



## UT2309-H

Preliminary

Power MOSFET

### -3.7A, -30V P-CHANNEL ENHANCEMENT MODE POWER MOSFET

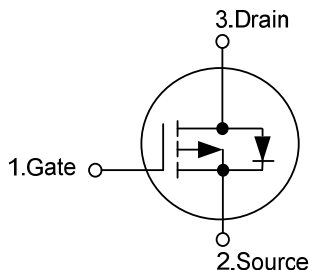
#### DESCRIPTION

The UTC **UT2309-H** is P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

#### FEATURES

- \*  $R_{DS(ON)} < 75\text{ m}\Omega$  @  $V_{GS} = -10\text{V}$ ,  $I_D = -3.0\text{A}$
- \*  $R_{DS(ON)} < 120\text{ m}\Omega$  @  $V_{GS} = -4.5\text{V}$ ,  $I_D = -2.0\text{A}$
- \* Extremely low on-resistance due to high density cell
- \* Perfect thermal performance and electrical capability with advanced technology of trench process

#### SYMBOL

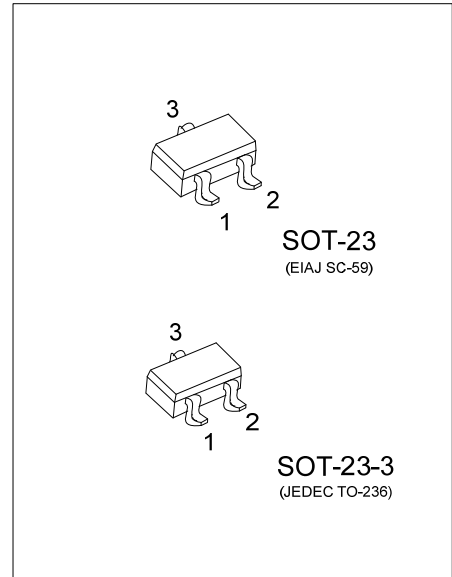


#### ORDERING INFORMATION

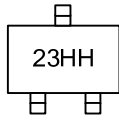
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UT2309L-AE2-R	UT2309G-AE2-R	SOT-23-3	G	S	D	Tape Reel
UT2309L-AE3-R	UT2309G-AE3-R	SOT-23	G	S	D	Tape Reel

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

<b>UT2309G-AE2-R</b>		(1)Packing Type	(1) R: Tape Reel
		(2)Package Type	(2) AE2: SOT-23-3, AE3: SOT-23
		(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free



### ■ MARKING



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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DS}$	-30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	-3.7	A
Pulsed Drain Current	$I_{DM}$	-14.8	A
Power Dissipation	$P_D$	1.38	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.

■ THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient (PCB mounted)	$\theta_{JA}$	90	$^\circ\text{C/W}$

Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

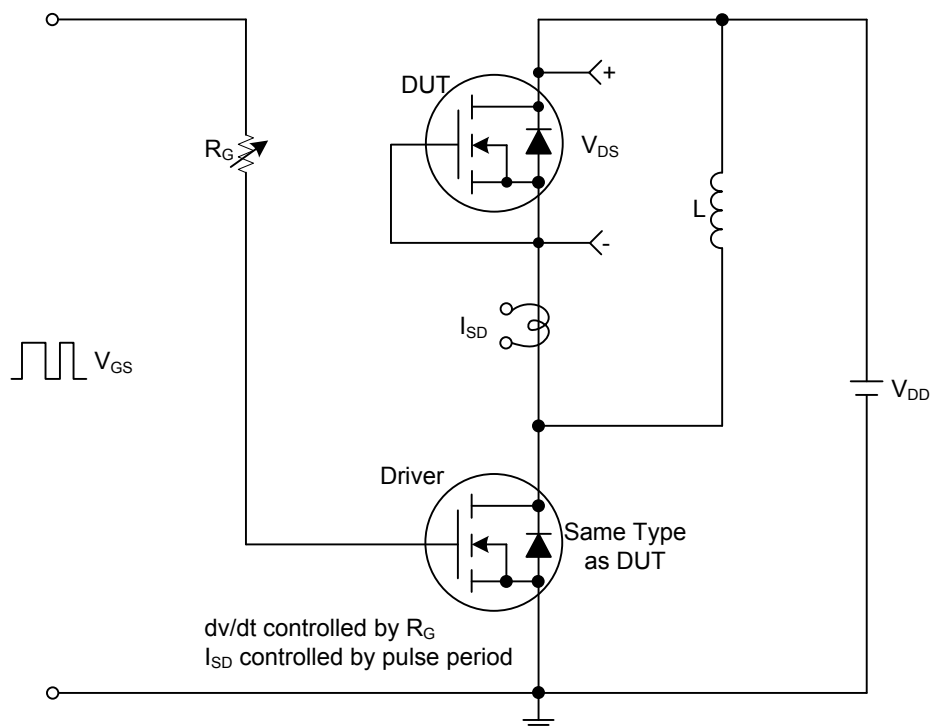
■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA	-30			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C			-1	μA
		V <sub>DS</sub> = -24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C			-10	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, 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	-1.2		-2.5	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -3.0A			75	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2.0A			120	mΩ
DYNAMIC PARAMETERS <sup>b</sup>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V, f = 1.0MHz		425		pF
Output Capacitance	C <sub>OSS</sub>			53		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			45		pF
SWITCHING PARAMETERS <sup>b</sup>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3.0A		24		nC
Gate Source Charge	Q <sub>GS</sub>			4		nC
Gate Drain Charge	Q <sub>GD</sub>			5		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DS</sub> = -10V, V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -1.0A R <sub>G</sub> = 10Ω		30		ns
Turn-ON Rise Time	t <sub>R</sub>			68		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			106		ns
Turn-OFF Fall-Time	t <sub>F</sub>			186		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I <sub>S</sub>	V <sub>G</sub> = V <sub>D</sub> = 0V , Force Current			-3.7	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				-14.8	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = -3.7A, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C			1.4	V

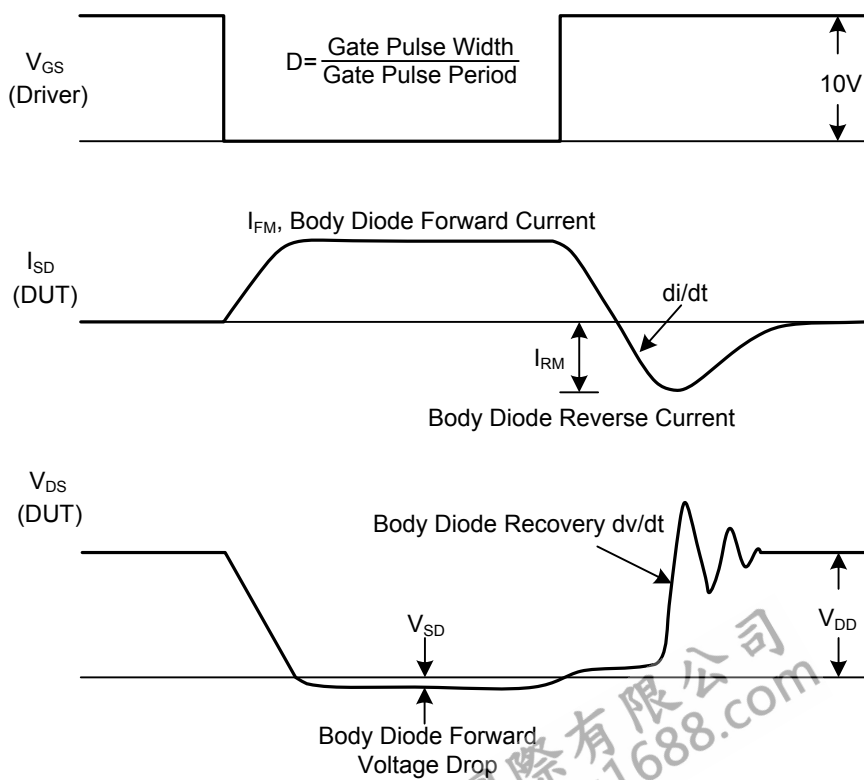
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

# ■ TEST CIRCUITS AND WAVEFORMS



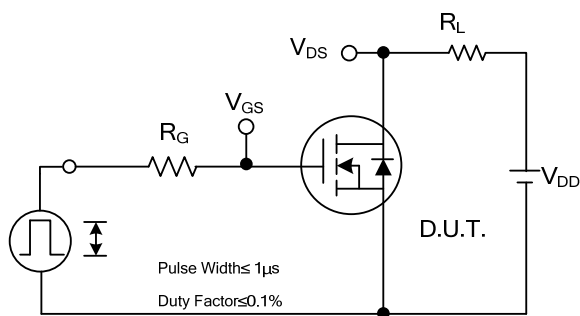
Peak Diode Recovery  $dv/dt$  Test Circuit



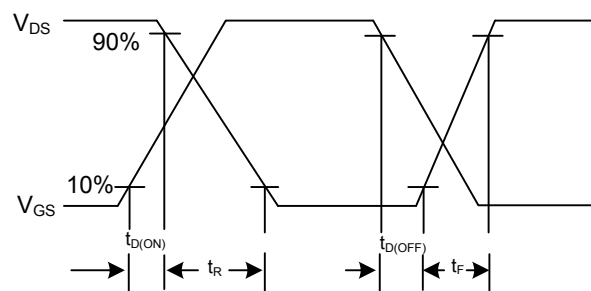
Peak Diode Recovery  $dv/dt$  Test Circuit and Waveforms

Peak Diode Recovery  $dv/dt$  Waveforms

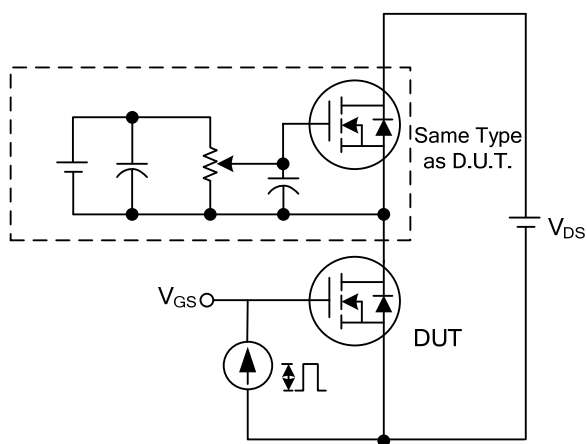
# TEST CIRCUITS AND WAVEFORMS



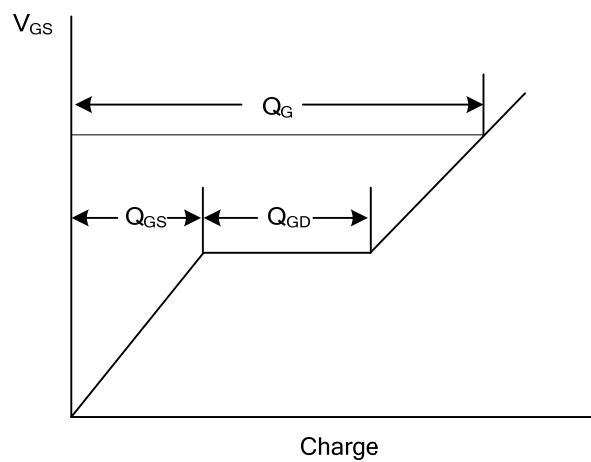
Switching Test Circuit



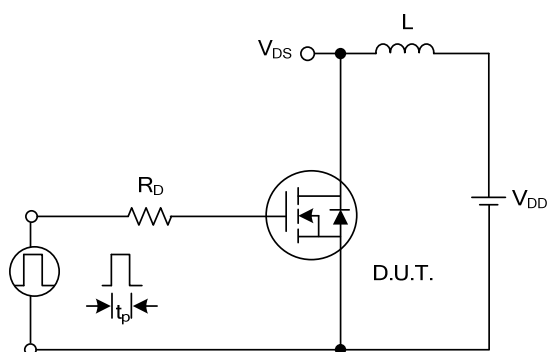
Switching Waveforms



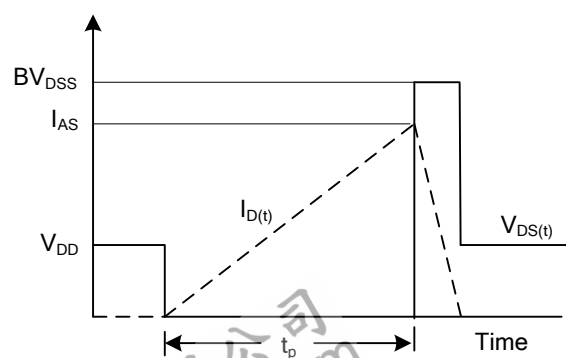
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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