



UT35NP04

Advance

Power MOSFET

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

■ **DESCRIPTION**

The UTC **UT35NP04** 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 **UT35NP04** is universally applied in low voltage applications.

■ **FEATURES**

***N-CHANNEL**

$R_{DS(on)} \leq 20 \text{ m}\Omega @ V_{GS}=10V, I_D=20A$

$R_{DS(on)} \leq 30 \text{ m}\Omega @ V_{GS}=4.5V, I_D=15A$

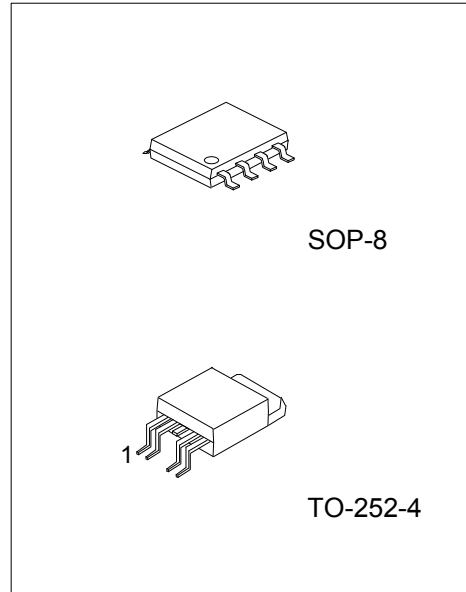
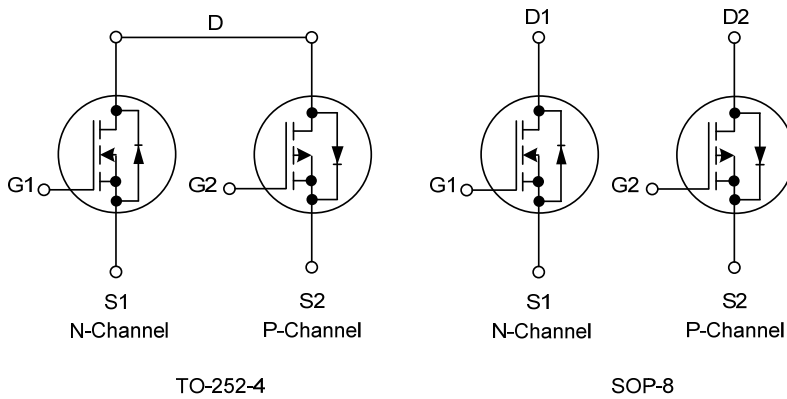
***P-CHANNEL**

$R_{DS(on)} \leq 45 \text{ m}\Omega @ V_{GS}=-10V, I_D=-20A$

$R_{DS(on)} \leq 58 \text{ m}\Omega @ V_{GS}=-4.5V, I_D=-15A$

* High switching speed

■ **SYMBOL**



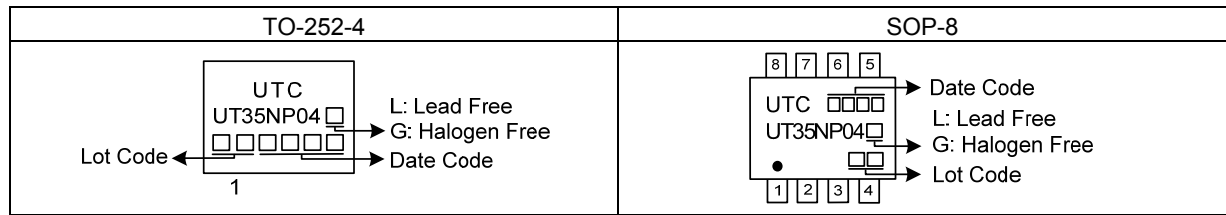
■ **ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT35NP04L-TN4-R	UT35NP04G-TN4-R	TO-252-4	S1	G1	D	S2	G2	-	-	-	Tape Reel
UT35NP04L-S08-R	UT35NP04G-S08-R	SOP-8	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

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

<p>UT35NP04G-TN4-R</p> <ul style="list-style-type: none"> (1)Packing Type (2)Package Type (3)Green Package 	<ul style="list-style-type: none"> (1) R: Tape Reel (2) TN4: TO-252-4, S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS		UNIT	
		N-CHANNEL	P-CHANNEL		
Drain-Source Voltage	V_{DSS}	40	-40	V	
Gate-Source Voltage	V_{GSS}	± 20	± 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 3)	E_{AS}	3	12.5	mJ	
Power Dissipation	$T_A=25^\circ\text{C}$	TO-252-4	55		W
		SOP-8	2.1		W
Junction Temperature	T_J	-55 ~ +150		$^\circ\text{C}$	
Storage Temperature Range	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: $L=0.1\text{mH}$, $I_{AS}=7.7\text{A}$, $V_{DD}=30\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

P-Channel: $L=0.1\text{mH}$, $I_{AS}=-15.8\text{A}$, $V_{DD}=-30\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT	
Junction to Ambient	θ_{JA}	TO-252-4	110	$^\circ\text{C/W}$
		SOP-8	125 (Note)	$^\circ\text{C/W}$
Junction to Case	θ_{JC}	TO-252-4	2.27 (Note)	$^\circ\text{C/W}$
		SOP-8	59.5 (Note)	$^\circ\text{C/W}$

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

■ 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}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	40			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=40\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate-Source Leakage Current	I_{GSS}	Forward			+100	nA
		Reverse			-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 (Note 2)	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=20\text{A}$			20	m Ω
		$V_{GS}=4.5\text{V}$, $I_D=15\text{A}$			30	m Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		1100		pF
Output Capacitance	C_{OSS}			145		pF
Reverse Transfer Capacitance	C_{RSS}			126		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 2)	Q_G	$V_{GS}=10\text{V}$, $V_{DS}=30\text{V}$, $I_D=3\text{A}$		39		nC
Gate to Source Charge	Q_{GS}			5.6		nC
Gate to Drain Charge	Q_{GD}			11		nC
Turn-ON Delay Time (Note 2)	$t_{D(ON)}$	$V_{DS}=30\text{V}$, $V_{GS}=10\text{V}$, $I_D=3\text{A}$, $R_G=3\Omega$		7.2		ns
Rise Time	t_R			17		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			28		ns
Fall-Time	t_F			20		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage(Note 2)	V_{SD}	$I_S=15\text{A}$, $V_{GS}=0\text{V}$			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_S=15\text{A}$, $V_{GS}=0\text{V}$,		40		nS
Body Diode Reverse Recovery Charge	Q_{rr}	$dI_F/dt=100\text{A}/\mu\text{s}$		65		nC

■ ELECTRICAL CHARACTERISTICS (Cont.)

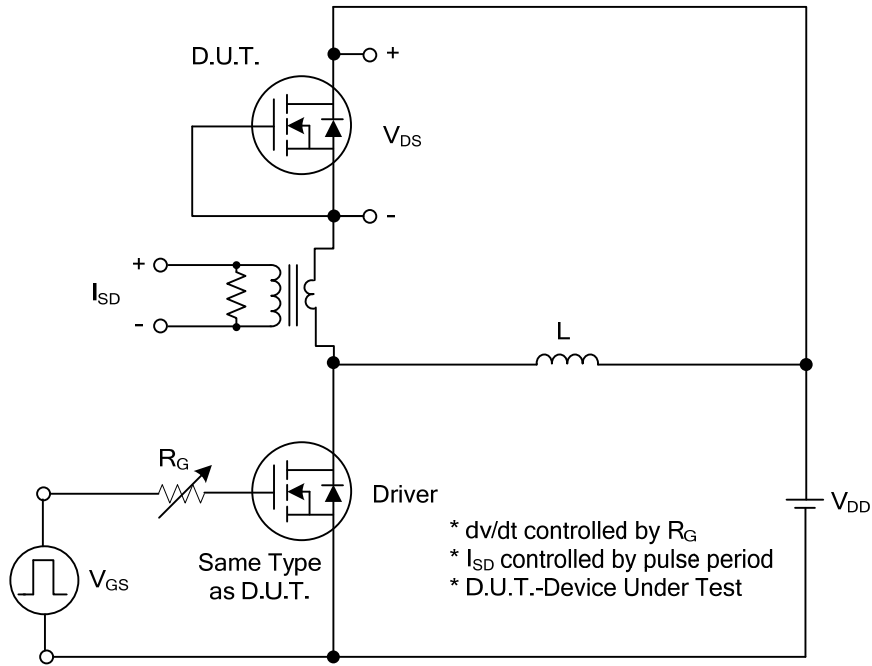
P-Channel

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = -250\mu A, V_{GS} = 0V$	-40			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = -40V, V_{GS} = 0V$			-1	μA
Gate-Source Leakage Current	Forward	I_{GSS} $V_{GS} = +20V$ $V_{GS} = -20V$			+100	nA
	Reverse				-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 (Note 2)	$R_{DS(ON)}$	$V_{GS} = -10V, I_D = -20A$			45	m Ω
		$V_{GS} = -4.5V, I_D = -15A$			58	m Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS} = 0V, V_{DS} = -25V, f = 1.0MHz$		1380		pF
Output Capacitance	C_{OSS}			163		pF
Reverse Transfer Capacitance	C_{RSS}			135		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 2)	Q_G	$V_{GS} = -10V, V_{DS} = -30V, I_D = -35A$		33		nC
Gate to Source Charge	Q_{GS}			6		nC
Gate to Drain Charge	Q_{GD}			9		nC
Turn-ON Delay Time (Note 2)	$t_{D(ON)}$	$V_{DS} = -30V, V_{GS} = -10V, I_D = -35A,$ $R_G = 3\Omega$		8		ns
Rise Time	t_R			18		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			37		ns
Fall-Time	t_F			24		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage(Note 2)	V_{SD}	$I_S = -15A, V_{GS} = 0V$			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_S = 15A, V_{GS} = 0V, dI_F/dt = 100A/\mu s$		65		nS
Body Diode Reverse Recovery Charge	Q_{rr}			145		nC

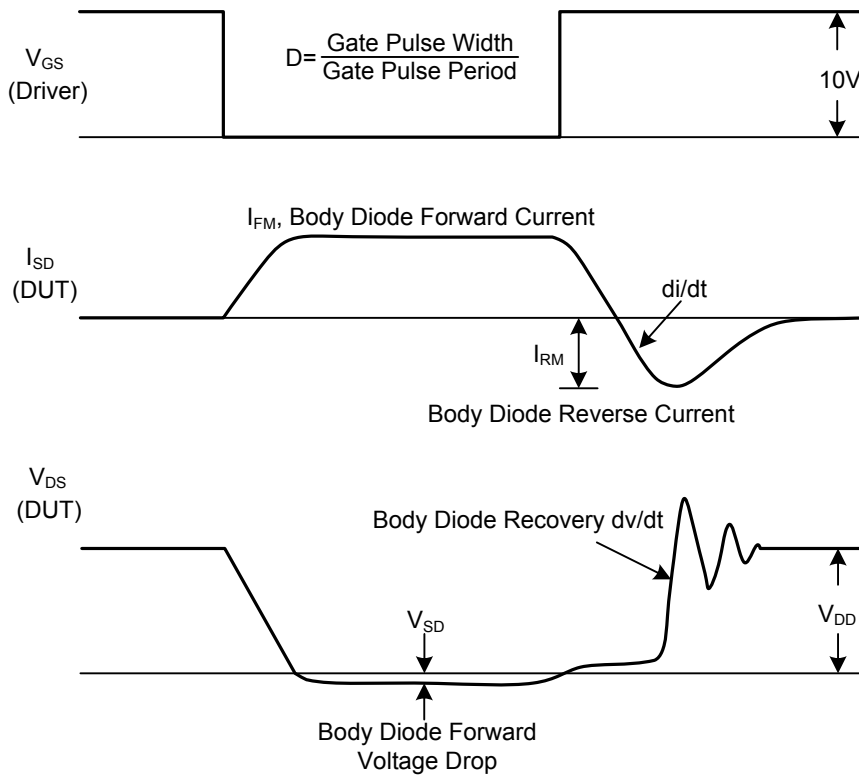
Notes: 1. Pulse width limited by maximum junction temperature

2. Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

■ TEST CIRCUITS AND WAVEFORMS

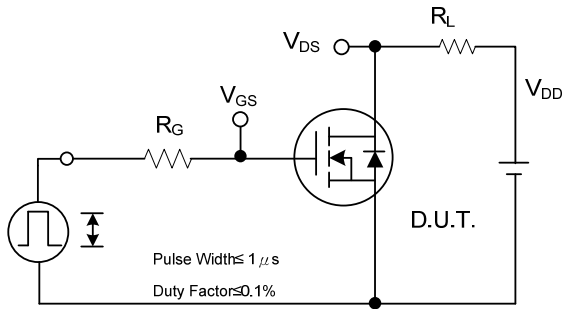


Peak Diode Recovery dv/dt Test Circuit

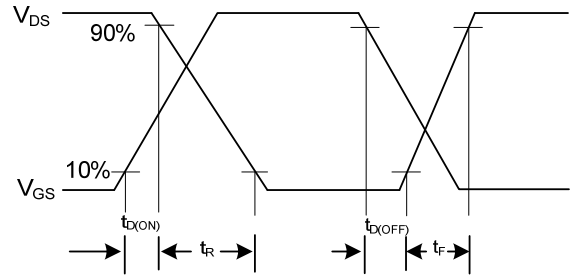


Peak Diode Recovery dv/dt Waveforms

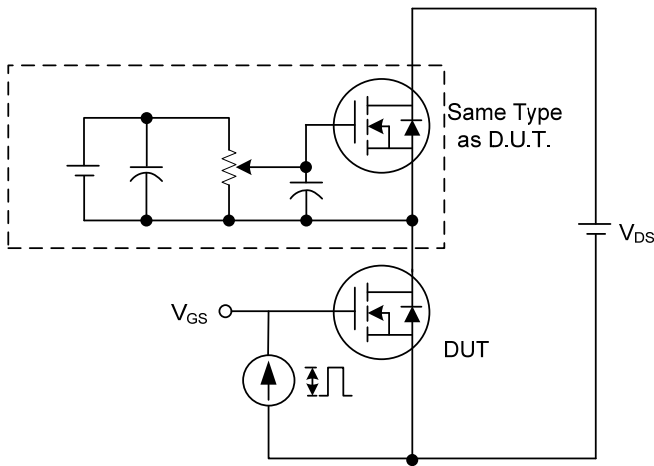
TEST CIRCUITS AND WAVEFORMS



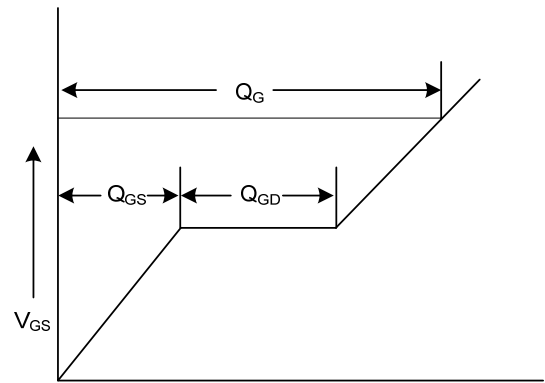
Switching Test Circuit



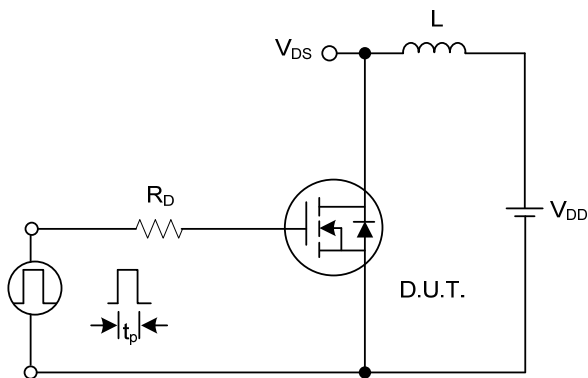
Switching Waveforms



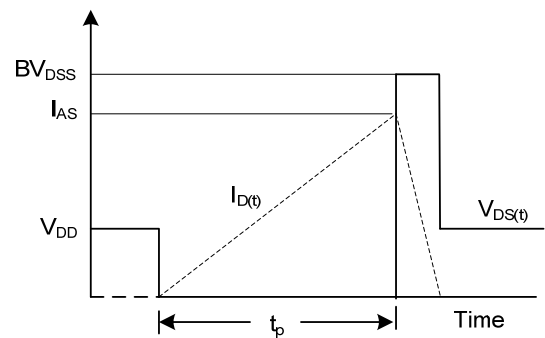
Gate Charge Test Circuit



Charge Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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