



## UT2309A

Preliminary

Power MOSFET

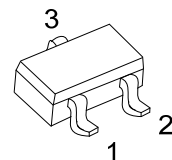
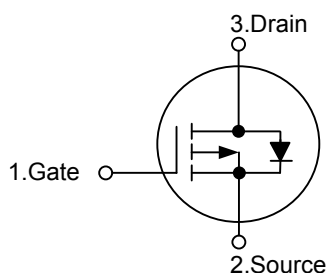
### -3.7A, -30V P-CHANNEL ENHANCEMENT MODE POWER MOSFET

#### DESCRIPTION

The **UT2309A** is a P-channel power MOSFET, designed with high density cell with fast switching speed, ultra low on-resistance and excellent thermal and electrical capabilities.

Used in commercial and industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

#### SYMBOL



SOT-23  
(EIAJ SC-59)

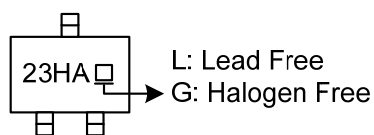
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UT2309AL-AE2-R	UT2309AG-AE2-R	SOT-23-3	G	S	D	Tape Reel
UT2309AL-AE3-R	UT2309AG-AE3-R	SOT-23	G	S	D	Tape Reel

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

UT2309AG-AE3-R	(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 specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DS}$	-30	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	V
Continuous Drain Current	Continuous	$I_D$	-3.7	A
Pulsed Drain Current	Pulsed (Note 2)	$I_{DM}$	-12	A
Avalanche Current (Note 2)		$I_{AR}$	-12	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	7.2	mJ
Peak Diode Recovery $dv/dt$ (Note 4)		$dv/dt$	1.1	V/ns
Total 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  $T_J$ .

3.  $L=0.1\text{mH}$ ,  $I_{AS}=-12\text{A}$ ,  $V_{DD}=-30\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD}\leq 3.0\text{A}$ ,  $di/dt\leq 200\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL CHARACTERISTICS

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

Note: Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board.

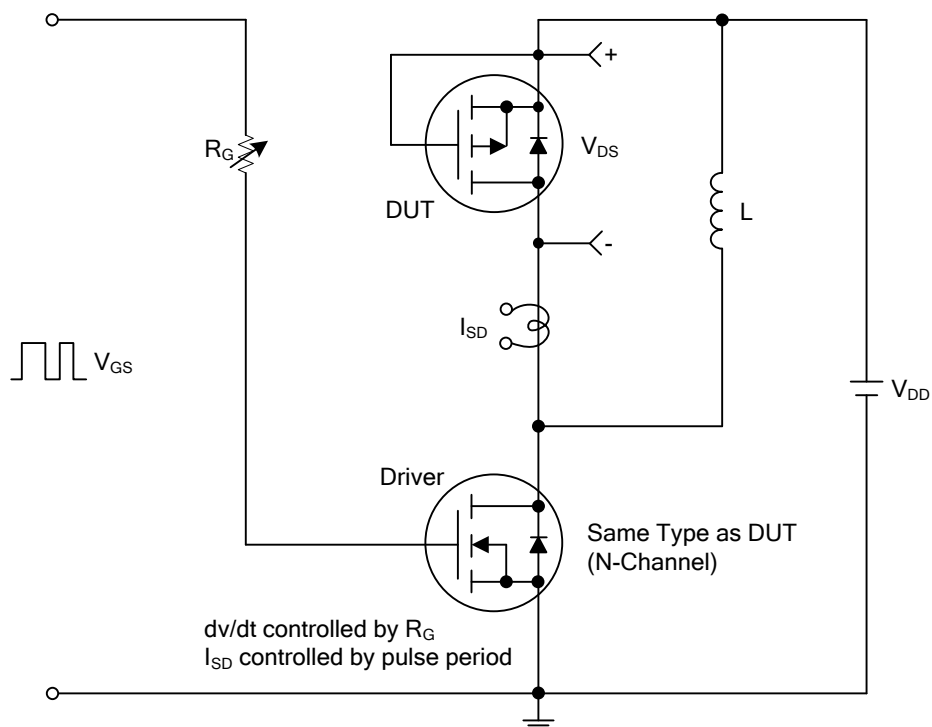
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0\text{ V}$ , $I_D=-250\text{ }\mu\text{A}$	-30			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=-30\text{V}$ , $V_{GS}=0\text{V}$			-0.5	$\mu\text{A}$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20\text{V}$ , $V_{DS}=0\text{V}$			$\pm 100$	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$	-1		-3	V
Static Drain-Source On-Resistance (Note 1)	$R_{DS(ON)}$	$V_{GS}=-10\text{V}$ , $I_D=-3\text{A}$			75	m $\Omega$
		$V_{GS}=-4.5\text{V}$ , $I_D=-2.6\text{A}$			120	m $\Omega$
DYNAMIC CHARACTERISTICS						
Input Capacitance	$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=-25\text{V}$ , $f=1.0\text{MHz}$		705		pF
Output Capacitance	$C_{OSS}$			85		pF
Reverse Transfer Capacitance	$C_{RSS}$			75		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=-30\text{V}$ , $V_{GS}=-10\text{V}$ , $I_D=-0.5\text{A}$		56.5		nC
Gate-Source Charge	$Q_{GS}$			2.8		nC
Gate-Drain Charge	$Q_{GD}$			5.8		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=-30\text{V}$ , $I_D=-0.5\text{A}$ , $R_G=25\Omega$ , $V_{GS}=-10\text{V}$		34		ns
Turn-ON Rise Time	$t_R$			64		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			206		ns
Turn-OFF Fall Time	$t_F$			168		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Continuous Drain-Source Current	$I_S$				-3.7	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				-12	A
Forward On Voltage (Note 1)	$V_{SD}$	$I_S=-1\text{A}$ , $V_{GS}=0\text{V}$			-1.2	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$I_S=-3\text{A}$ , $V_{GS}=0\text{V}$		540		ns
Reverse Recovery Charge	$Q_{rr}$	$dI/dt=-100\text{A}/\mu\text{s}$		1810		nC

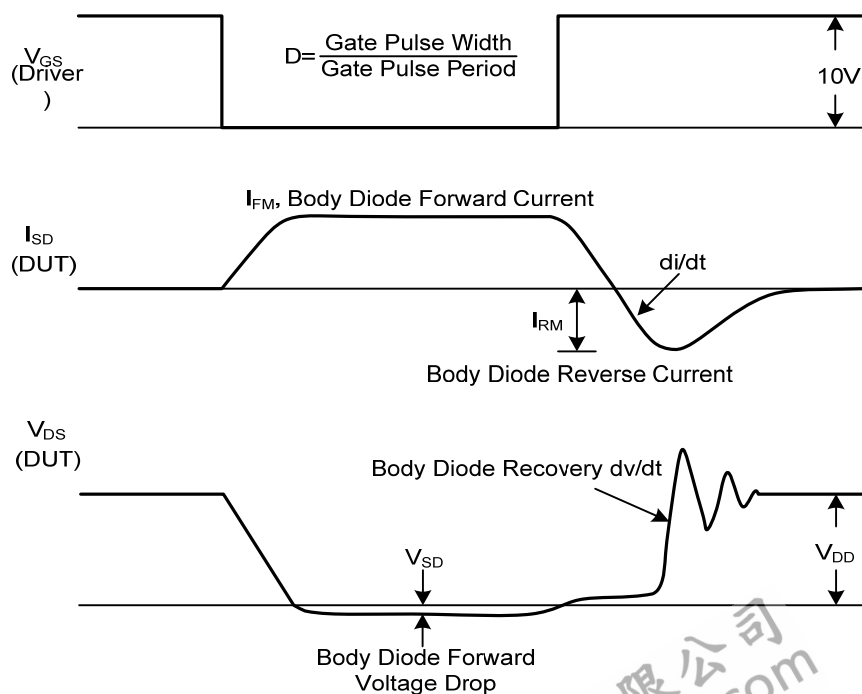
Notes: 1. Pulse Test: Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

# ■ TEST CIRCUITS AND WAVEFORMS

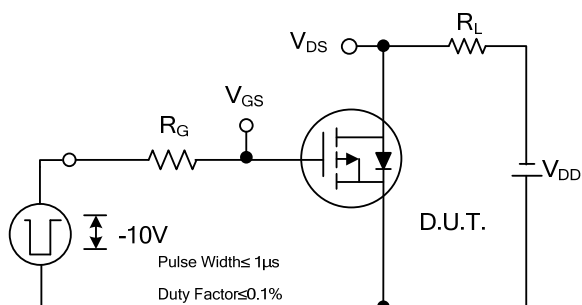


Peak Diode Recovery  $dv/dt$  Test Circuit

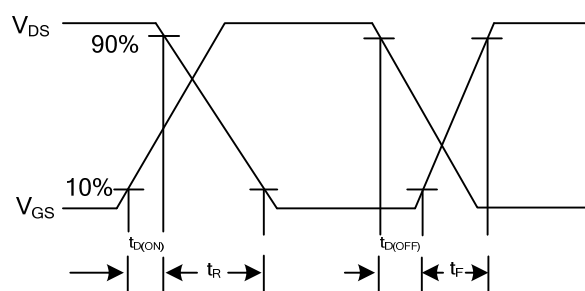


Peak Diode Recovery  $dv/dt$  Waveforms

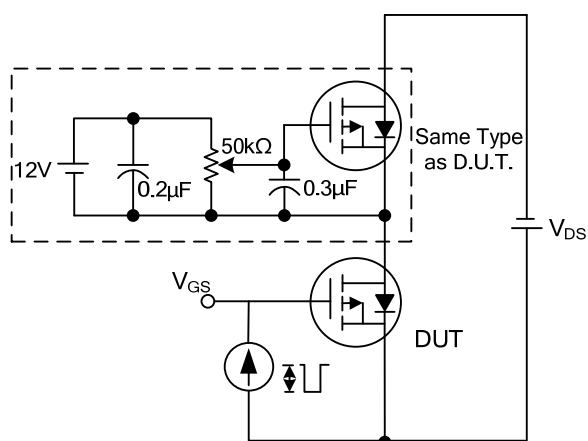
# ■ TEST CIRCUITS AND WAVEFORMS



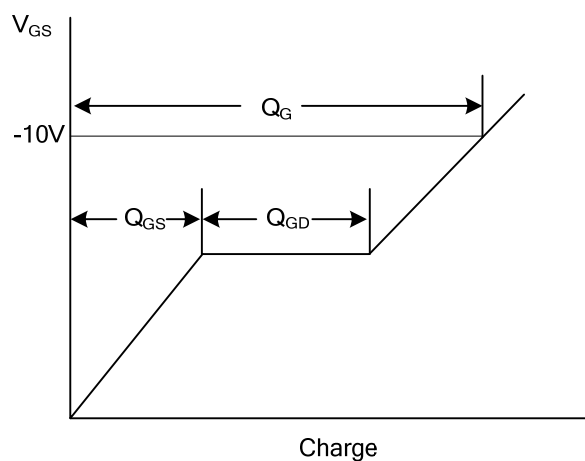
Switching Test Circuit



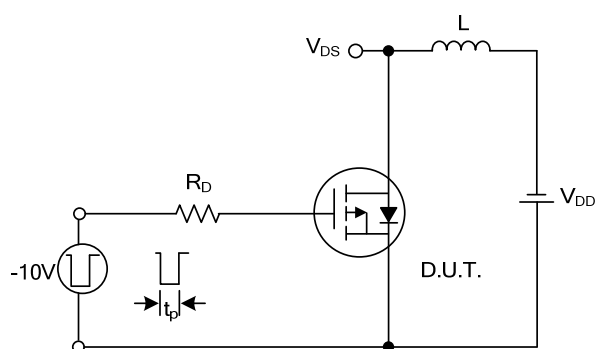
Switching Waveforms



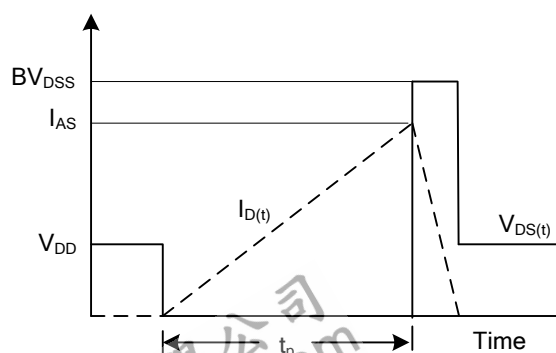
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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