



12N50

Preliminary

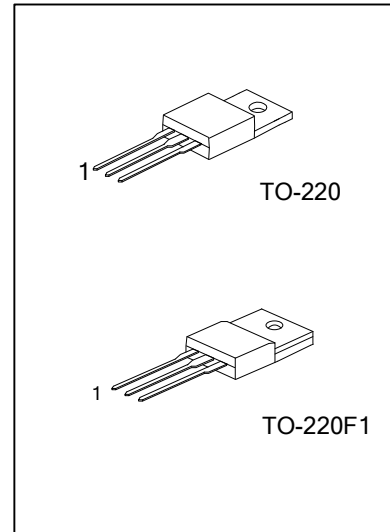
Power MOSFET

12 Amps, 500 Volts N-CHANNEL POWER MOSFET

DESCRIPTION

The UTC **12N50** 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.

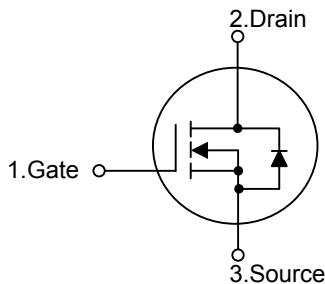
The UTC **12N50** is generally applied in high efficiency switch mode power supplies, active power factor correction and electronic lamp ballasts based on half bridge topology.



FEATURES

- * 12A, 500V, $R_{DS(ON)}=0.54\Omega @ V_{GS}=10V$
- * High Switching Speed
- * 100% Avalanche Tested

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
12N50L-TA3-T	12N50G-TA3-T	TO-220	G	D	S	Tube
12N50L-TF1-T	12N50G-TF1-T	TO-220F1	G	D	S	Tube

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

<p>12N50L-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Free</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220 ,TF1: TO-220F1</p> <p>(3) G: Halogen Free, L: Lead Free</p>
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■ 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	12 *	A
	Pulsed (Note 1)	I_{DM}	48 *	A
Avalanche Current (Note 1)		I_{AR}	12	A
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	684	mJ
	Repetitive (Note 3)	E_{AR}	19.5	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	V/ns
Power Dissipation	$T_C=25^\circ\text{C}$	TO-220	192	W
		TO-220F1	42	
	Derate above 25°C	TO-220	1.53	W/ $^\circ\text{C}$
		TO-220F1	0.33	
Junction Temperature		T_J	+150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55~+150	$^\circ\text{C}$

Note: 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.

* Drain current limited by maximum junction temperature

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-220F1		62.5	
Junction to Case	TO-220	θ_{JC}	0.65	$^\circ\text{C/W}$
	TO-220F1		3.0	

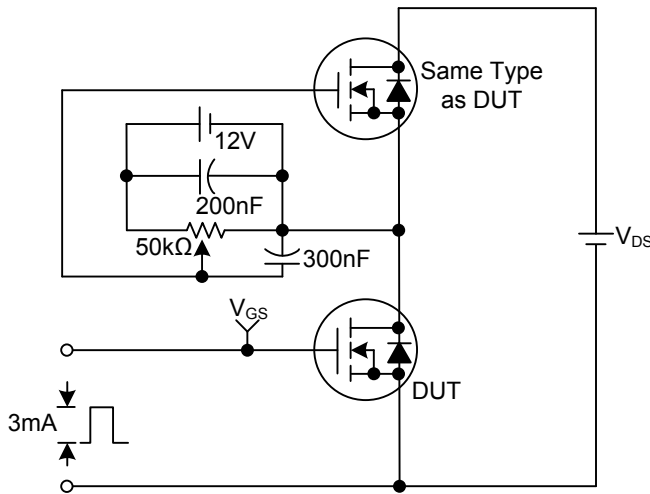
■ ELECTRICAL CHARACTERISTICS ($T_c=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	500			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=500\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate- Source Leakage Current	Forward	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$			+100	nA
	Reverse	$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=6\text{A}$		0.42	0.54	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		1450	1930	pF
Output Capacitance	C_{OSS}			198	265	pF
Reverse Transfer Capacitance	C_{RSS}			14.5	22	pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{GS}=10\text{V}$, $V_{DS}=400\text{V}$, $I_D=12\text{A}$ (Note 4, 5)		30	39	nC
Gate to Source Charge	Q_{GS}			8		nC
Gate to Drain Charge	Q_{GD}			12		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=250\text{V}$, $I_D=12\text{A}$, $R_G=25\Omega$ (Note 4, 5)		28	65	ns
Rise Time	t_R			54	120	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			75	160	ns
Fall-Time	t_F			47	105	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				12	A
Maximum Body-Diode Pulsed Current	I_{SM}				48	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=12\text{A}$, $V_{GS}=0\text{V}$			1.5	V
Body Diode Reverse Recovery Time	t_{RR}	$I_S=12\text{A}$, $V_{GS}=0\text{V}$, $di_F/dt=100\text{A}/\mu\text{s}$ (Note 4)		154		ns
Body Diode Reverse Recovery Charge	Q_{RR}			0.45		μC

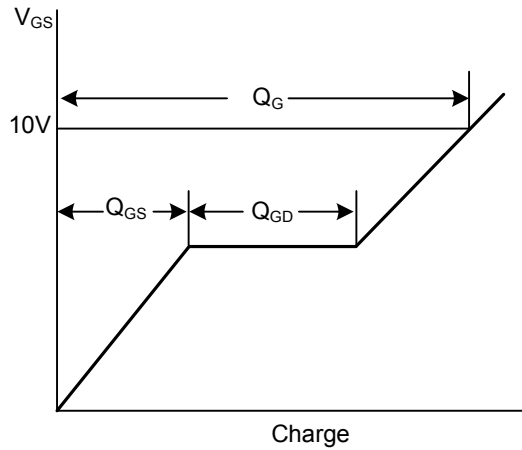
- Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=9.5\text{mH}$, $I_{AS}=12\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. $I_{SD}\leq 12\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$
4. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

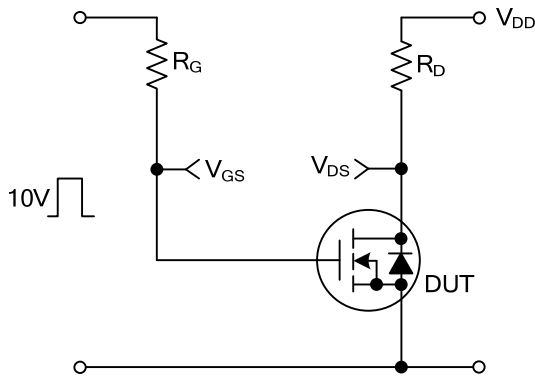
Gate Charge Test Circuit



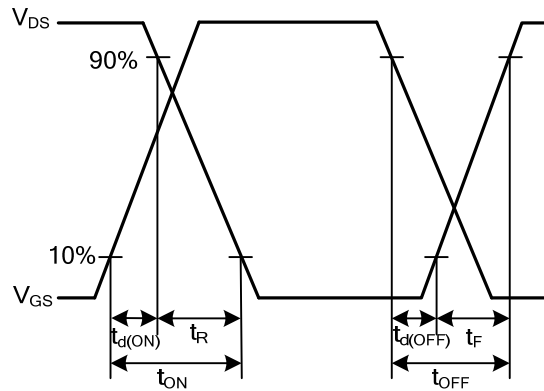
Gate Charge Waveforms



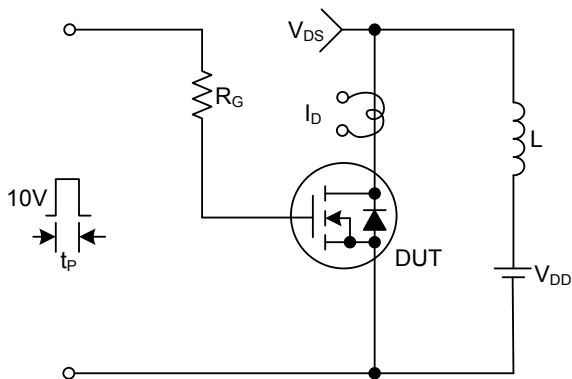
Resistive Switching Test Circuit



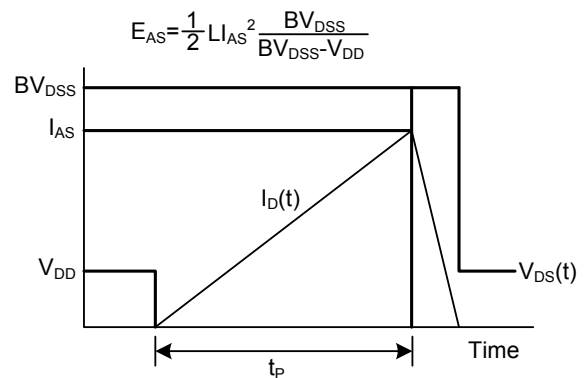
Resistive Switching Waveforms



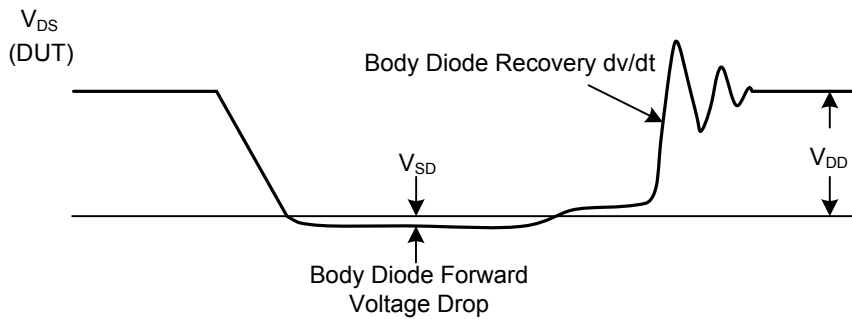
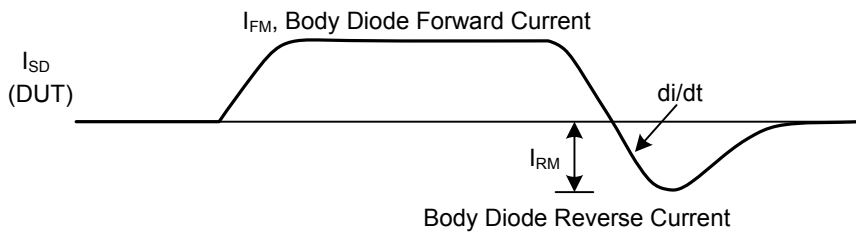
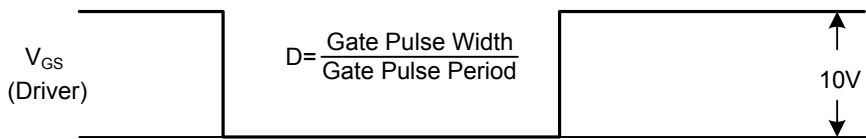
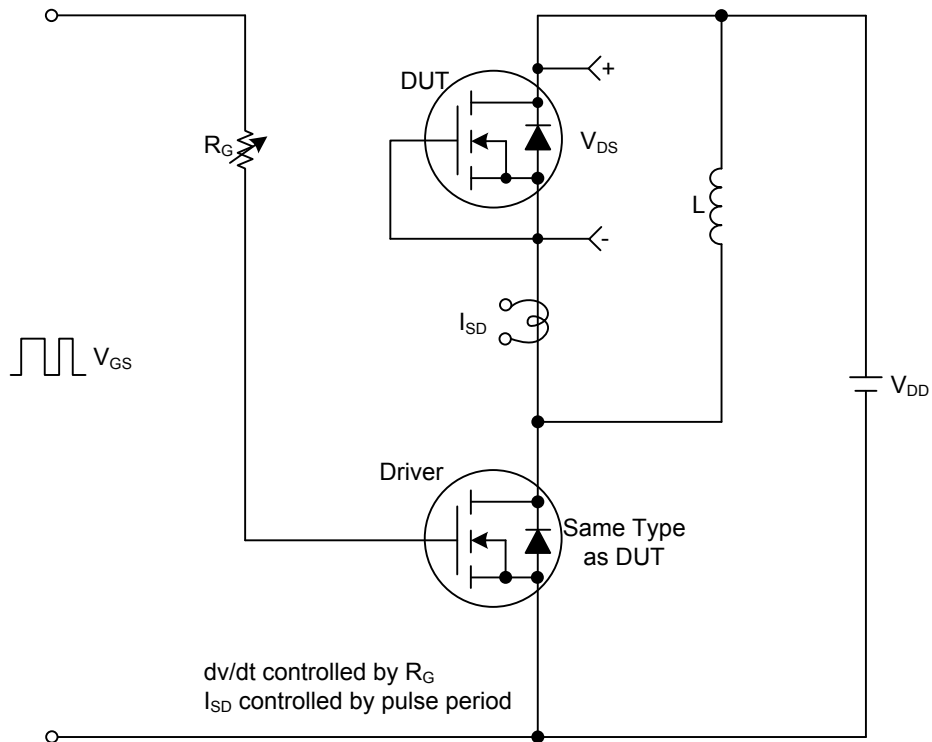
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms



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