



# UT15NP06

*Power MOSFET*

## DUAL ENHANCEMENT MODE (N-CHANNEL / P-CHANNEL)

■ DESCRIPTION

The UTC **UT15NP06** incorporates a N-channel MOSFET and a P-channel MOSFET, it uses UTC's advanced technology to provide customers a minimum on-state resistance, high switching speed, low gate charge and cost effectiveness.

The UTC **UT15NP06** is universally applied in low voltage applications.

■ FEATURES

\*N-CHANNEL

$$R_{DS(on)} \leq 60 \text{ m}\Omega @ V_{GS}=10V, I_D=12A$$

$$R_{DS(on)} \leq 110 \text{ m}\Omega @ V_{GS}=4.5V, I_D=8.0A$$

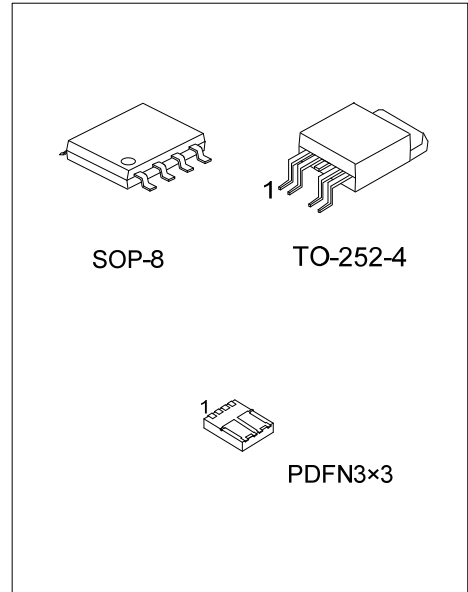
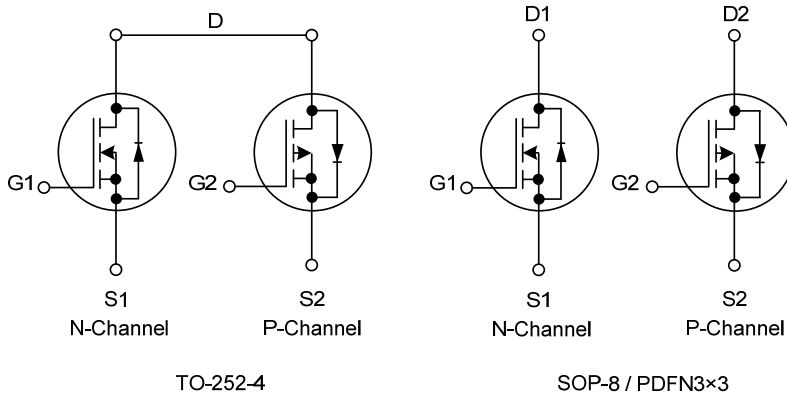
\*P-CHANNEL

$$R_{DS(on)} \leq 115 \text{ m}\Omega @ V_{GS}=-10V, I_D=-12A$$

$$R_{DS(on)} \leq 170 \text{ m}\Omega @ V_{GS}=-4.5V, I_D=-8.0A$$

\* High switching speed

■ SYMBOL



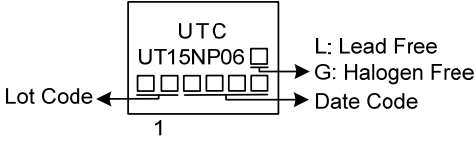
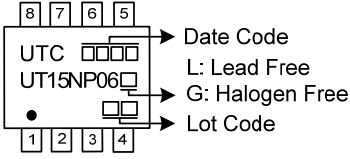
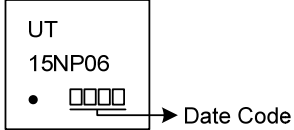
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT15NP06L-TN4-R	UT15NP06G-TN4-R	TO-252-4	S1	G1	D	S2	G2	-	-	-	Tape Reel
UT15NP06L-S08-R	UT15NP06G-S08-R	SOP-8	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel
UT15NP06L-P3030-R	UT15NP06G-P3030-R	PDFN3x3	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

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

<p>UT15NP06G-TN4-R</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel (2) TN4: TO-252-4, S08: SOP-8, P3030: PDFN3x3 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

PACKAGE	MARKING
TO-252-4	 <p>UTC UT15NP06 Lot Code → [ ] [ ] [ ] [ ] [ ] → Date Code 1</p> <p>L: Lead Free G: Halogen Free</p>
SOP-8	 <p>8 7 6 5 → Date Code UTC [ ] [ ] [ ] UT15NP06 [ ] • [ ] [ ] → Lot Code 1 2 3 4</p> <p>L: Lead Free G: Halogen Free</p>
PDFN3x3	 <p>UT 15NP06 • [ ] [ ] [ ] → Date Code</p>

### ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER			SYMBOL	RATINGS		UNIT
				N-CHANNEL	P-CHANNEL	
Drain-Source Voltage			$V_{DSS}$	60	-60	V
Gate-Source Voltage			$V_{GSS}$	$\pm 20$	$\pm 20$	V
Drain Current	Continuous	$T_A=25^\circ\text{C}$	$I_D$	15	-15	A
	Pulsed (Note 1)		$I_{DM}$	30	-30	A
Avalanche Energy, Single Pulse (Note 2)			EAS	9.8	17	mJ
Power Dissipation	$T_C=25^\circ\text{C}$	TO-252-4	$P_D$	36		W
		SOP-8		1.25		W
		PDFN3x3		28		W
Junction Temperature			$T_J$	-55 ~ +150		$^\circ\text{C}$
Storage Temperature Range			$T_{STG}$	-55 ~ +150		$^\circ\text{C}$

Note: 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. N-Channel:  $L=0.1\text{mH}$ ,  $I_{AS}=14\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$

P-Channel:  $L=0.1\text{mH}$ ,  $I_{AS}=-18.6\text{A}$ ,  $V_{DD}=-50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$

### ■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-252-4			
	SOP-8	125	$^\circ\text{C/W}$	
	PDFN3x3	60	$^\circ\text{C/W}$	
Junction to Case	TO-252-4	$\theta_{JC}$	3.47	$^\circ\text{C/W}$
	SOP-8		100	$^\circ\text{C/W}$
	PDFN3x3		4.46	$^\circ\text{C/W}$

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)

**N-Channel**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$			1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0		3.0	V
Drain to Source On-state Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=12A$		50	60	m $\Omega$
		$V_{GS}=4.5V, I_D=8.0A$		72	110	m $\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$		380		pF
Output Capacitance	$C_{OSS}$			42		pF
Reverse Transfer Capacitance	$C_{RSS}$			30		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note)	$Q_G$	$V_{GS}=10V, V_{DS}=48V, I_D=12A$		15		nC
Gate Source Charge	$Q_{GS}$			2.8		nC
Gate Drain Charge	$Q_{GD}$			3		nC
Turn-ON Delay Time (Note)	$t_{D(ON)}$	$V_{DD}=30V, V_{GS}=10V, I_D=12A, R_G=3.3\Omega$		5		ns
Turn-ON Rise Time	$t_R$			16		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			17		ns
Turn-OFF Fall-Time	$t_F$			18		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Drain-Source Diode Forward Voltage (Note)	$V_{SD}$	$I_S=15A, V_{GS}=0V$		1	1.4	V

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

2. Essentially independent of operating temperature.

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

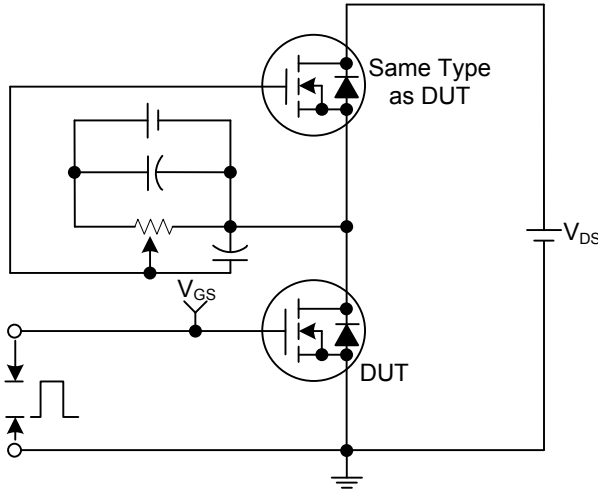
#### P-Channel

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-60			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-60V, V_{GS}=0V$			-1	$\mu A$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Cutoff Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0		-3.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-12A$		85	115	m $\Omega$
		$V_{GS}=-4.5V, I_D=-8.0A$		140	170	m $\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=-20V, V_{GS}=0V, f=1.0MHz$		800		pF
Output Capacitance	$C_{OSS}$			60		pF
Reverse Transfer Capacitance	$C_{RSS}$			45		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=-48V, V_{GS}=-10V, I_D=-12A$		20		nC
Gate to Source Charge	$Q_{GS}$			3.3		nC
Gate to Drain Charge	$Q_{GD}$			5		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DS}=-30V, V_{GS}=-10V, I_D=-12A, R_G=3\Omega$		6		ns
Rise Time	$t_R$			16		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			30		ns
Fall-Time	$t_F$			18		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Diode Forward Voltage	$V_{SD}$	$I_S=-15.0A, V_{GS}=0V$		-1	-1.4	V

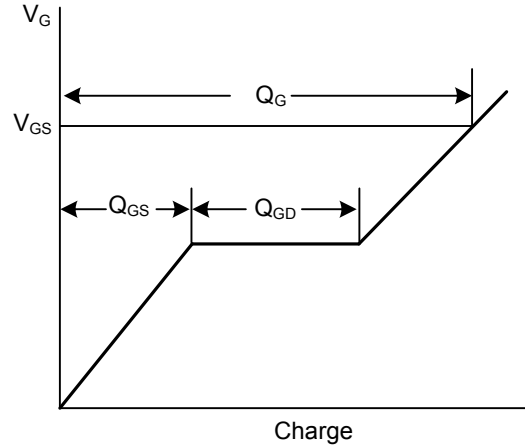
- Notes: 1. Pulse width limited by maximum junction temperature  
 2. Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$

### TEST CIRCUITS AND WAVEFORMS

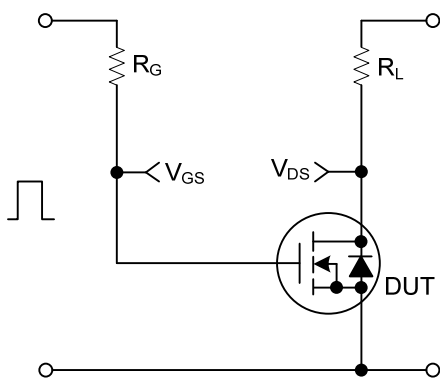
#### N-CHANNEL



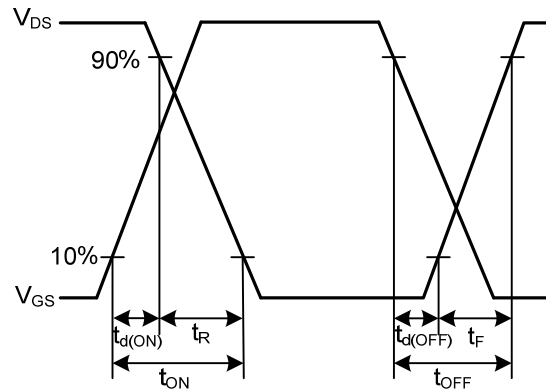
Gate Charge Test Circuit



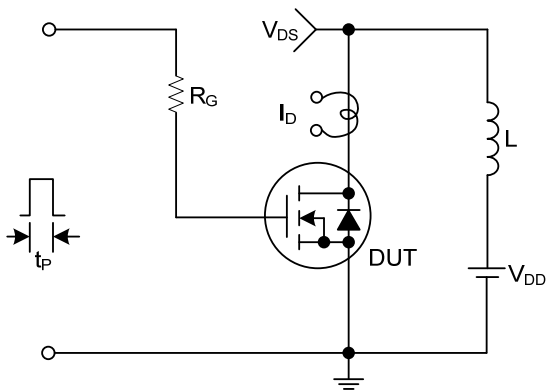
Gate Charge Waveforms



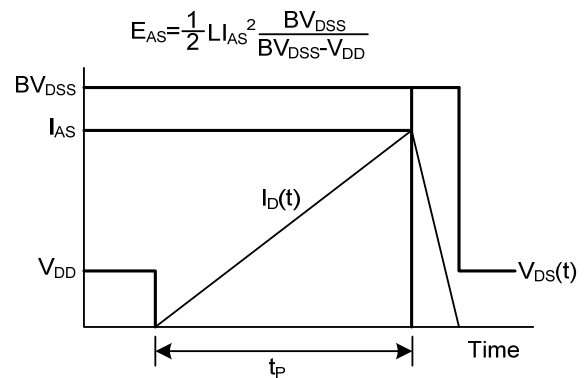
Resistive Switching Test Circuit



Resistive Switching Waveforms



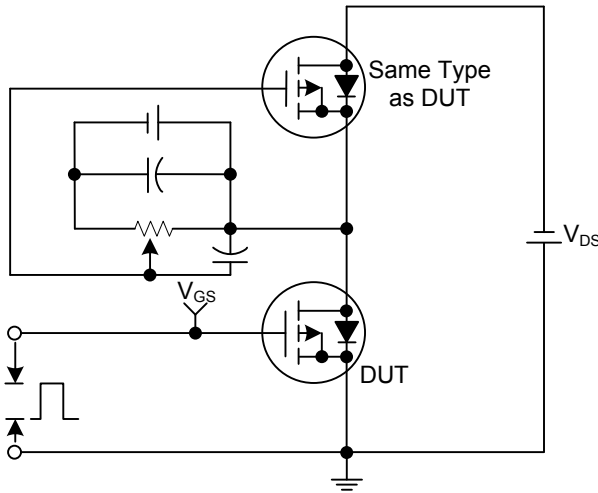
Unclamped Inductive Switching Test Circuit



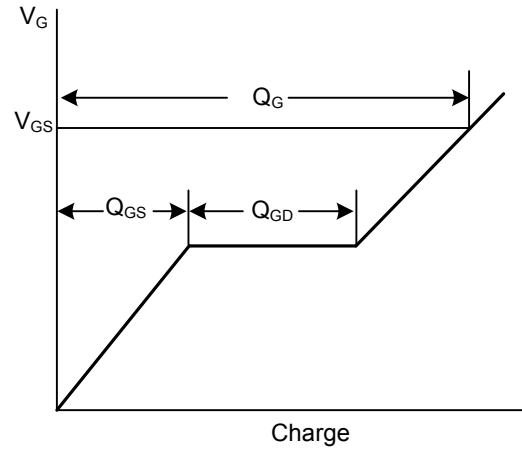
Unclamped Inductive Switching Waveforms

## TEST CIRCUITS AND WAVEFORMS

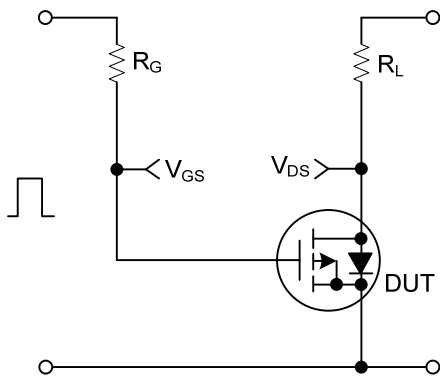
### P-CHANNEL



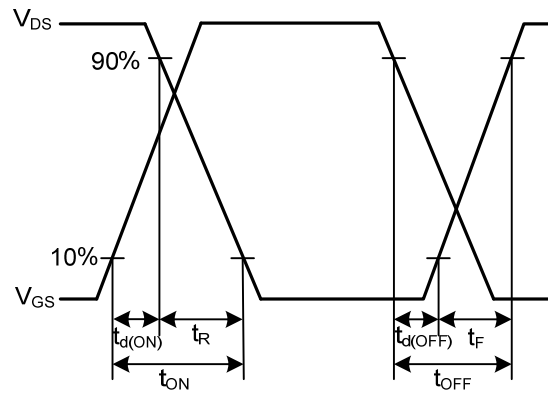
Gate Charge Test Circuit



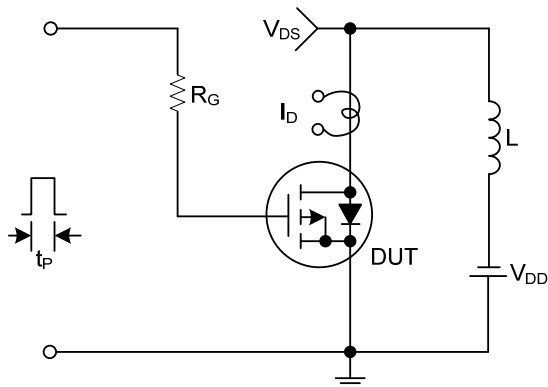
Gate Charge Waveforms



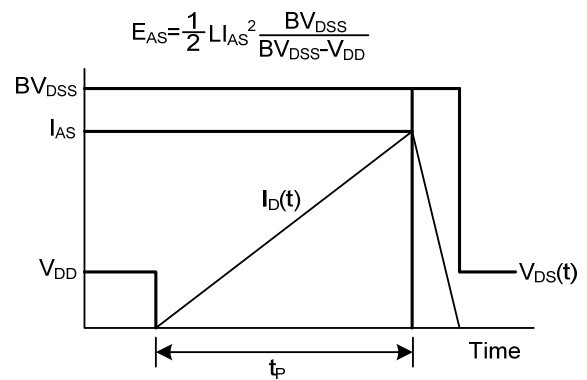
Resistive Switching Test Circuit



Resistive Switching Waveforms

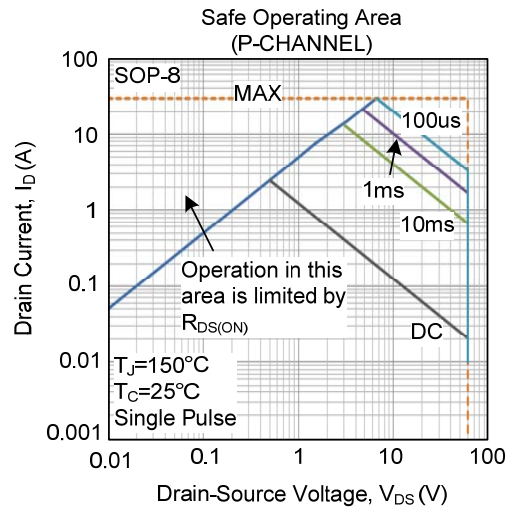
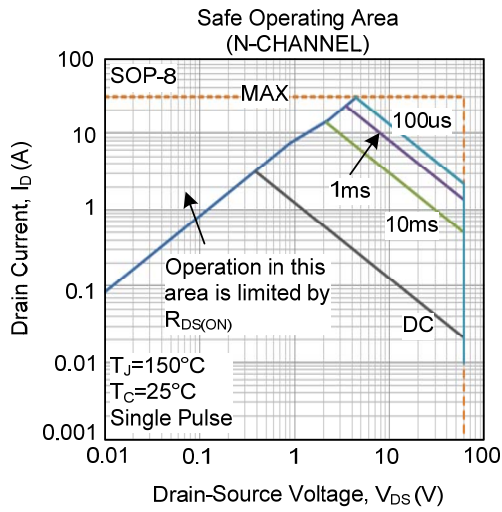


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

## ■ TYPICAL CHARACTERISTICS



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