

**4N50**

Preliminary

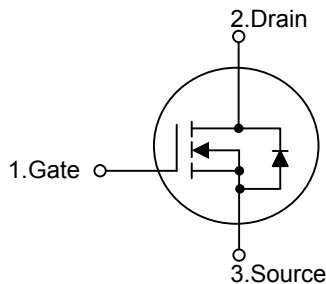
Power MOSFET**4A, 500V N-CHANNEL
POWER MOSFET****DESCRIPTION**

The UTC **4N50** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **4N50** is generally applied in high efficiency switch mode power supplies, active power factor correction and electronic lamp ballasts based on half bridge topology.

FEATURES

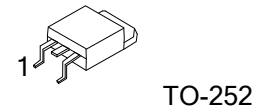
- * $R_{DS(ON)}=2.2\Omega$ @ $V_{GS}=10V$
- * High Switching Speed
- * 100% Avalanche Tested

SYMBOL**ORDERING INFORMATION**

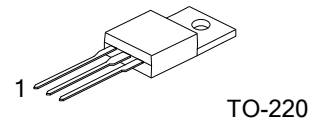
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4N50L-TA3-T	4N50G-TA3-T	TO-220	G	D	S	Tube
4N50L-TF3-T	4N50G-TF3-T	TO-220F	G	D	S	Tube
4N50L-TN3-R	4N50G-TN3-R	TO-252	G	D	S	Tape Reel

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

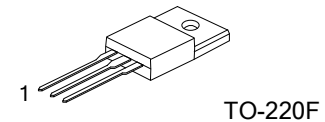
	(1) R: Tape Reel, T: Tube (2) TA3: TO-220, TF3: TO-220F, TN3: TO-252 (3) G: Halogen Free, L: Lead Free
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TO-252



TO-220



TO-220F

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous ($T_C=25^\circ\text{C}$)	I_D	4	A
	Pulsed (Note 3)	I_{DM}	16 (Note 2)	A
Avalanche Current (Note 3)		I_{AR}	4	A
Avalanche Energy	Single Pulsed (Note 4)	E_{AS}	216	mJ
	Repetitive (Note 3)	E_{AR}	8.5	mJ
Peak Diode Recovery dv/dt (Note 5)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	85	W
	TO-220F		28	
	TO-252		52	
Derate above 25°C	TO-220		0.67	$W/^\circ\text{C}$
	TO-220F		0.22	
	TO-252		0.41	
Junction Temperature		T_J	+150	$^\circ\text{C}$
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. Drain current limited by maximum junction temperature
3. Repetitive Rating: Pulse width limited by maximum junction temperature
4. $L = 27\text{mH}$, $I_{AS} = 4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
5. $I_{SD} \leq 4\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

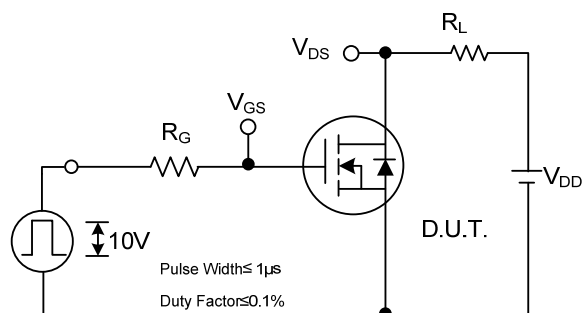
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-220F		62.5	
	TO-252		110	
Junction to Case	TO-220	θ_{JC}	1.47	$^\circ\text{C/W}$
	TO-220F		4.5	
	TO-252		2.4	

■ ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, unless otherwise noted)

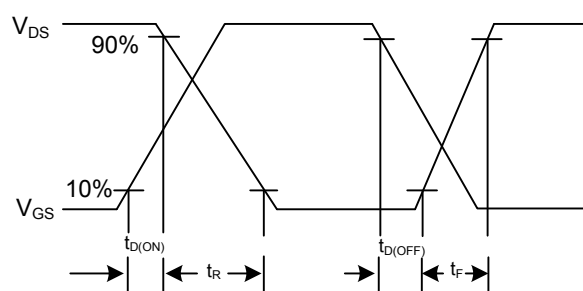
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	500			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =500V, V _{GS} =0V			25	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =2A		1.6	2.2	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		485	650	pF
Output Capacitance		C _{OSS}			65	90	pF
Reverse Transfer Capacitance		C _{RSS}			5	8	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{GS} =10V, V _{DS} =400V, I _D =4A (Note 1, 2)		11	15	nC
Gate to Source Charge		Q _{GS}			3		nC
Gate to Drain Charge		Q _{GD}			5		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =250V, I _D =4A, R _G =25Ω (Note 1, 2)		14	38	ns
Rise Time		t _R			21	52	ns
Turn-OFF Delay Time		t _{D(OFF)}			27	64	ns
Fall-Time		t _F			20	50	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				4	A
Maximum Body-Diode Pulsed Current		I _{SM}				16	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =4A, V _{GS} =0V			1.6	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =4A, V _{GS} =0V,		36		ns
Body Diode Reverse Recovery Charge		Q _{RR}	dl _F /dt=100A/μs (Note 1)		33		μC

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

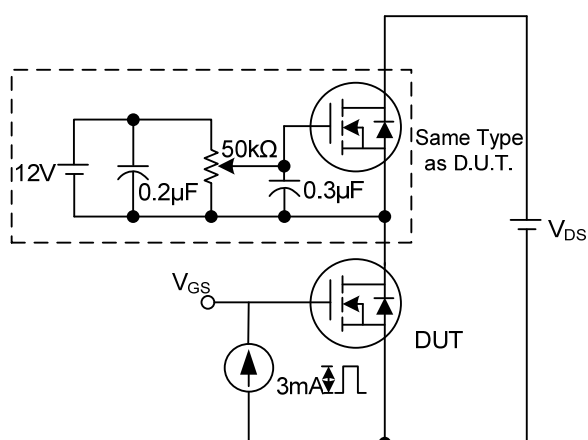
TEST CIRCUITS AND WAVEFORMS



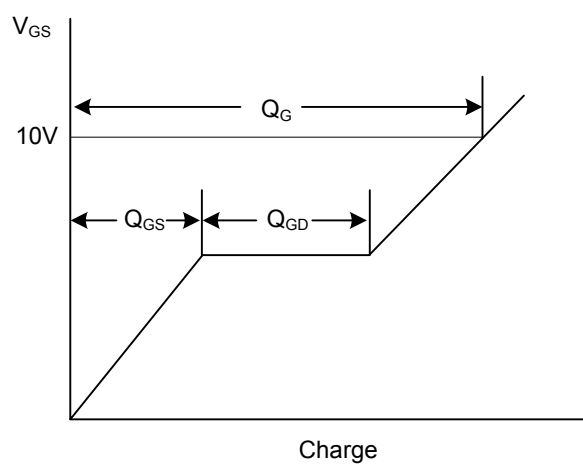
Switching Test Circuit



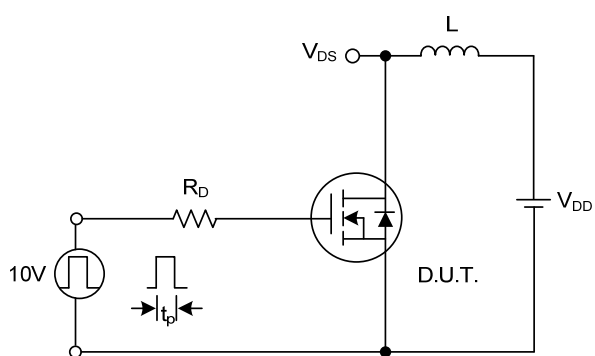
Switching Waveforms



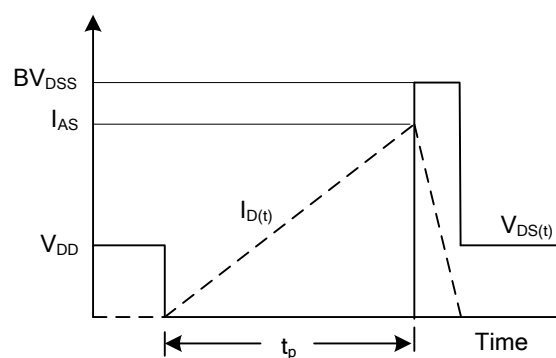
Gate Charge Test Circuit



Gate Charge Waveform

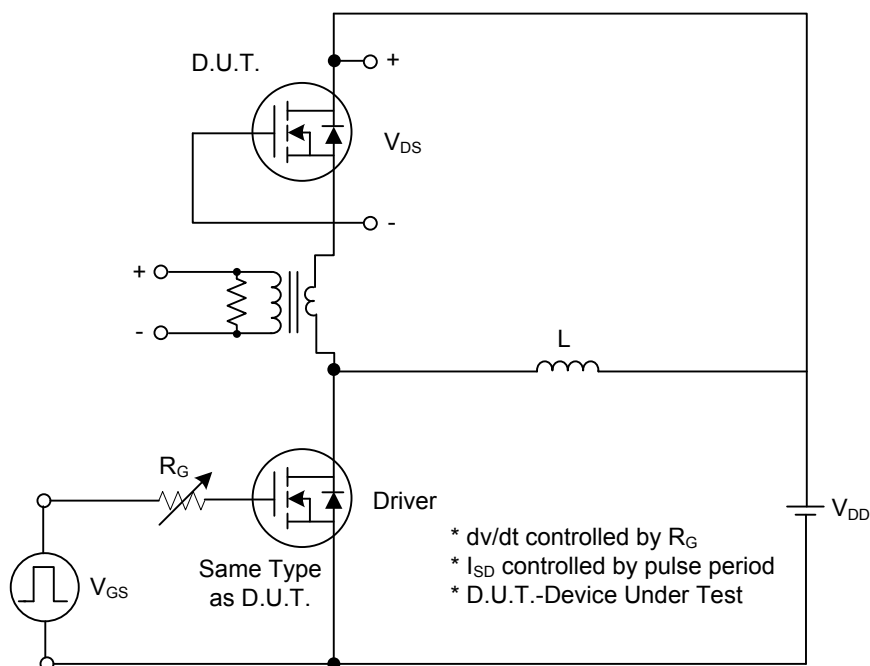


Unclamped Inductive Switching Test Circuit

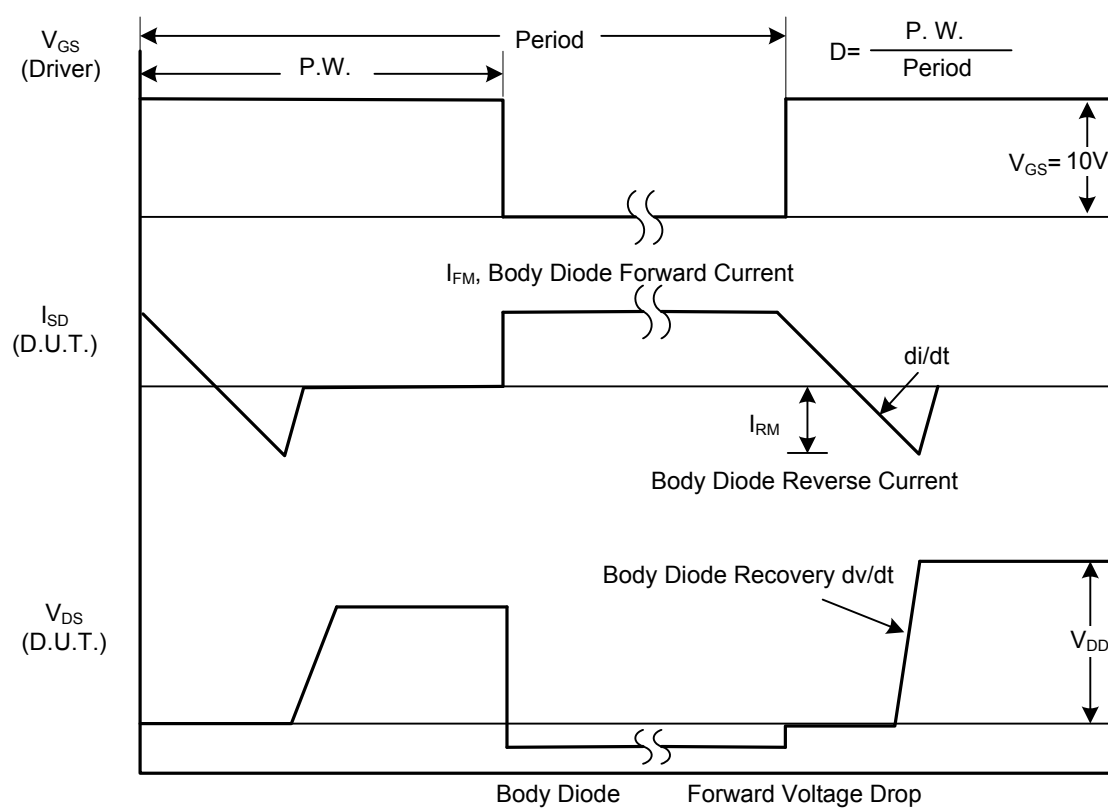


Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)



Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

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