

## UNISONIC TECHNOLOGIES CO., LTD

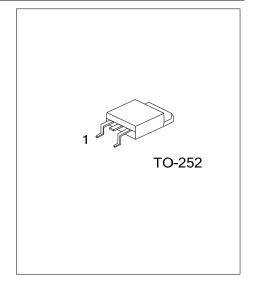
UT3009 Preliminary Power MOSFET

# 30V, 78A N-CHANNEL FAST SWITCHING POWER MOSFETS

### ■ DESCRIPTION

The UTC **UT3009** is an N-channel enhancement power MOSFET using UTC's advanced technology to provide the customers with perfect  $R_{\rm DS(ON)}$ , low gate charge, ultra high cell density and high switching speed.

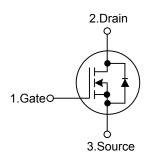
This UTC **UT3009** is suitable for most of the synchronous buck converter applications, etc.



#### **■ FEATURES**

- \*  $R_{DS(ON)}$ =5.5m $\Omega$  @  $V_{DSS}$ =30V, $I_D$ =78A
- \* High Switching Speed
- \* Low Gate Charge(typical 20.8nC)

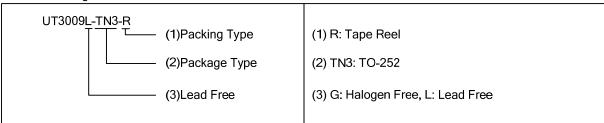
#### ■ SYMBOL



#### **■ ORDERING INFORMATION**

Ordering Number		Doolsono	Pin Assignment			Daakina	
Lead Free	Halogen Free	Package	1	2	3	Packing	
UT3009L-TN3-R	UT3009G-TN3-R	TO-252	G	D	S	Tape Reel	

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



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#### ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	30	V
Gate-Source Voltage		$V_{GSS}$	±20	V
Drain Current	Continuous T <sub>C</sub> =25°C	_	78	Α
	V <sub>GS</sub> @10V (Note 1) T <sub>C</sub> =100°C	I <sub>D</sub>	55	Α
	Pulsed (Note 2)	I <sub>DM</sub>	155	Α
Avalanche Current		$I_{AR}$	48	Α
Single Pulsed Avalanche Energy (Note 3)		E <sub>AS</sub>	252	mJ
Power Dissipation (T <sub>C</sub> =25°C) (Note 4)		$P_D$	53	
Junction Temperature		TJ	-55~175	°C
Storage Temperature		T <sub>STG</sub>	-55~175	°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	RATINGS	UNIT	
Junction to Ambient (Note 1)	$\theta_{JA}$	62	°C/W	
Junction to Case (Note 1)	$\theta_{JC}$	2.8	°C/W	

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

- 2. The data tested by pulsed, pulse width  $\leq$  300µs, duty cycle  $\leq$  2%.
- 3. The EAS data shows Max. rating. The test condition is  $V_{DD}$ =25V,  $V_{GS}$ =10V, L=0.1mH,  $I_{AS}$ =48A.
- 4. The power dissipation is limited by 175°C junction temperature.

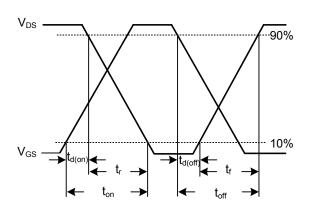
#### ■ **ELECTRICAL CHARACTERISTICS** (T<sub>J</sub>=25°C, unless otherwise specified.)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		$BV_{DSS}$	$I_D=250\mu A, V_{GS}=0V$	30			V
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_{J}$	Reference to 25°C, I <sub>D</sub> =1mA		96.4		mV/°C
Drain-Source Leakage Current		I <sub>DSS</sub>	$V_{DS} = 24V, V_{GS} = 0V$ $\frac{T_J = 25^{\circ}C}{T_J = 55^{\circ}C}$			1	μA
			T <sub>J</sub> =55°C			5	
Gate- Source Leakage Current	Forward	loos	$V_{GS}$ =+20V, $V_{DS}$ =0V			+100	nA
	Reverse	- I <sub>GSS</sub>	$V_{GS}$ =-20V, $V_{DS}$ =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage	Gate Threshold Voltage		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.5	2.5	V
V <sub>GS(th)</sub> Temperature Coefficient		$\triangle V_{GS(TH)}$	V <sub>DS</sub> -V <sub>GS</sub> , I <sub>D</sub> -250μA		-6.16		mV/°C
Static Drain-Source On-State Resistance			$V_{GS}$ =10V, $I_D$ =30A		4.7	5.5	mΩ
(Note 2)		$R_{DS(ON)}$	V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A		7.5	9	mΩ
Forward Transconductance		<b>g</b> fs	$V_{DS}$ =5V, $I_D$ =30A		22		S
DYNAMIC PARAMETERS		_			-		-
Input Capacitance	ut Capacitance C <sub>ISS</sub>		)/ 0)/ )/ 45)/		2361		pF
Output Capacitance	Output Capacitance		V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1.0MHz		315		pF
Reverse Transfer Capacitance		C <sub>OSS</sub> C <sub>RSS</sub>	1-1.0IVIH2		237		pF
SWITCHING PARAMETERS		_					
Total Gate Charge (4.5V)		$Q_{G}$	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =20V,		20.8		nC
Gate to Source Charge		$Q_GS$	$I_{D}=12A$		5.3		nC
Gate to Drain Charge		$Q_GD$	ID- 1274		10.5		nC
Gate Resistance		$R_{G}$	$V_{GS}$ =0V, $V_{DS}$ =0V, f=1.0MHz		1.7	3.4	Ω
Turn-ON Delay Time		t <sub>D(ON)</sub>		7.2	9	13.5	ns
Rise Time		t <sub>R</sub>	$V_{DD}$ =12V, $V_{GS}$ =10V, $I_{D}$ =5A,	17.3	21.6	32.4	ns
Turn-OFF Delay Time		t <sub>D(OFF)</sub>	$R_G=3.3\Omega$	21.3	26.6	40	ns
Fall-Time		$t_{F}$		8.4	10.5	15.8	ns
SOURCE- DRAIN DIODE RATI	NGS AND CI	HARACTERIS"	TICS				
Maximum Body-Diode Continuo	us	1				70	Λ
Current (Note 1,4)		I <sub>S</sub>	V <sub>D</sub> =V <sub>G</sub> =0V, Force Current			78	Α
Maximum Body-Diode Pulsed Current		I <sub>SM</sub>	vD-vG-uv, Force Current	-		155	^
(Note 2, 4)						155	Α
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
(Note 2)			ISTIA, VGSTUV, IJTZO U			'	V
Single Pulse Avalanche Energy (Note 3)		Eas	V <sub>DD</sub> =25V, L=0.1mH, I <sub>AS</sub> =24A	63			mJ

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

- 2. The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- 3. The Min. value is 100% EAS tested guarantee.
- 4. The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

#### **■ TEST CIRCUITS AND WAVEFORMS**



Switching Time Waveform

$$E_{AS} = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

$$BV_{DSS} - V_{DD}$$

$$I_{AS} - V_{DD}$$

Unclamped Inductive Switching Wave

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