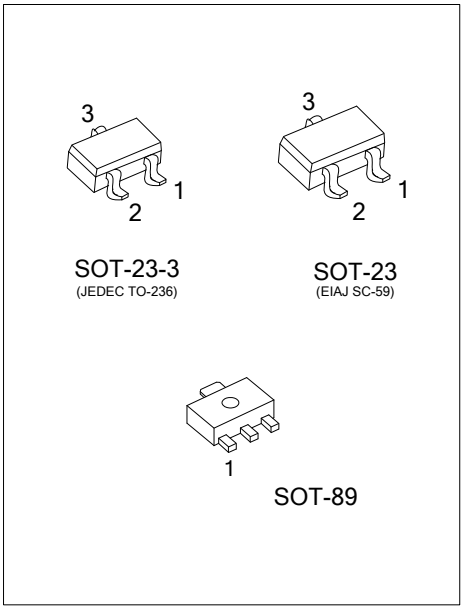
# UT2304

**Power MOSFET**

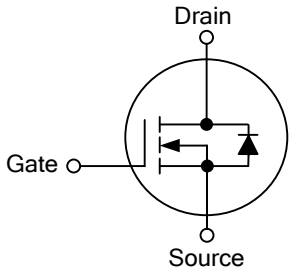
## N-CHANNEL ENHANCEMENT MODE




### ■ DESCRIPTION

The **UT2304** is an N-Channel Power MOSFET that can achieve the lowest possible on-resistance, extremely and cost- effectiveness device by using advanced trench technology.

### ■ SYMBOL

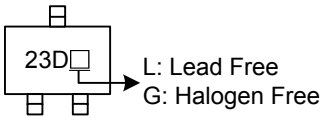



### ■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| UT2304L-AE2-R | UT2304G-AE2-R | SOT-23-3 | S | G | D | Tape Reel |
| UT2304L-AE3-R | UT2304G-AE3-R | SOT-23 | S | G | D | Tape Reel |
| UT2304L-AB3-R | UT2304G-AB3-R | SOT-89 | S | D | G | Tape Reel |

| | |
|---|---|
| UT2304L-AE3-R<br>(1)Packing Type<br>(2)Package Type<br>(3)Lead Free | (1) R: Tape Reel<br>(2) AE2: SOT-23-3, AE3: SOT-23, AB3: SOT-89<br>(3) L: Lead Free, G: Halogen Free |

### ■ MARKING



## ■ ABSOLUTE MAXIMUM RATINGS ($T_A$=25°C, unless otherwise specified)

| PARAMETER | SYMBOL | RATING | UNITS |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current (Note 3) | $I_D$ | 2.5 | A |
| Pulsed Drain Current (Note 1, 2) | $I_{DM}$ | 10 | A |
| Power Dissipation | $P_D$ | 1.4 | W |
| Junction Temperature | $T_J$ | +150 | °C |
| Storage Temperature | $T_{STG}$ | -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 DATA

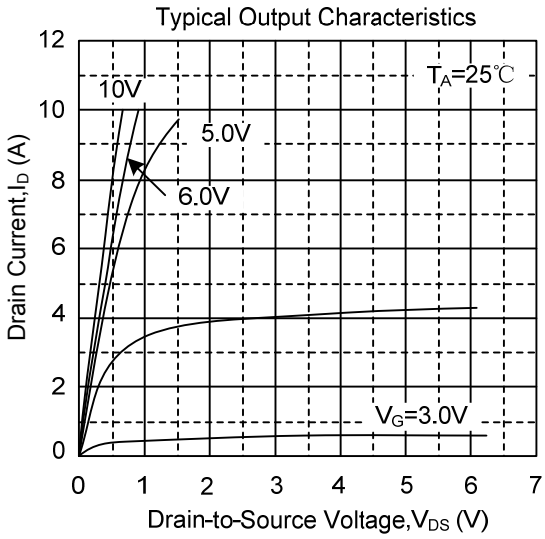
| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Junction to Ambient (Note 3) | $\theta_{JA}$ | | | 90 | °C/W |

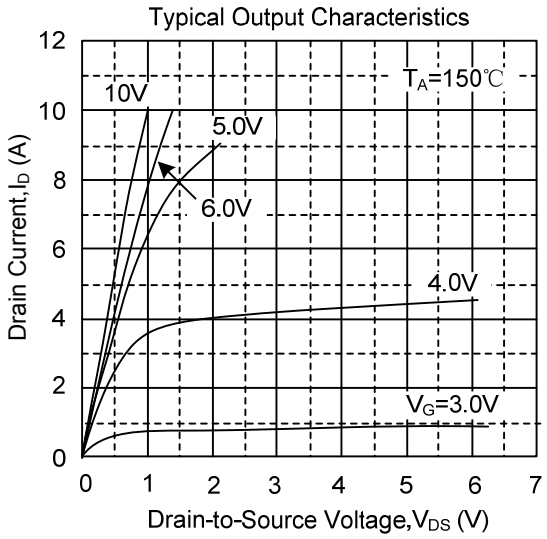
## ■ ELECTRICAL CHARACTERISTICS ($T_J$=25°C, unless otherwise specified)

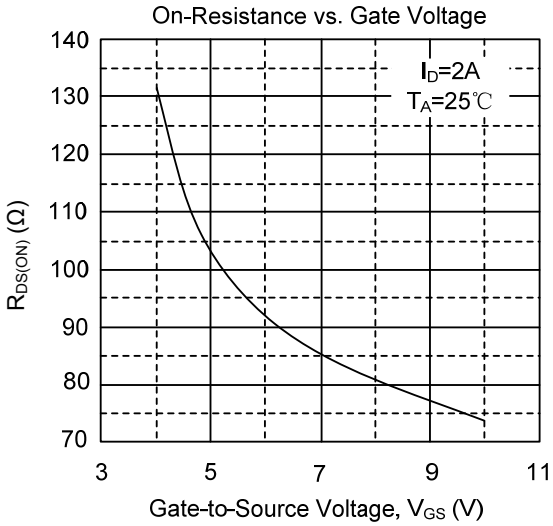
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250uA | 30 | | | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=30V,$V_{GS}$=0V | | | 1 | μA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | | | ±100 | nA |
| Breakdown Voltage Temperature Coefficient | $\Delta BV_{DSS}/\Delta T_J$ | Reference to 25°C, $I_D$=1mA | | 0.1 | | V/°C |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 1 | | 3 | V |
| Static Drain-Source On-State Resistance (Note 2) | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=2.5A | | | 117 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=2A | | | 190 | mΩ |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$=0V,$V_{DS}$=25V, f=1.0MHz | | 120 | 190 | pF |
| Output Capacitance | $C_{OSS}$ | | | 62 | | pF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 24 | | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn-ON Delay Time (Note 2) | $t_{D(ON)}$ | $V_{DS}$=15V, $V_{GS}$=10V, $I_D$=1A, $R_G$=3.3Ω, $R_D$=15 Ω | | 5 | | ns |
| Turn-ON Rise Time | $t_R$ | | | 9 | | ns |
| Turn-OFF Delay Time | $t_{D(OFF)}$ | | | 11 | | ns |
| Turn-OFF Fall Time | $t_F$ | | | 2 | | ns |
| Total Gate Charge (Note 2) | $Q_G$ | $V_{DS}$=24V, $V_{GS}$=4.5V, $I_D$=2.5A | | 3 | 5 | nC |
| Gate-Source Charge | $Q_{GS}$ | | | 0.8 | | nC |
| Gate-Drain Charge | $Q_{GD}$ | | | 1.8 | | nC |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | |
| Forward On Voltage (Note 2) | $V_{SD}$ | $V_{GS}$=0V, $I_S$=1.2A | | | 1.2 | V |
| Reverse Recovery Time (Note 2) | $t_{RR}$ | $I_S$=2A, $V_{GS}$=0V, dI/dt=100A/μs | | 24 | | ns |
| Reverse Recovery Charge | $Q_{RR}$ | | | 23 | | nC |

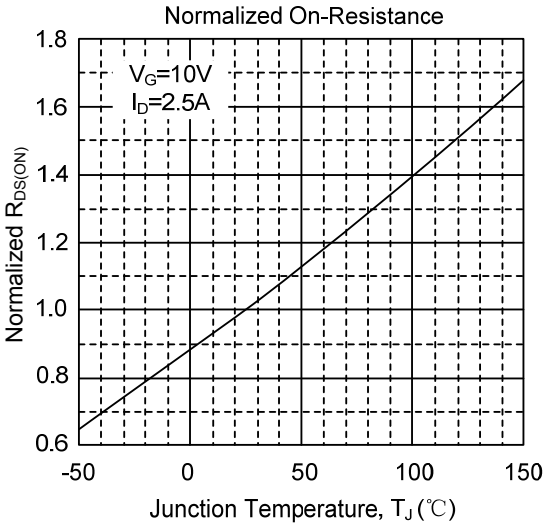
Notes: 1. Pulse width limited by $T_{J(MAX)}$
2. Pulse width ≤300μs, duty cycle ≤2%.
3. Surface mounted on 1 $in^2$ copper pad of FR4 board

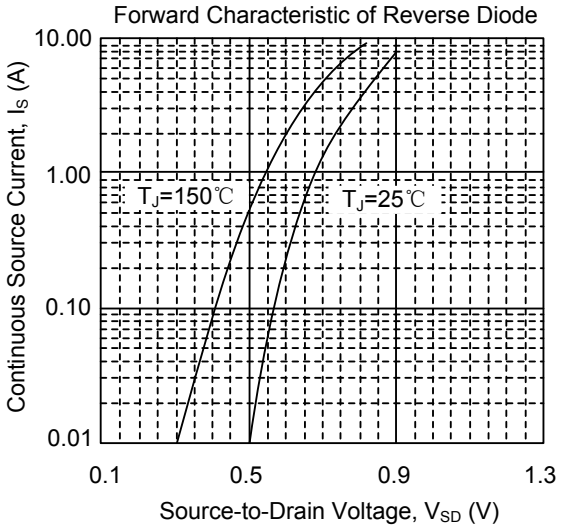
## ■ TYPICAL CHARACTERISTICS

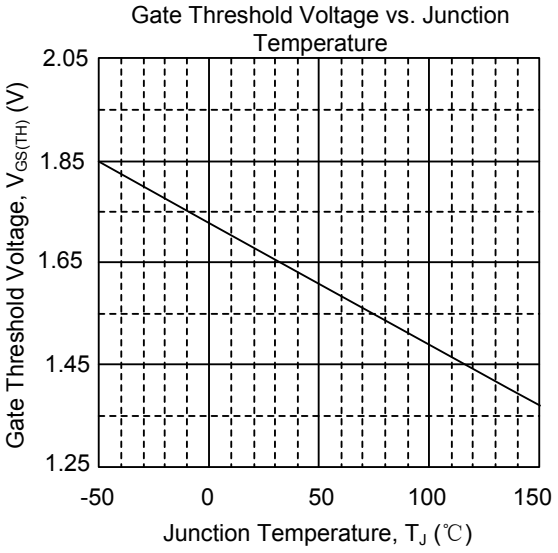


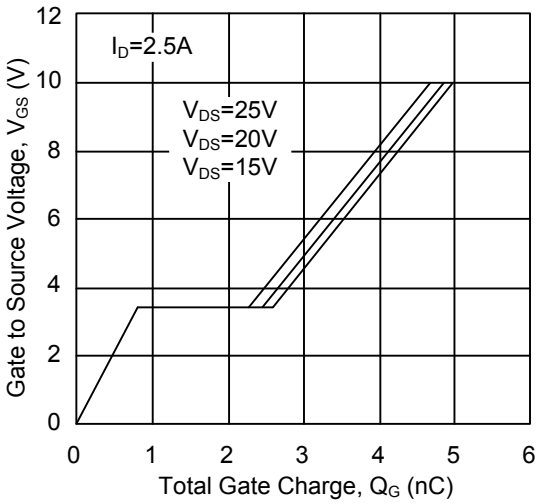



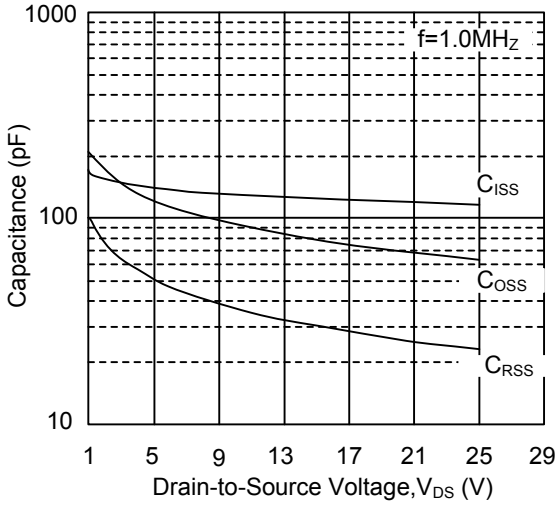



## ■ TYPICAL CHARACTERISTICS(Cont.)

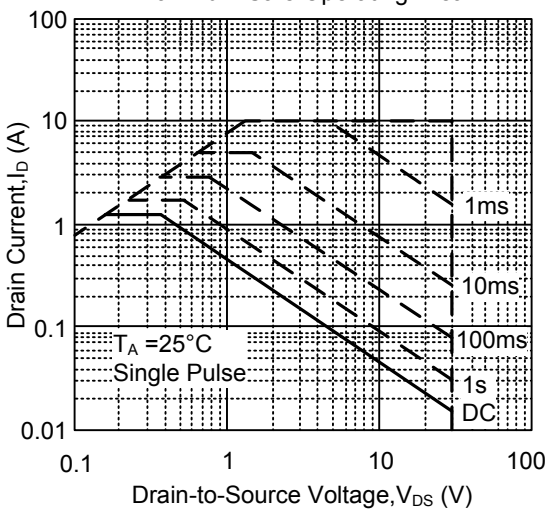
Gate Charge Characteristics



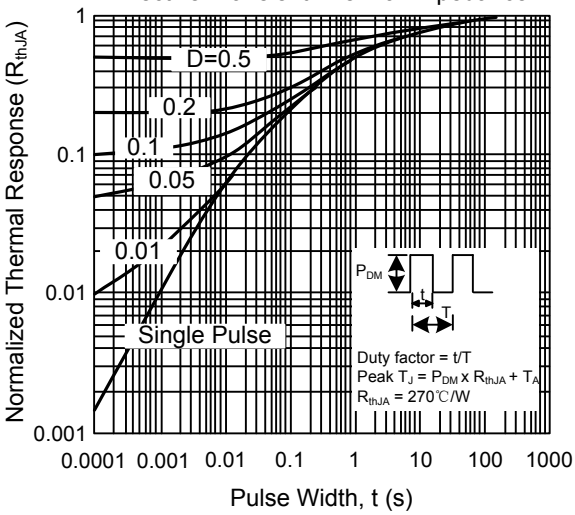

Typical Capacitance Characteristics



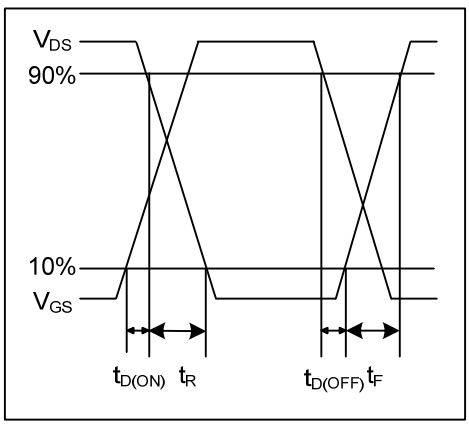

Maximum Safe Operating Area




Effective Transient Thermal Impedance




Switching Time Waveform




Gate Charge Waveform