



UT12NP10

Preliminary

Power MOSFET

**DUAL MIDDLE POWER MOSFET
(N-CHANNEL/P-CHANNEL)**

■ DESCRIPTION

The UTC **UT12NP10** incorporates an N-channel MOSFET and a P-channel MOSFET, it uses UTC's advanced technology to provide customers a minimum on-state resistance and high-speed switching, thereby enabling high-density mounting.

The UTC **UT12NP10** is universally applied in high-speed switching, motor driver.

■ FEATURES

* N-Channel

$$R_{DS(on)} \leq 100 \text{ m}\Omega @ V_{GS}=10V, I_D=8.0A$$

$$R_{DS(on)} \leq 125 \text{ m}\Omega @ V_{GS}=4.5V, I_D=6.0A$$

* P-Channel

$$R_{DS(on)} \leq 165 \text{ m}\Omega @ V_{GS}=-10V, I_D=-8.0A$$

$$R_{DS(on)} \leq 190 \text{ m}\Omega @ V_{GS}=-4.5V, I_D=-6.0A$$

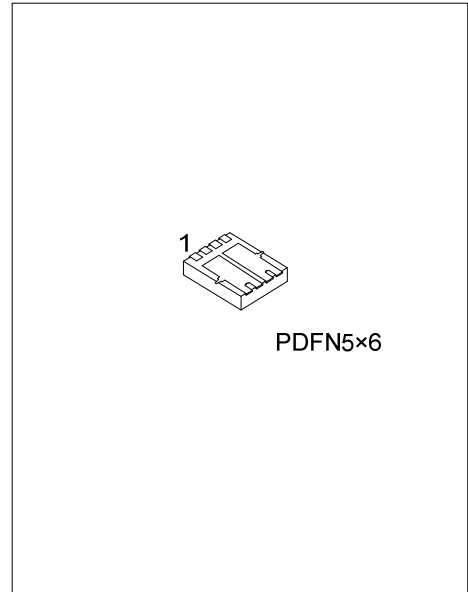
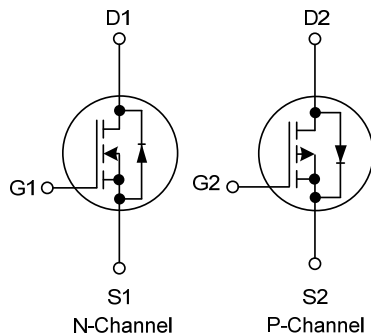
* Enhancement mode

* Low on-resistance RDS(on)

* Low gate charge

* Fast Switching and High efficiency

■ SYMBOL



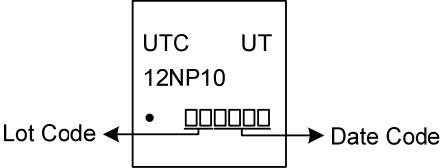
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT12NP10L-P5060-R	UT12NP10G-P5060-R	PDFN5x6	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

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

<p>UT12NP10G-P5060-R</p>	<p>(1) R: Tape Reel (2) P5060: PDFN5x6 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



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

PARAMETER	SYMBOL	RATINGS		UNIT	
		N-CH	P-CH		
Drain-Source Voltage	V_{DSS}	100	-100	V	
Gate-Source Voltage	V_{GSS}	± 20	± 20	V	
Drain Current	Continuous $T_C=25^\circ\text{C}$	I_D	12	-12	A
	Pulsed	I_{DM}	24	-24	A
Avalanche Energy, Single Pulse	E_{AS}	10	50	mJ	
Power Dissipation	P_D	31		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 maximum junction temperature.
3. N-Channel: $L=1.0\text{mH}$, $I_{AS}=4.6\text{A}$, $V_{DD}=25\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.
 P-Channel: $L=1.0\text{mH}$, $I_{AS}=-10\text{A}$, $V_{DD}=-50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	65	$^\circ\text{C/W}$
Junction to Case	θ_{JC}	4 (Note)	$^\circ\text{C/W}$

Note: The data tested by surface mounted on a 1 inch² 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
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	100			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=100\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1.0		3.0	V
Static Drain-Source On-State Resistance (Pulsed)	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=8.0\text{A}$			100	m Ω
		$V_{GS}=4.5\text{V}$, $I_D=6.0\text{A}$			125	m Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		900		pF
Output Capacitance	C_{OSS}			50		pF
Reverse Transfer Capacitance	C_{RSS}			37		pF
SWITCHING PARAMETERS						
Total Gate Charge (Pulsed)	Q_G	$V_{DD}=80\text{V}$, $V_{GS}=10\text{V}$, $I_D=12\text{A}$ $I_G=1\text{mA}$ (Note 1, 2)		26		nC
Gate to Source Charge (Pulsed)	Q_{GS}			5		nC
Gate to Drain Charge (Pulsed)	Q_{GD}			6.2		nC
Turn-ON Delay Time (Pulsed)	$t_{D(ON)}$	$V_{DD}=50\text{V}$, $V_{GS}=10\text{V}$, $I_D=12\text{A}$, $R_G=3\Omega$ (Note 1, 2)		7		ns
Rise Time (Pulsed)	t_R			17		ns
Turn-OFF Delay Time (Pulsed)	$t_{D(OFF)}$			19		ns
Fall-Time (Pulsed)	t_F			18		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				12	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				24	A
Diode Forward Voltage	V_{SD}	$I_S=12\text{A}$, $V_{GS}=0\text{V}$			1.4	V
Reverse Recovery Time (Note 1)	t_{rr}	$I_S=12\text{A}$, $V_{GS}=0\text{V}$ $di/dt=100\text{A}/\mu\text{s}$		40		ns
Reverse Recovery Charge	Q_{rr}			33		nC

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

■ ELECTRICAL CHARACTERISTICS (Cont.)

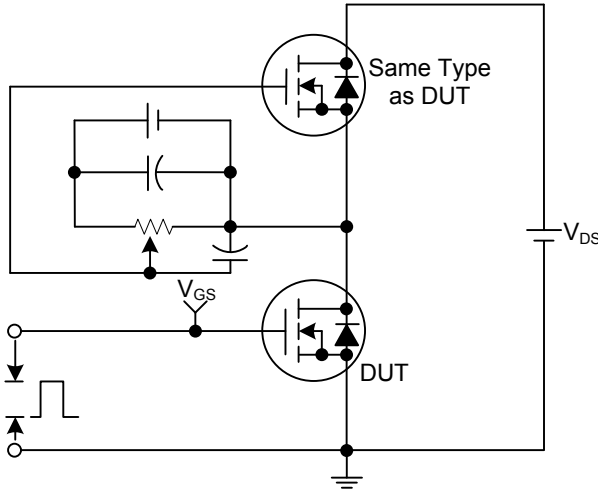
P-CHANNEL

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = -250\mu A, V_{GS} = 0V$	-100			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -100V, V_{GS} = 0V$			-1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1.0		-3.0	V
Static Drain-Source On-State Resistance (Pulsed)	$R_{DS(ON)}$	$V_{GS} = -10V, I_D = -8.0A$			165	m Ω
		$V_{GS} = -4.5V, I_D = -6.0A$			190	m Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS} = 0V, V_{DS} = -25V, f = 1.0MHz$		1520		pF
Output Capacitance	C_{OSS}			83		pF
Reverse Transfer Capacitance	C_{RSS}			70		pF
SWITCHING PARAMETERS						
Total Gate Charge (Pulsed)	Q_G	$V_{DD} = -80V, V_{GS} = -10V, I_D = -12A$ $I_G = -1mA$ (Note 1, 2)		35		nC
Gate to Source Charge (Pulsed)	Q_{GS}			7		nC
Gate to Drain Charge (Pulsed)	Q_{GD}			8		nC
Turn-ON Delay Time (Pulsed)	$t_{D(ON)}$	$V_{DD} = -50V, V_{GS} = -10V, I_D = -12A,$ $R_G = 6\Omega$ (Note 1, 2)		7		ns
Rise Time (Pulsed)	t_R			17		ns
Turn-OFF Delay Time (Pulsed)	$t_{D(OFF)}$			39		ns
Fall-Time (Pulsed)	t_F			20		ns
SOURCE TO DRAIN DIODE SPECIFICATIONS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				-12	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				-24	A
Diode Forward Voltage	V_{SD}	$I_S = -1.0A, V_{GS} = 0V$			-1.4	V
Reverse Recovery Time (Note 1)	t_{rr}	$I_S = -12A, V_{GS} = 0V, di/dt = 100A/\mu s$		148		ns
Reverse Recovery Charge	Q_{rr}			670		nC

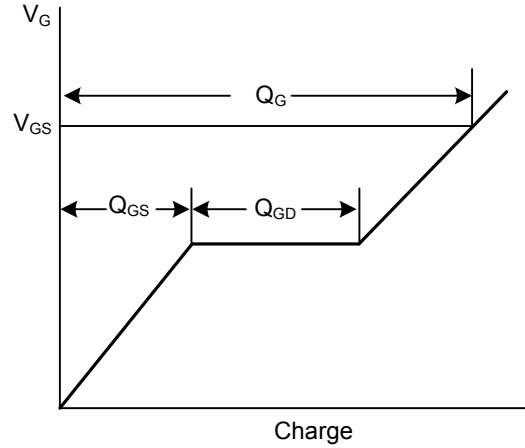
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

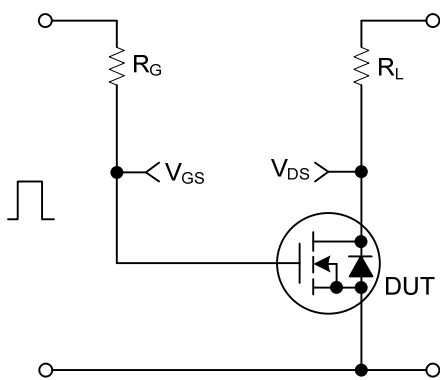
N-CHANNEL



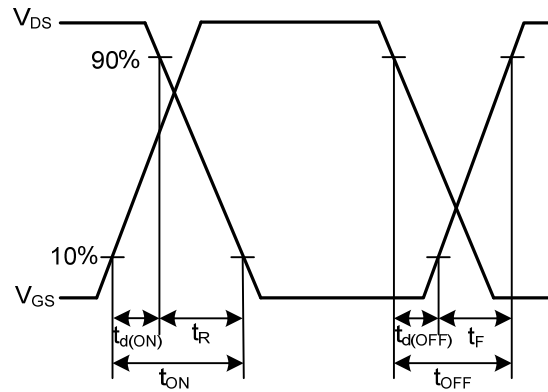
Gate Charge Test Circuit



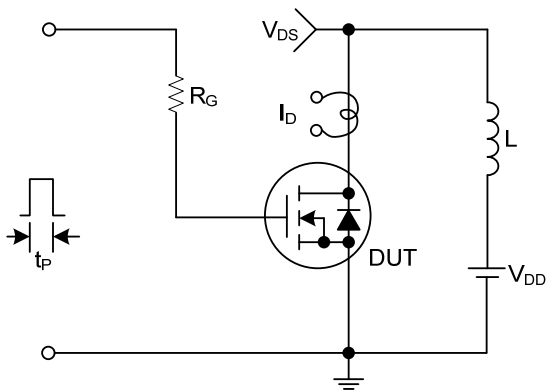
Gate Charge Waveforms



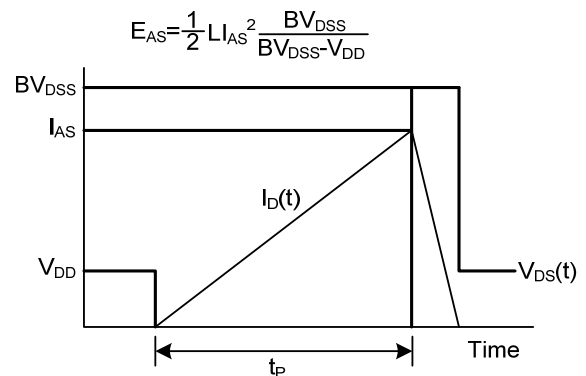
Resistive Switching Test Circuit



Resistive Switching Waveforms



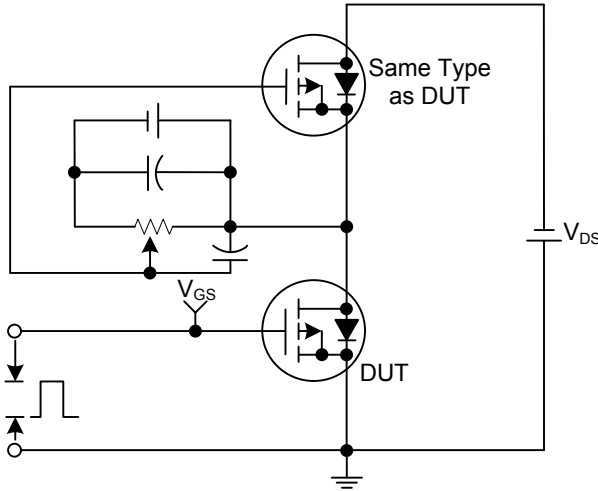
Unclamped Inductive Switching Test Circuit



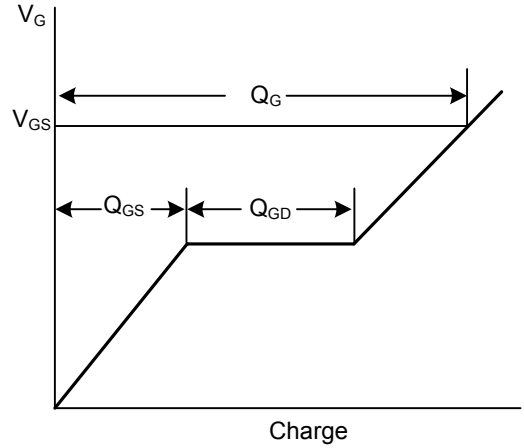
Unclamped Inductive Switching Waveforms

TEST CIRCUITS AND WAVEFORMS

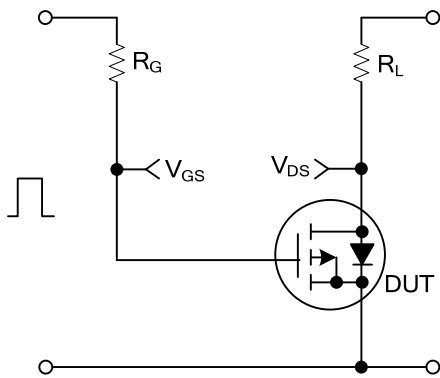
P-CHANNEL



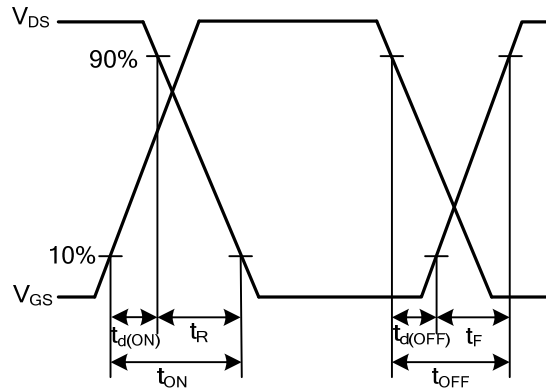
Gate Charge Test Circuit



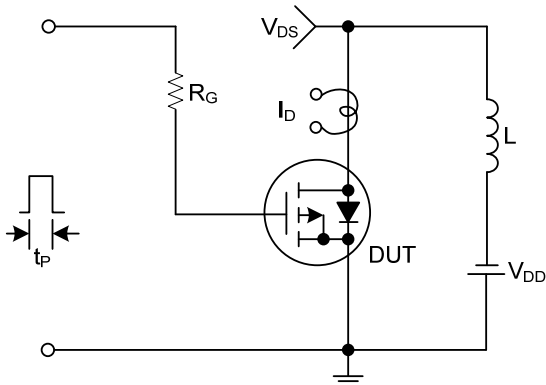
Gate Charge Waveforms



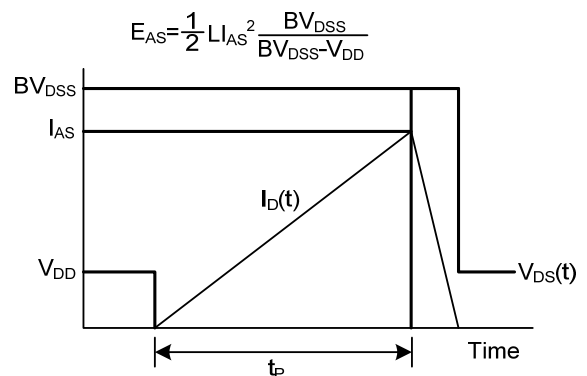
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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