



13N50

Power MOSFET

13A, 500V N-CHANNEL POWER MOSFET

DESCRIPTION

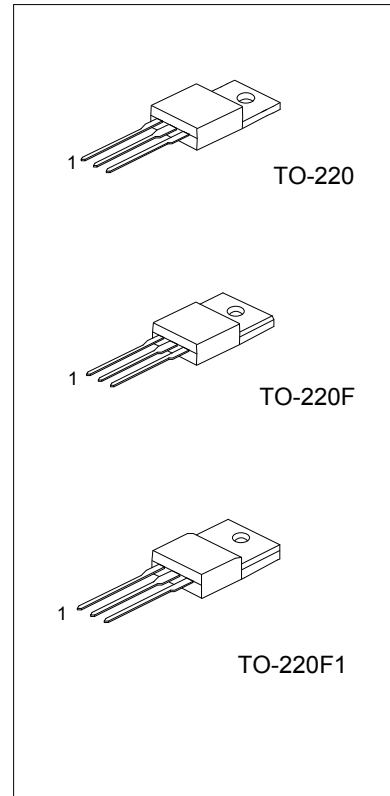
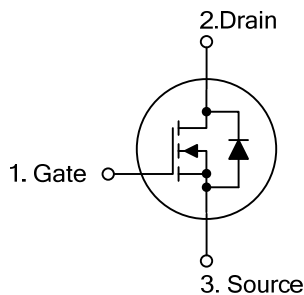
The UTC **13N50** is an N-Channel enhancement mode power MOSFET. The device adopts planar stripe and uses DMOS technology to minimize and provide lower on-state resistance and faster switching speed. It can also withstand high energy pulse under the avalanche and commutation mode conditions.

The UTC **13N50** is ideally suitable for high efficiency switch mode power supply, power factor correction, electronic lamp ballast based on half bridge topology.

FEATURES

- * $R_{DS(ON)} = 0.48\Omega @ V_{GS} = 10V$
- * Ultra low gate charge (typical 43nC)
- * Low reverse transfer Capacitance ($C_{RSS} =$ typical 20pF)
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13N50L-TA3-T	13N50G-TA3-T	TO-220	G	D	S	Tube
13N50L-TF3-T	13N50G-TF3-T	TO-220F	G	D	S	Tube
13N50L-TF1-T	13N50G-TF1-T	TO-220F1	G	D	S	Tube

<p>13N50L-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Free</p>	<p>(1) T: Tube (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1 (3) L: Lead Free, G: Halogen 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
Continuous Drain Current		I_D	13	A
Pulsed Drain Current (Note 2)		I_{DM}	52	A
Avalanche Current (Note 2)		I_{AR}	13	A
Single Pulsed Avalanche Energy (Note 3)		E_{AS}	810	mJ
Repetitive Avalanche Energy (Note 2)		E_{AR}	17	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation ($T_C=25^\circ\text{C}$)	TO-220	P_D	168	W
	TO-220F/TO-220F1		48	
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. Repetitive Rating : Pulse width limited by maximum junction temperature

3. $L = 9.3\text{mH}$, $I_{AS} = 13\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 13\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	0.74	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		2.58	

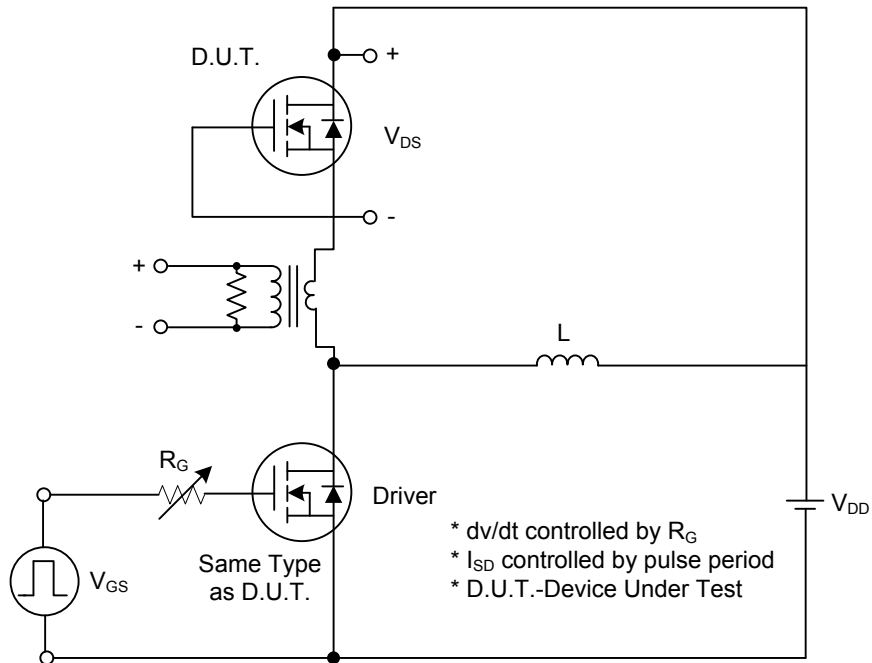
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = 250μA	500			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 500V, V _{GS} = 0V			10	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} = 30V, V _{DS} = 0V			100	nA
		V _{GS} = -30V, V _{DS} = 0V			-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250mA, Referenced to 25°C		0.5		V/°C
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 = 6.5A		0.42	0.48	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		1800	2300	pF
Output Capacitance	C _{OSS}			245	320	pF
Reverse Transfer Capacitance	C _{RSS}			25	35	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{D(ON)}	V _{DD} =250V, I _D =13A, R _G =25Ω (Note 1,2)		40	90	nS
Turn-On Rise Time	t _R			140	290	nS
Turn-Off Delay Time	t _{D(OFF)}			100	210	nS
Turn-Off Fall Time	t _F			85	180	nS
Total Gate Charge	Q _G	V _{DS} =400V, I _D =13A, V _{GS} =10 V (Note 1,2)		45	60	nC
Gate-Source Charge	Q _{GS}			11		nC
Gate-Drain Charge	Q _{GD}			22		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0V, I _S = 13 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I _S				13	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				52	A
Reverse Recovery Time	t _{rr}	V _{GS} = 0V, I _S = 13A,		290		nS
Reverse Recovery Charge	Q _{RR}	di _F / dt =100A/μs (Note 1)		2.6		μC

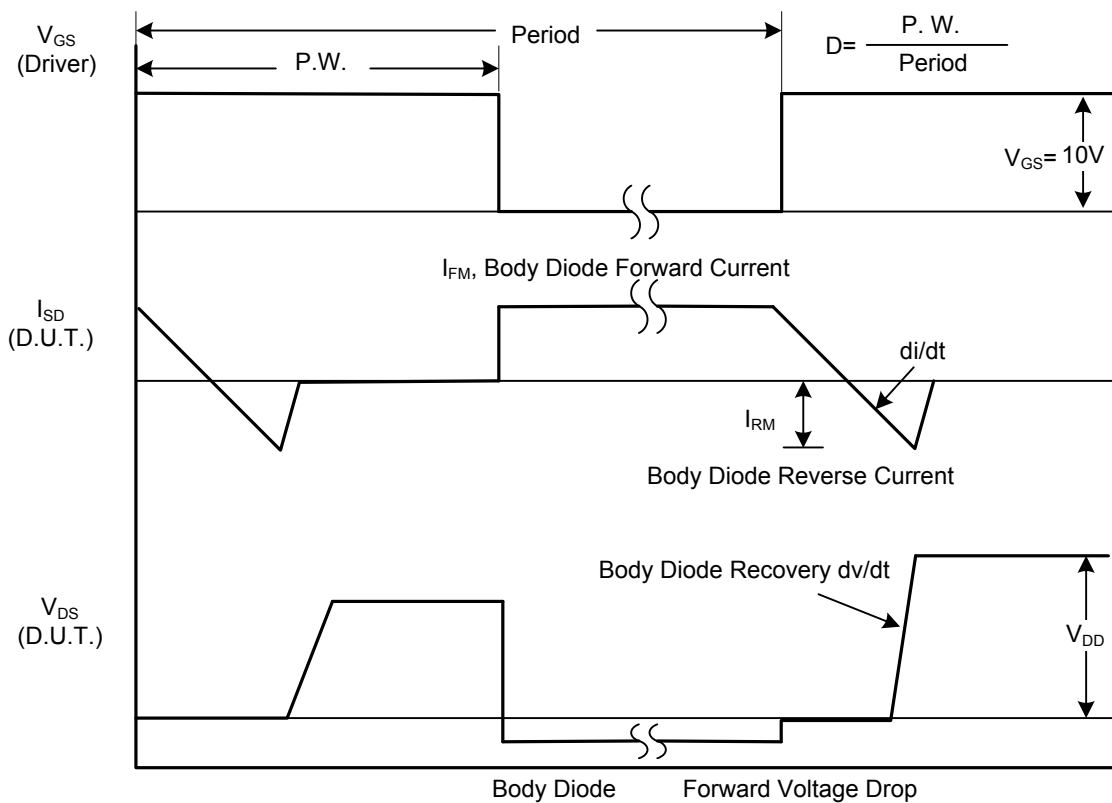
Note: 1. Pulse Test : Pulse width≤300μs, Duty cycle≤2%

2. Essentially independent of operating ambient temperature

■ TEST CIRCUITS AND WAVEFORMS

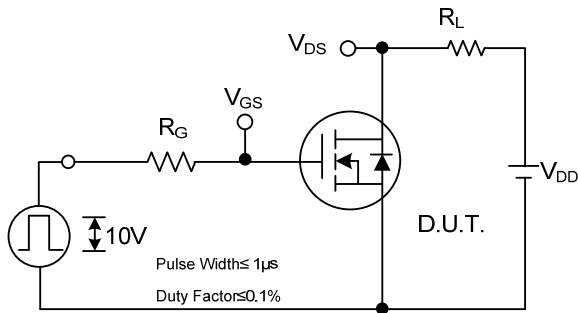


Peak Diode Recovery dv/dt Test Circuit

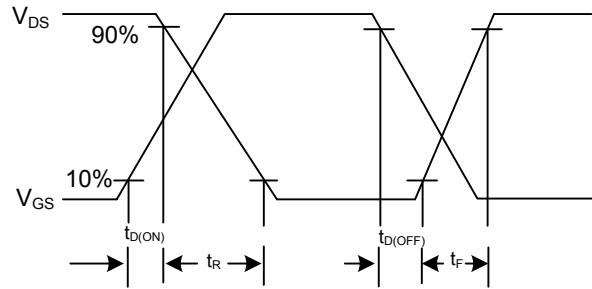


Peak Diode Recovery dv/dt Waveforms

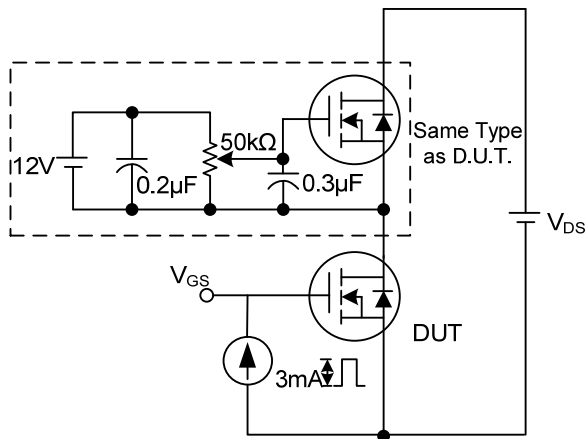
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



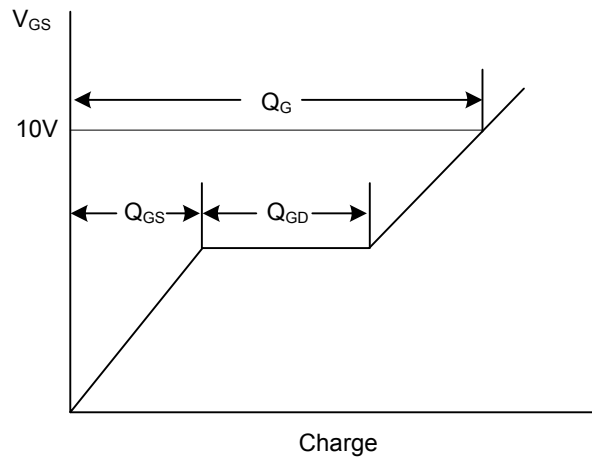
Switching Test Circuit



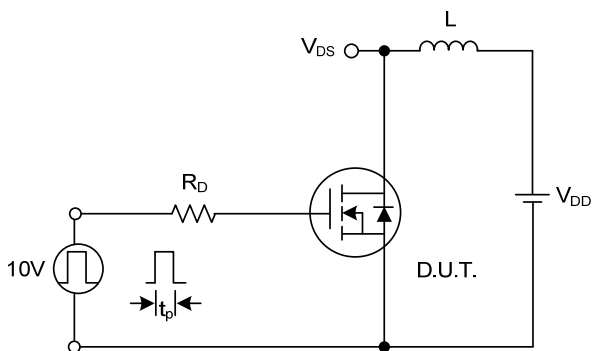
Switching Waveforms



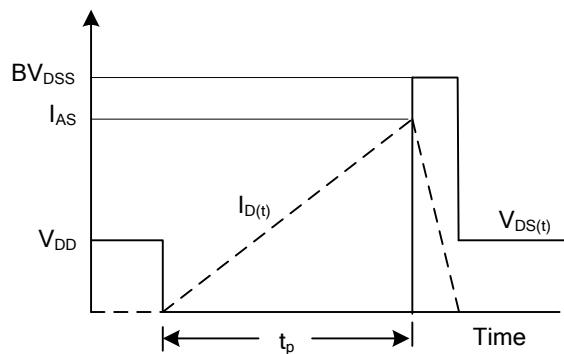
Gate Charge Test Circuit



Gate Charge Waveform

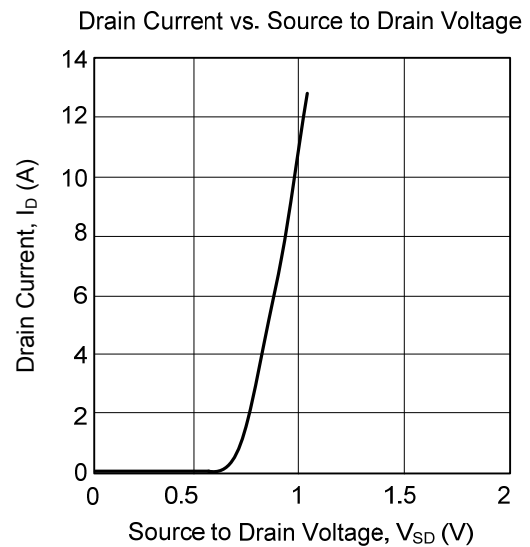
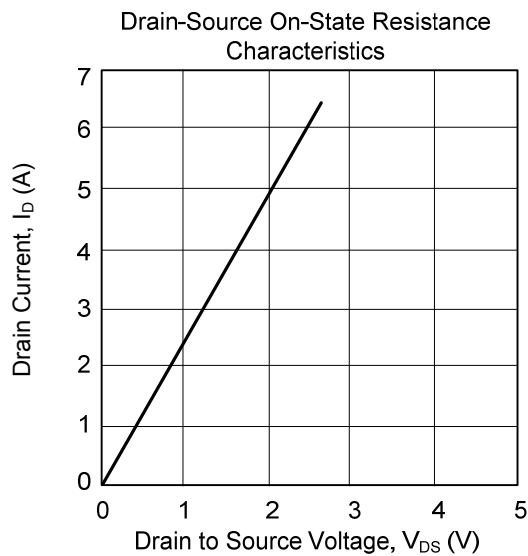
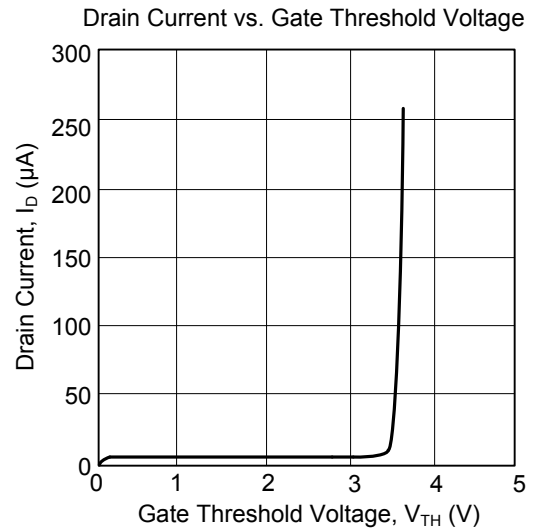
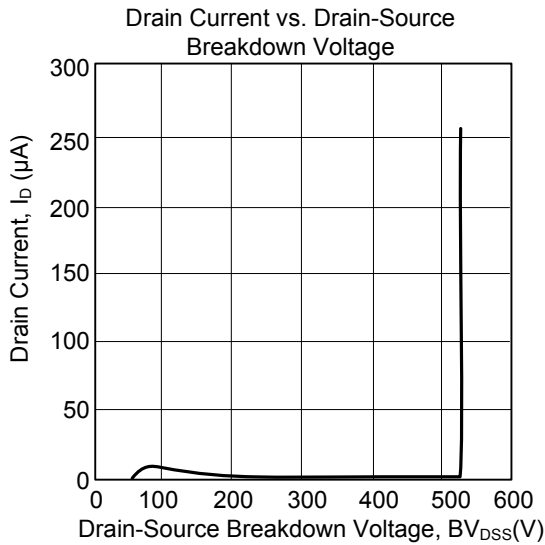


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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