



## UT7400

Preliminary

Power MOSFET

### 2A, 30V N-CHANNEL POWER MOSFET

#### DESCRIPTION

The UTC **UT7400** is a N-channel Power Mosfet, it uses UTC's advanced technology to provide the customers with a minimum on state resistance, etc.

The UTC **UT7400** is suitable for load switch and battery protection applications.

#### FEATURES

\*  $R_{DS(ON)} \leq 96 \text{ m}\Omega$  @  $V_{GS}=10\text{V}$ ,  $I_D=1.9\text{A}$

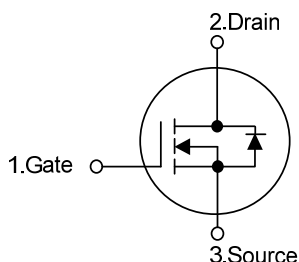
$R_{DS(ON)} \leq 105 \text{ m}\Omega$  @  $V_{GS}=4.5\text{V}$ ,  $I_D=1.6\text{A}$

$R_{DS(ON)} \leq 128 \text{ m}\Omega$  @  $V_{GS}=2.5\text{V}$ ,  $I_D=1.2\text{A}$

$R_{DS(ON)} \leq 180 \text{ m}\Omega$  @  $V_{GS}=1.8\text{V}$ ,  $I_D=0.7\text{A}$

\* Low thermal resistance

#### SYMBOL



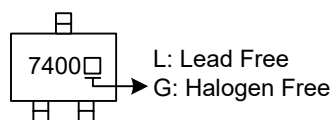
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UT7400L-AL3-R	UT7400G-AL3-R	SOT-323	G	S	D	Tape Reel

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

	(1) Packing Type	(1) R: Tape Reel
	(2) Package Type	(2) AL3: SOT-323
	(3) Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

#### MARKING



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

PARAMETER	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current (Note 3)	$I_D$	2	A
Pulsed Drain Current (Note 1, 2)	$I_{DM}$	8	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_D$	0.2	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 DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient (Note )	$\theta_{JA}$	625	$^\circ\text{C/W}$

Note: Device mounted on FR-4 substrate  $P_c$  board, 2oz copper, with 1inch square copper plate.

■ 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> =24V, V <sub>GS</sub> =0V			1	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V			±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	0.6		1.8	V
Drain-Source On-State Resistance (Note 2)	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =1.9A			96	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =1.6A			105	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =1.2A			128	mΩ
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =0.7A			180	mΩ
DYNAMIC CHARACTERISTICS						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1.0MHz		152		pF
Output Capacitance	C <sub>OSS</sub>			28		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			21		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =24V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A (Note 1,2)		7.2		nC
Gate-Source Charge	Q <sub>GS</sub>			1.6		nC
Gate-Drain Charge	Q <sub>GD</sub>			1.1		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =2A, R <sub>G</sub> =3Ω (Note 1,2)		3		ns
Turn-ON Rise Time	t <sub>R</sub>			16		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			19		ns
Turn-OFF Fall Time	t <sub>F</sub>			18		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				2	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				8	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =2A, V <sub>GS</sub> =0V			1.2	V

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

2. Essentially independent of operating temperature.

[illegible]

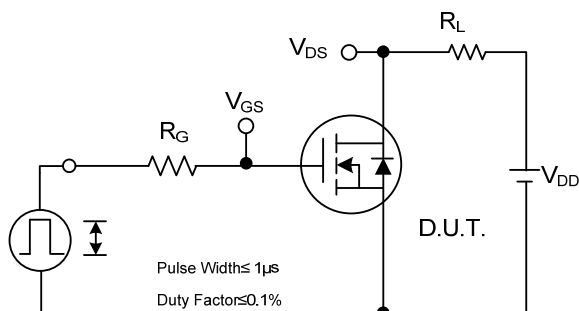
The diagram illustrates the timing relationships for a MOSFET's body diode during switching. It consists of three vertically aligned waveforms:

- Top Trace ( $V_{GS}$  (Driver)):** A square wave representing the gate voltage. The pulse width is labeled **P.W.**, and the total duration of one cycle is labeled **Period**. The duty cycle is given by the formula  $D = \frac{P.W.}{Period}$ . The peak voltage is indicated as  $V_{GS} = 10V$ .
- Middle Trace ( $I_{SD}$  (D.U.T.)):** The source-drain current. During the  $V_{GS}$  pulse, it shows a forward current  $I_{FM}$  (Body Diode Forward Current). When  $V_{GS}$  is low, it shows a reverse current  $I_{RM}$  (Body Diode Reverse Current) with a negative slope labeled  $di/dt$ .
- Bottom Trace ( $V_{DS}$  (D.U.T.)):** The drain-source voltage. It shows a trapezoidal waveform. The rising edge is labeled **Body Diode Recovery  $dv/dt$** . The peak voltage is  $V_{DD}$ .

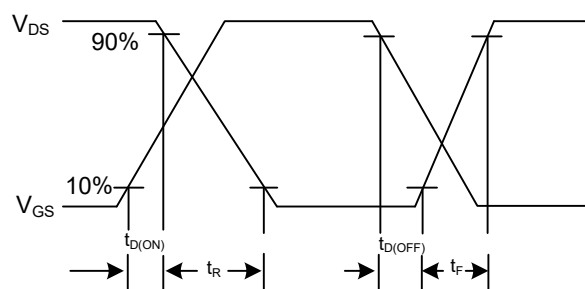
At the bottom, two regions are identified: **Body Diode** (during the reverse current phase) and **Forward Voltage Drop** (during the forward current phase).

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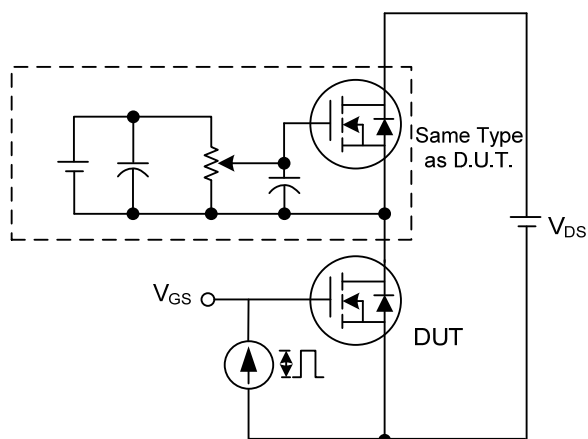
# ■ TEST CIRCUITS AND WAVEFORMS



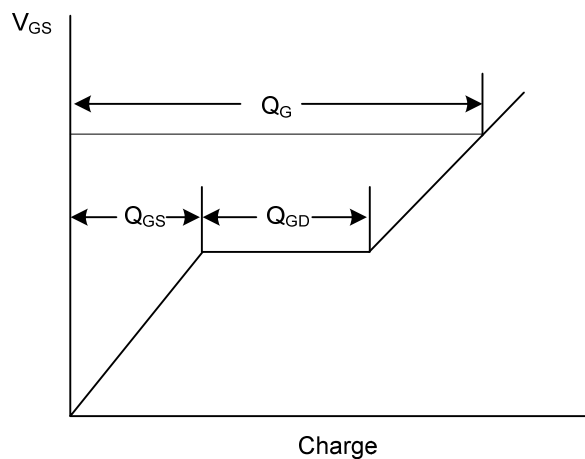
Switching Test Circuit



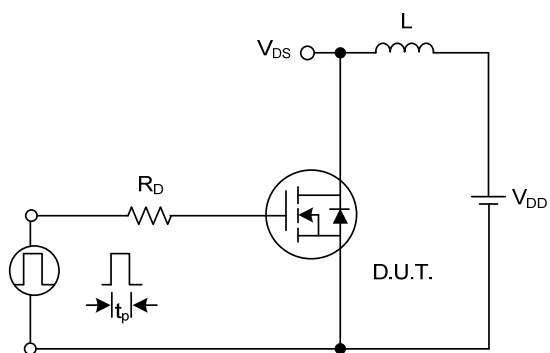
Switching Waveforms



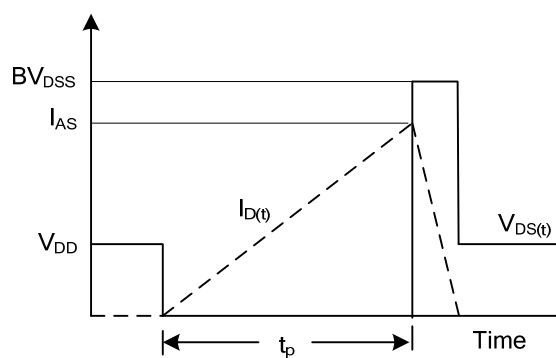
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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