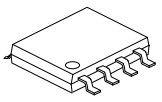
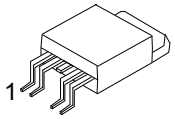
DUAL ENHANCEMENT MODE (N-CHANNEL / P-CHANNEL)



SOP-8



TO-252-4

■ 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

$R_{DS(on)}$ ≤ 20 mΩ @ V_{GS}=10V, I_D=20A

$R_{DS(on)}$ ≤ 30 mΩ @ V_{GS}=4.5V, I_D=15A

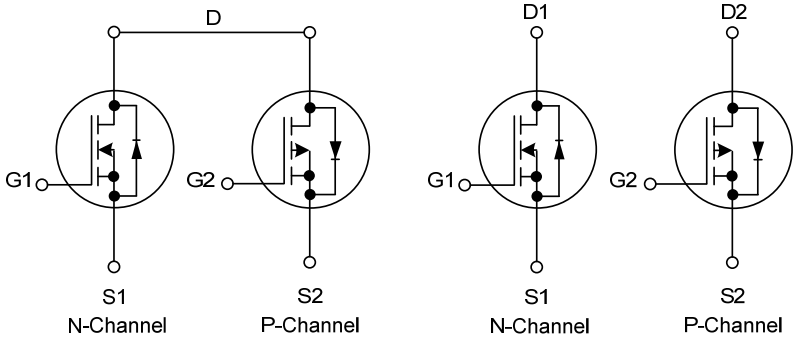
*P-CHANNEL

$R_{DS(on)}$ ≤ 45 mΩ @ V_{GS}=-10V, I_D=-20A

$R_{DS(on)}$ ≤ 58 mΩ @ V_{GS}=-4.5V, I_D=-15A

* High switching speed

■ SYMBOL



TO-252-4 SOP-8

■ 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

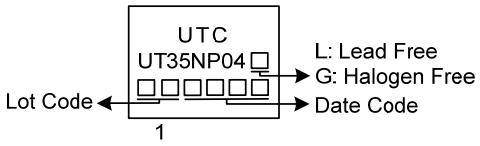
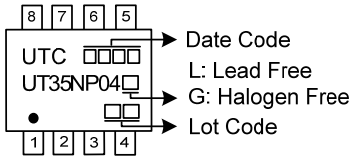
UT35NP04G-TN4-R

(1)Packing Type — (1) R: Tape Reel

(2)Package Type — (2) TN4: TO-252-4, S08: SOP-8

(3)Green Package — (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-252-4	SOP-8
	

■ 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°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°C	TO-252-4	P_D	55		W
		SOP-8		2.1		W
Junction Temperature			T_J	-55 ~ +150		°C
Storage Temperature Range			T_{STG}	-55 ~ +150		°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=0.1mH, I_{AS}=7.7A, V_{DD}=30V, R_G=25Ω, Starting T_J=25°C
P-Channel: L=0.1mH, I_{AS}=-15.8A, V_{DD}=-30V, R_G=25Ω, Starting T_J=25°C

■ THERMAL DATA

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

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

■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

N-Channel

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, 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			+100	nA
	Reverse		V_{GS}=-20V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	1.0		3.0	V
Static Drain-Source On-State Resistance (Note 2)		$R_{DS(ON)}$	V_{GS}=10V, I_D=20A			20	mΩ
			V_{GS}=4.5V, I_D=15A			30	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		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}=10V, V_{DS}=30V, I_D=3A		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}=30V, V_{GS}=10V, I_D=3A, R_G=3Ω		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=15A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	I_S=15A, V_{GS}=0V, dI_F/dt=100A/μs		40		nS
Body Diode Reverse Recovery Charge		Q_{rr}			65		nC

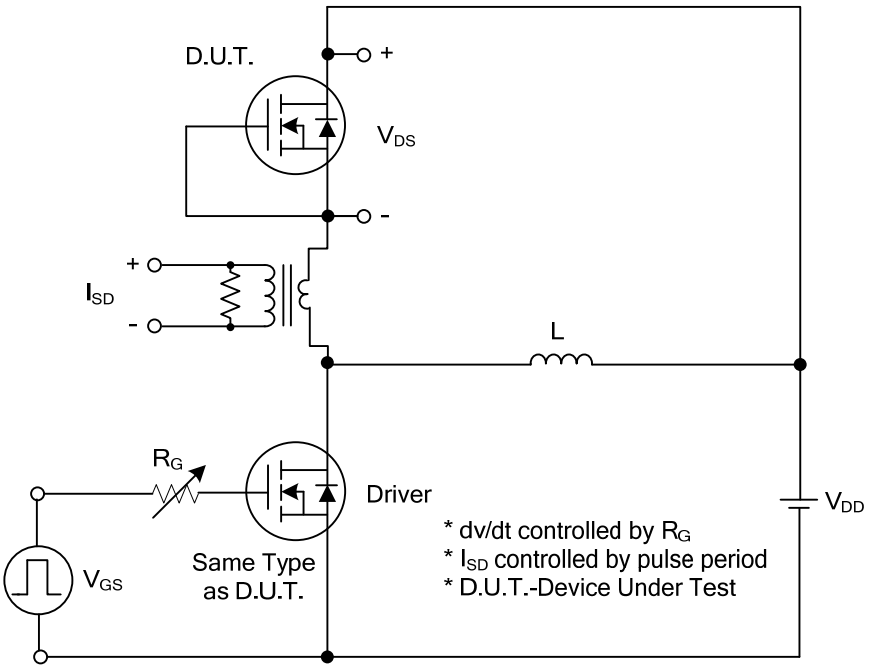
■ ELECTRICAL CHARACTERISTICS (Cont.)

P-Channel

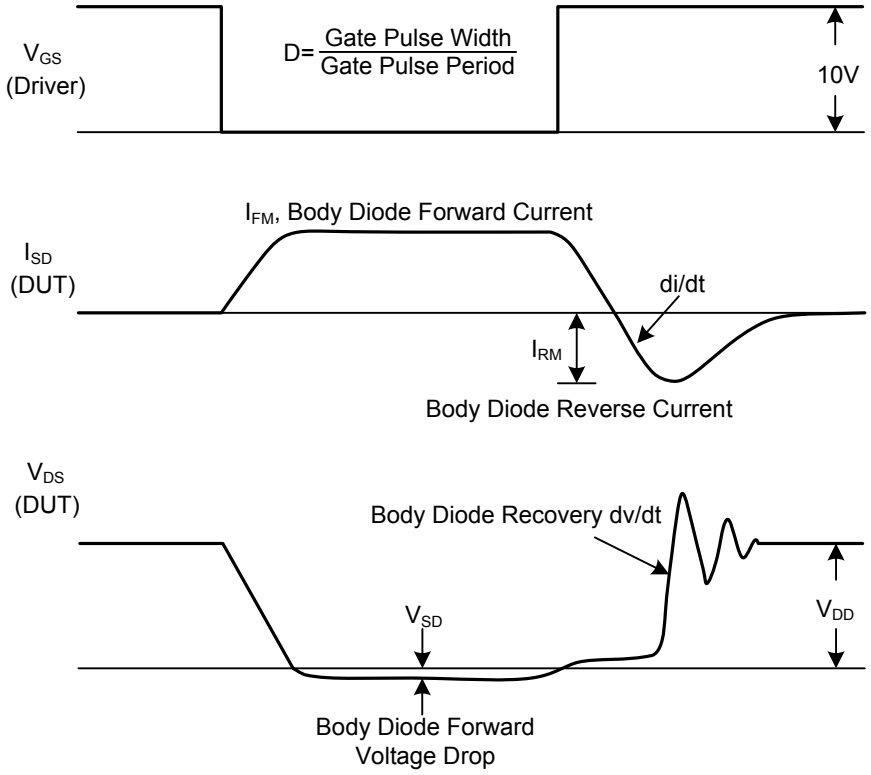
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=-250μA, V_{GS}=0V	-40			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=-40V, V_{GS}=0V			-1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V			+100	nA
	Reverse		V_{GS}=-20V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=-250μA	-1.0		-3.0	V
Static Drain-Source On-State Resistance (Note 2)		$R_{DS(ON)}$	V_{GS}=-10V, I_D=-20A			45	mΩ
			V_{GS}=-4.5V, I_D=-15A			58	mΩ
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=3Ω		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/μs		65		nS
Body Diode Reverse Recovery Charge		Q_{rr}			145		nC

Notes: 1. Pulse width limited by maximum junction temperature
2. Pulse width ≤ 300μs, Duty cycle ≤ 2%

■ TEST CIRCUITS AND WAVEFORMS

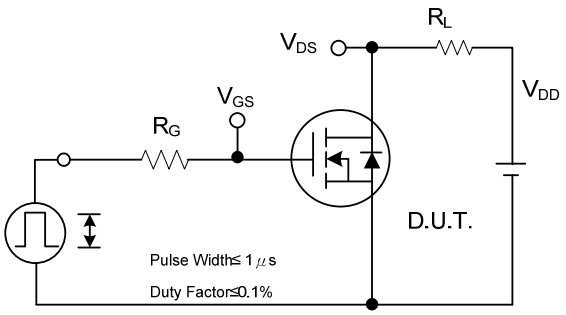


Peak Diode Recovery dv/dt Test Circuit

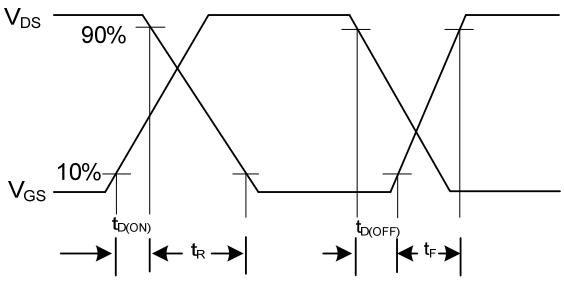


Peak Diode Recovery dv/dt Waveforms

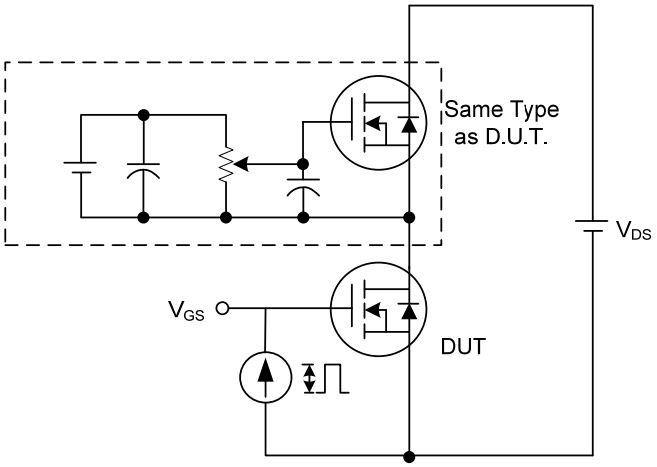
■ TEST CIRCUITS AND WAVEFORMS



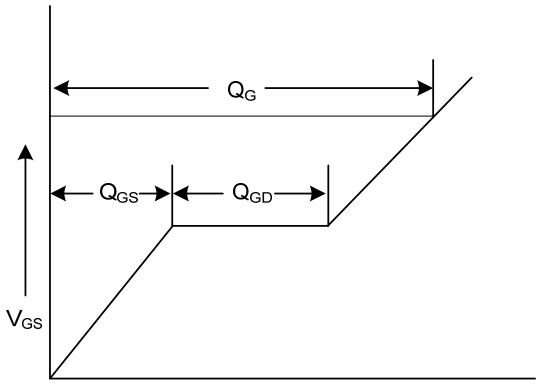
Switching Test Circuit



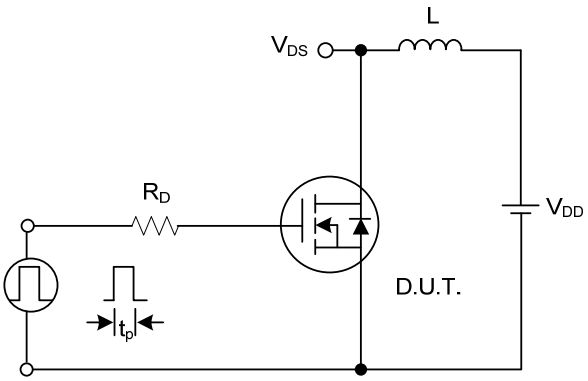
Switching Waveforms



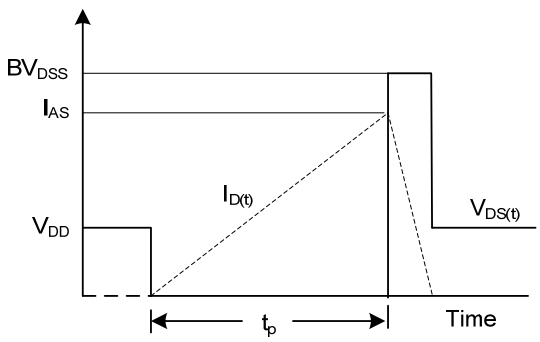
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms