



## UTT9NP03

Preliminary

Power MOSFET

### 30V DUAL MIDDLE POWER MOSFET (N-CHANNEL/P-CHANNEL)

#### DESCRIPTION

The UTC **UTT9NP03** is a 30V N-Channel & P-Channel middle Power MOSFET, it uses UTC's advanced technology to provide the customers with a minimum on state resistance, etc.

The UTC **UTT9NP03** is suitable for switching.

#### FEATURES

##### \*N-CHANNEL

$R_{DS(on)} \leq 16 \text{ m}\Omega @ V_{GS}=10V, I_D=9.0A$

$R_{DS(on)} \leq 23.7 \text{ m}\Omega @ V_{GS}=4.5V, I_D=7.0A$

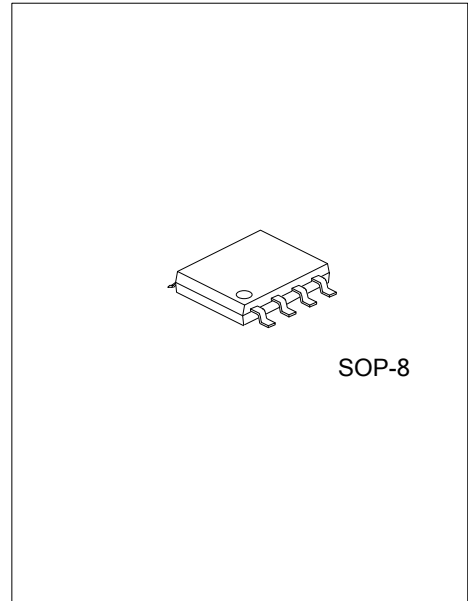
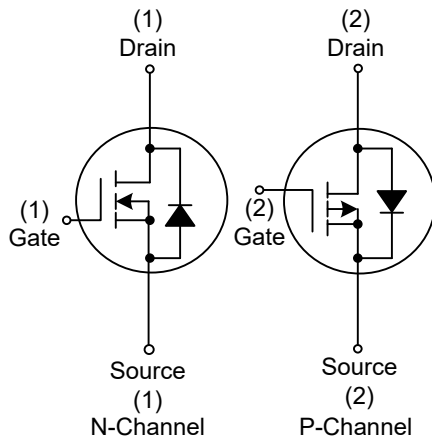
##### \*P-CHANNEL

$R_{DS(on)} \leq 28.6 \text{ m}\Omega @ V_{GS}=-10V, I_D=-8.0A$

$R_{DS(on)} \leq 40.3 \text{ m}\Omega @ V_{GS}=-4.5V, I_D=-5.5A$

\* Low on-resistance

#### SYMBOL



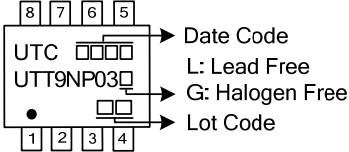
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UTT9NP03L-S08-R	UTT9NP03G-S08-R	SOP-8	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

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

UTT9NP03G-S08-R	(1)Packing Type	(1) R: Tape Reel
	(2)Package Type	(2) S08: SOP-8
	(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	RATINGS		UNIT
			TR1	TR2	
Drain-Source Voltage		$V_{DSS}$	30	-30	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	$\pm 20$	V
Drain Current	Continuous (Note 4)	$I_D$	$\pm 9.0$	$\pm 8.0$	A
	Pulsed (Note 5)	$I_{DP}$	$\pm 18$	$\pm 18$	A
Avalanche Energy, Single Pulse (Note 3)		$E_{AS}$	3.5	2.2	mJ
Avalanche Current (Note 3)		$I_{AS}$	7.0	-5.5	A
Power Dissipation	Total	$P_D$ (Note 4)	2.6		W
		$P_D$ (Note 6)	1.5		W
	Element	$P_D$ (Note 6)	1.25		W
Junction Temperature		$T_J$	+150		$^\circ\text{C}$
Range of 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. N-CHANNEL :  $L=0.1\text{mH}$ ,  $V_{DD}=15\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

P-CHANNEL :  $L=0.1\text{mH}$ ,  $V_{DD}=-15\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $P_W \leq 1\text{s}$ , Limited only by maximum temperature allowed.

5.  $P_W \leq 10\ \mu\text{s}$ , Duty cycle  $\leq 1\%$ .

6. Mounted on a ceramic board.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient (Note 6)	$\theta_{JA}$	83.3	$^\circ\text{C/W}$

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified)

**N-CHANNEL**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> =1mA, V <sub>GS</sub> =0V	30			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V			1	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V			±100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =1mA	1.0		2.5	V
Static Drain-Source On-State Resistance (Pulsed)	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =9.0A		12.3	16	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =7.0A		18.2	23.7	mΩ
Transconductance (Pulsed)	g <sub>FS</sub>	V <sub>GS</sub> =5V, I <sub>D</sub> =7A	4.4			S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1.0MHz		640		pF
Output Capacitance	C <sub>OSS</sub>			110		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			90		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Pulsed)	Q <sub>G</sub>	V <sub>GS</sub> =4.5V, V <sub>DD</sub> =15V, I <sub>D</sub> =9A (Note 1, 2)		7.9		nC
Gate to Source Charge (Pulsed)	Q <sub>GS</sub>			3.1		nC
Gate to Drain Charge (Pulsed)	Q <sub>GD</sub>			2.8		nC
Turn-ON Delay Time (Pulsed)	t <sub>D(ON)</sub>	V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A, R <sub>G</sub> =10Ω, R <sub>L</sub> =3.3Ω (Note 1, 2)		8		ns
Rise Time (Pulsed)	t <sub>R</sub>			19		ns
Turn-OFF Delay Time (Pulsed)	t <sub>D(OFF)</sub>			33		ns
Fall-Time (Pulsed)	t <sub>F</sub>			7		ns
<b>SOURCE TO DRAIN DIODE SPECIFICATIONS</b>						
Body Diode Continuous Forward Current	I <sub>S</sub>	T <sub>A</sub> =25°C			1.0	A
Body Diode Pulse Current (Note 3)	I <sub>SP</sub>				18	A
Forward Voltage (Pulsed)	V <sub>SD</sub>	I <sub>S</sub> =1A, V <sub>GS</sub> =0V			1.2	V

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

3. P<sub>W</sub> ≤ 10μs, Duty cycle ≤ 1%.

■ ELECTRICAL CHARACTERISTICS (Cont.)

**P-CHANNEL**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D = -1mA, V_{GS} = 0V$	-30			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -30V, V_{GS} = 0V$			-1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = -1mA$	-1.0		-2.5	V
Static Drain-Source On-State Resistance (Pulsed)	$R_{DS(ON)}$	$V_{GS} = -10V, I_D = -8.0A$		22.0	28.6	m $\Omega$
		$V_{GS} = -4.5V, I_D = -5.5A$		31.0	40.3	m $\Omega$
Transconductance (Pulsed)	$g_{FS}$	$V_{GS} = -5V, I_D = -5.5A$	5.5			S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0V, V_{DS} = -15V, f = 1.0MHz$		890		pF
Output Capacitance	$C_{OSS}$			160		pF
Reverse Transfer Capacitance	$C_{RSS}$			125		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Pulsed)	$Q_G$	$V_{GS} = -4.5V, V_{DD} = -15V, I_D = -8A$ (Note 1, 2)		9.8		nC
Gate to Source Charge (Pulsed)	$Q_{GS}$			3.0		nC
Gate to Drain Charge (Pulsed)	$Q_{GD}$			3.7		nC
Turn-ON Delay Time (Pulsed)	$t_{D(ON)}$	$V_{DD} = -15V, V_{GS} = -10V, I_D = -4A,$ $R_G = 10\Omega, R_L = 3.8\Omega$ (Note 1, 2)		10		ns
Rise Time (Pulsed)	$t_R$			16		ns
Turn-OFF Delay Time (Pulsed)	$t_{D(OFF)}$			55		ns
Fall-Time (Pulsed)	$t_F$			22		ns
<b>SOURCE TO DRAIN DIODE SPECIFICATIONS</b>						
Body Diode Continuous Forward Current	$I_S$	$T_A = 25^\circ C$			-1.0	A
Body Diode Pulse Current (Note 2)	$I_{SP}$				-18	A
Forward Voltage (Pulsed)	$V_{SD}$	$I_S = -1A, V_{GS} = 0V$			-1.2	V

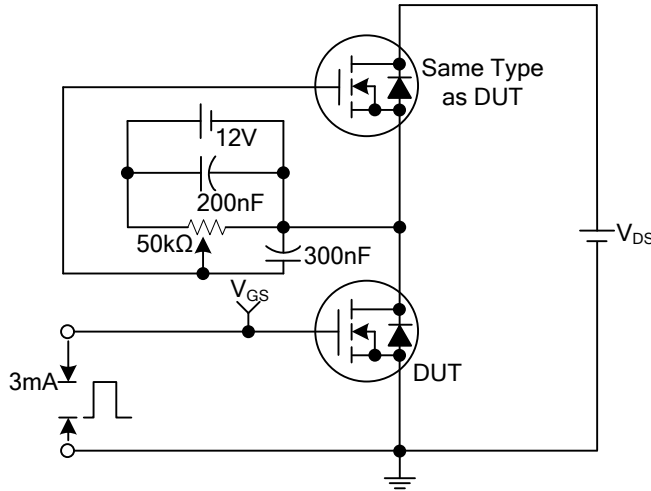
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

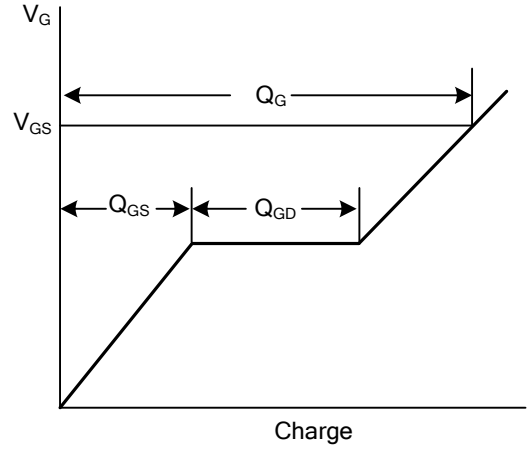
3.  $P_W \leq 10\mu s$ , Duty cycle  $\leq 1\%$ .

TEST CIRCUITS AND WAVEFORMS

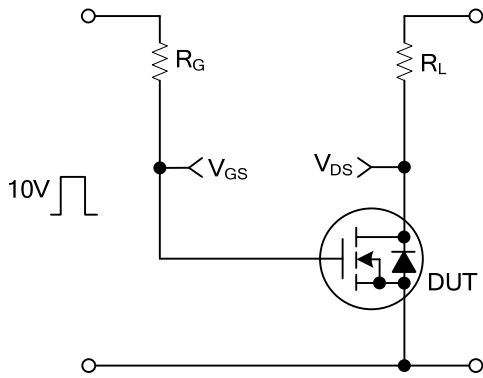
N-CHANNEL



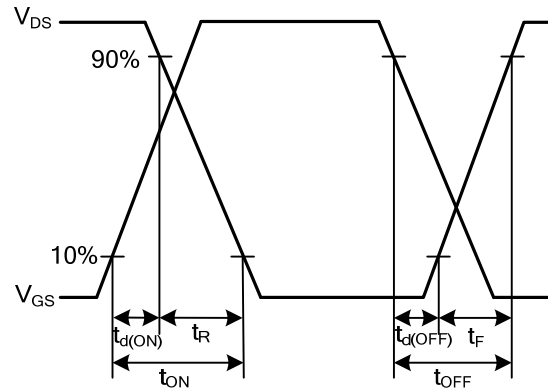
Gate Charge Test Circuit



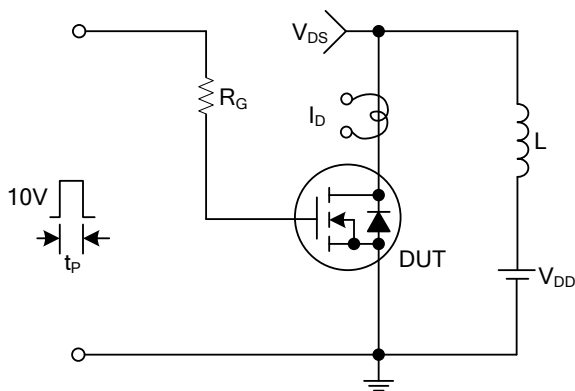
Gate Charge Waveforms



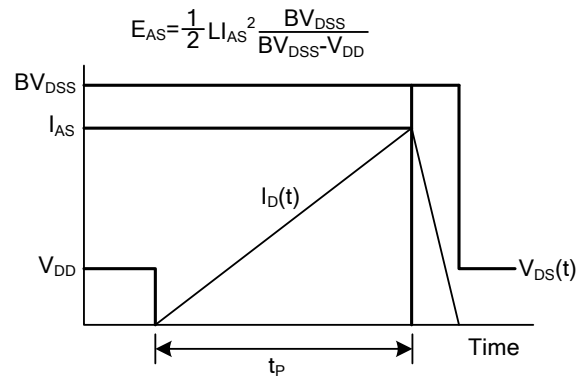
Resistive Switching Test Circuit



Resistive Switching Waveforms



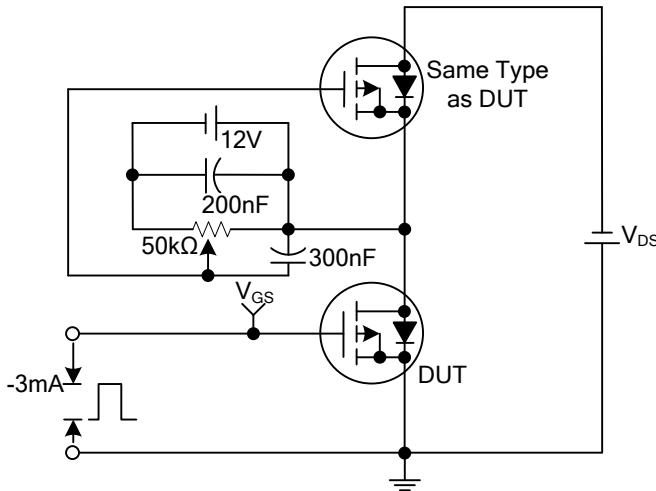
Unclamped Inductive Switching Test Circuit



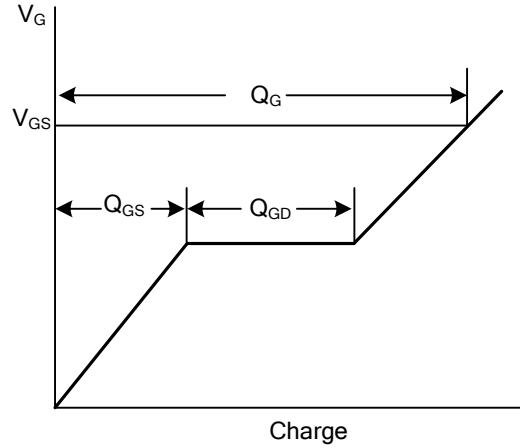
Unclamped Inductive Switching Waveforms

TEST CIRCUITS AND WAVEFORMS (Cont.)

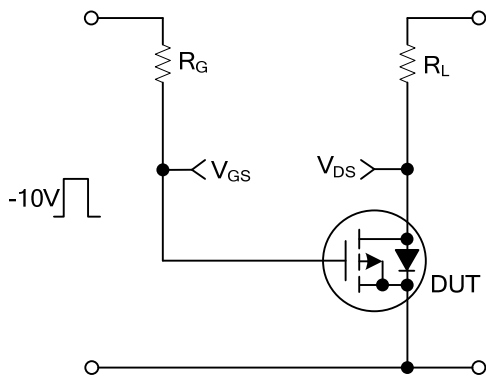
P-CHANNEL



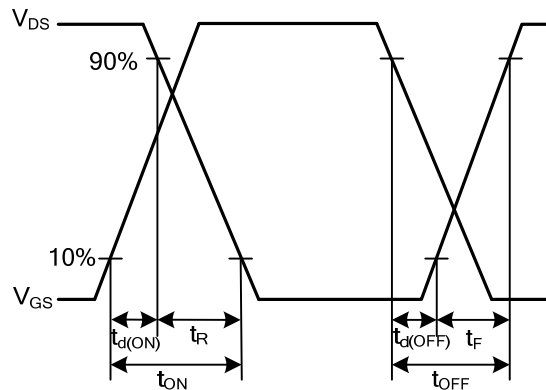
Gate Charge Test Circuit



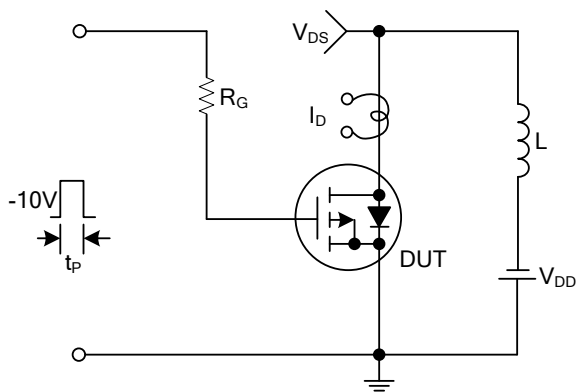
Gate Charge Waveforms



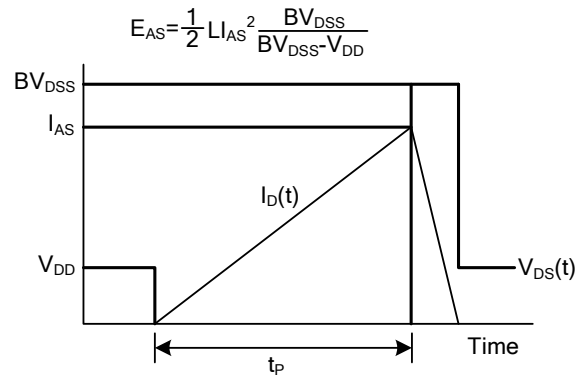
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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