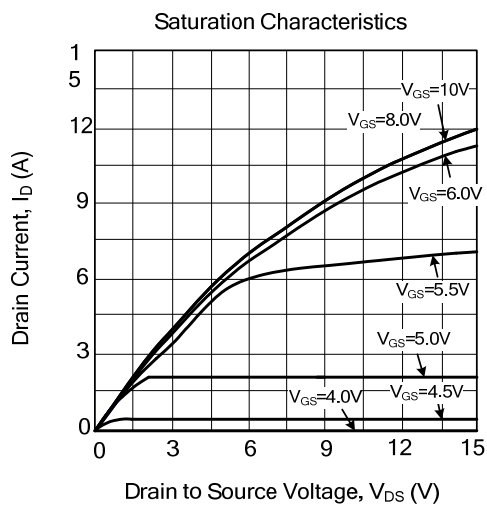
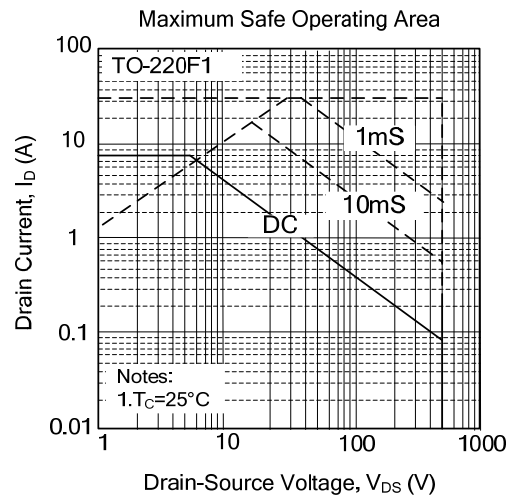
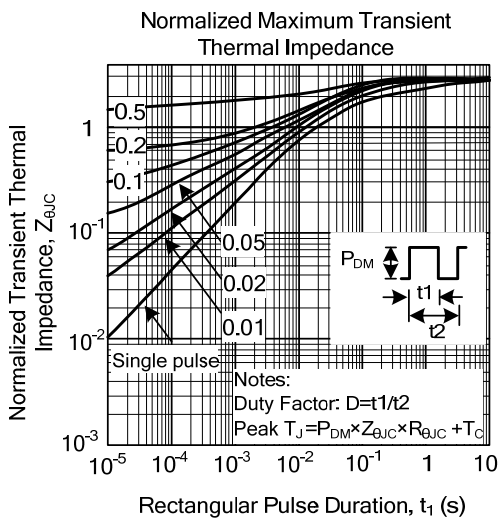
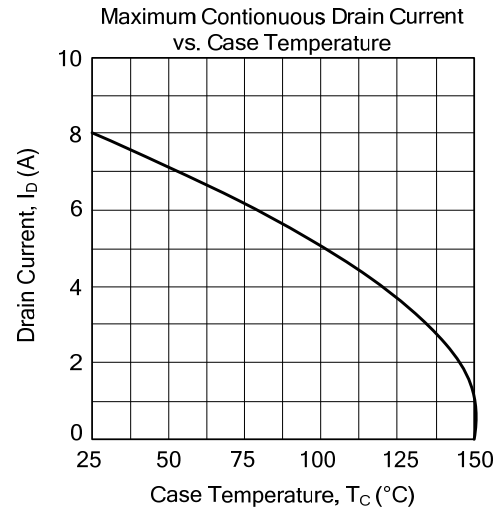
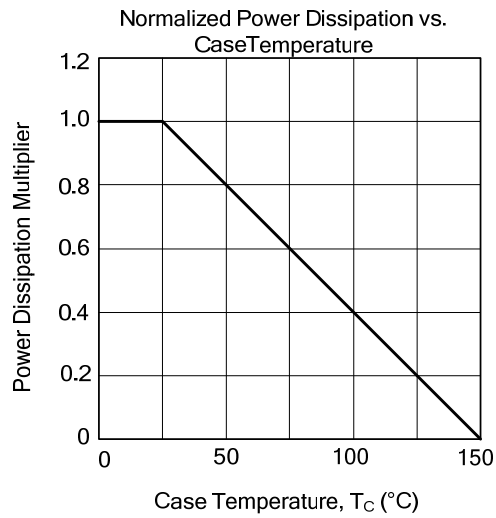


**Gate Charge Test Circuit**

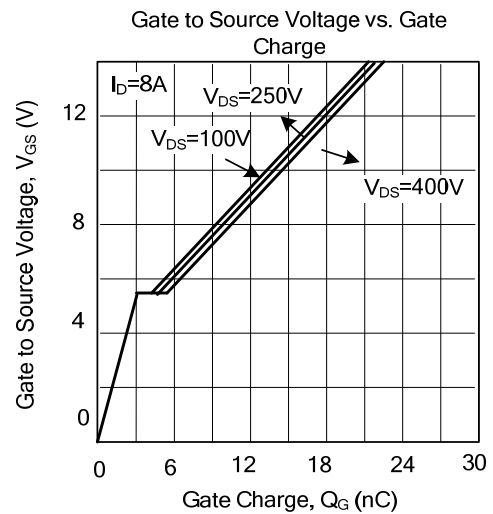
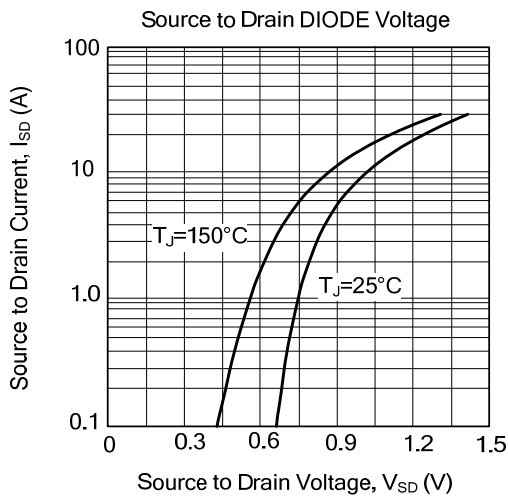
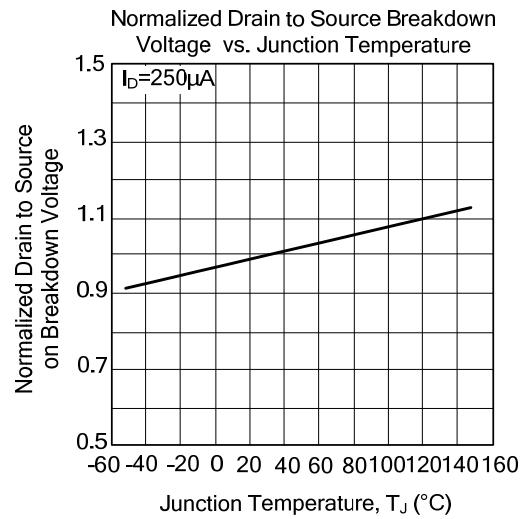
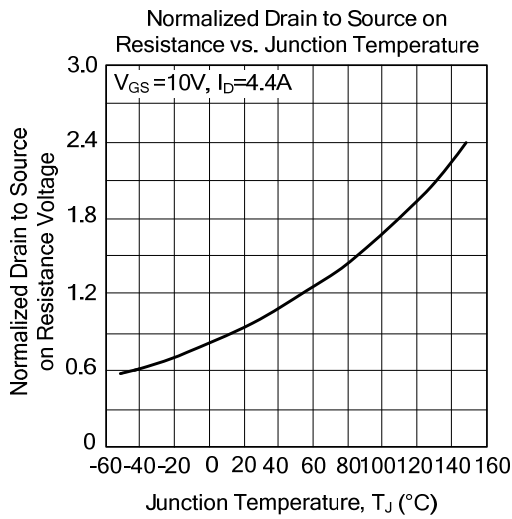
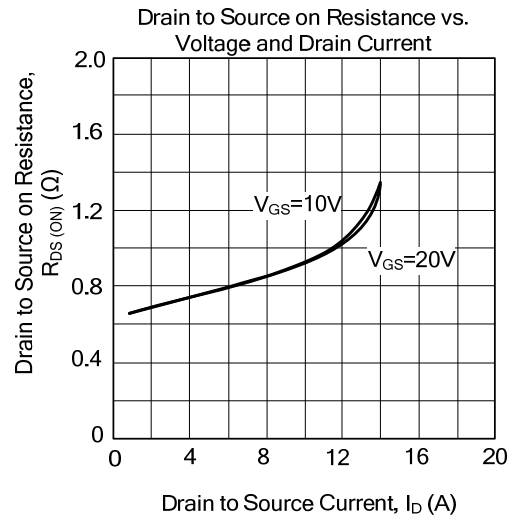
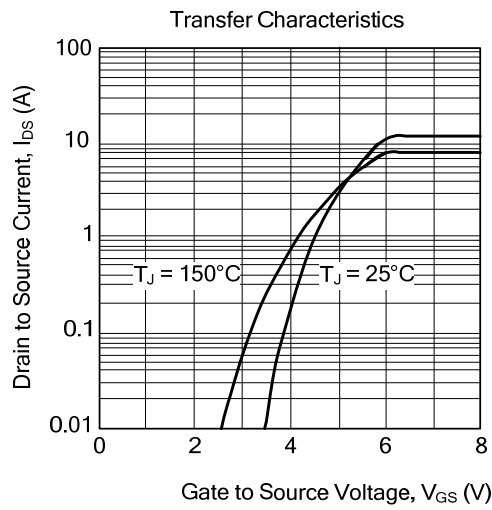


**Gate Charge Waveforms**

## TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)





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