



13N50K

Preliminary

Power MOSFET

13A, 500V N-CHANNEL POWER MOSFET

DESCRIPTION

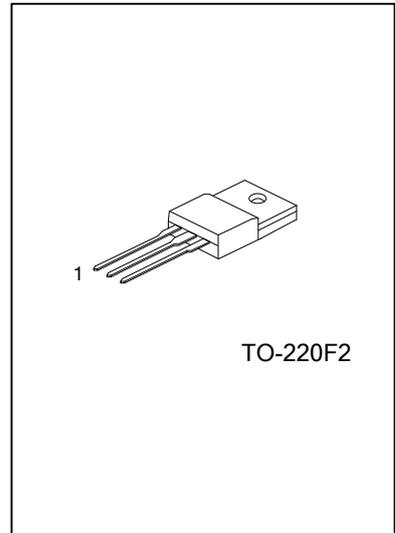
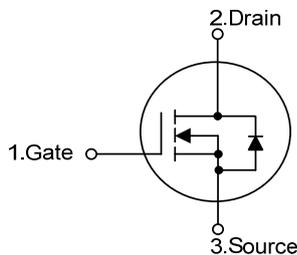
The UTC **13N50K** is an N-Channel enhancement mode power MOSFET. The device adopts planar stripe and uses DMOS technology to minimize and provide lower on-state resistance and faster switching speed. It can also withstand high energy pulse under the avalanche and commutation mode conditions.

The UTC **13N50K** 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 39nC)
- * Low reverse transfer Capacitance ($C_{RSS} =$ typical 20pF)
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

SYMBOL

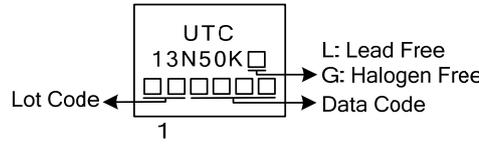


ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13N50KL-TF2-T	13N50KG-TF2-T	TO-220F2	G	D	S	Tube

<p>13N50KL-TF2-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Free</p>	<p>(1) T: Tube (2) TF2: TO-220F2 (3) L: Lead Free, G: Halogen Free</p>
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■ MARKING INFORMATION

PACKAGE	MARKING
TO-220F2	 <p>The marking diagram shows a rectangular area representing the marking on the package. At the top is 'UTC'. Below it is '13N50K' followed by a small square. Below that is a row of five small squares. An arrow labeled 'Lot Code' points to the first square, and an arrow labeled 'Data Code' points to the last square. Below the row of squares is the number '1'. To the right of the diagram, there are three lines: 'L: Lead Free', 'G: Halogen Free', and 'Data Code'.</p>

■ 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}	700	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 ($T_C=25^\circ\text{C}$)	P_D	48	W
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. $L = 8\text{mH}$, $I_{AS} = 13\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, 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	θ_{JC}	2.58	$^\circ\text{C}/\text{W}$

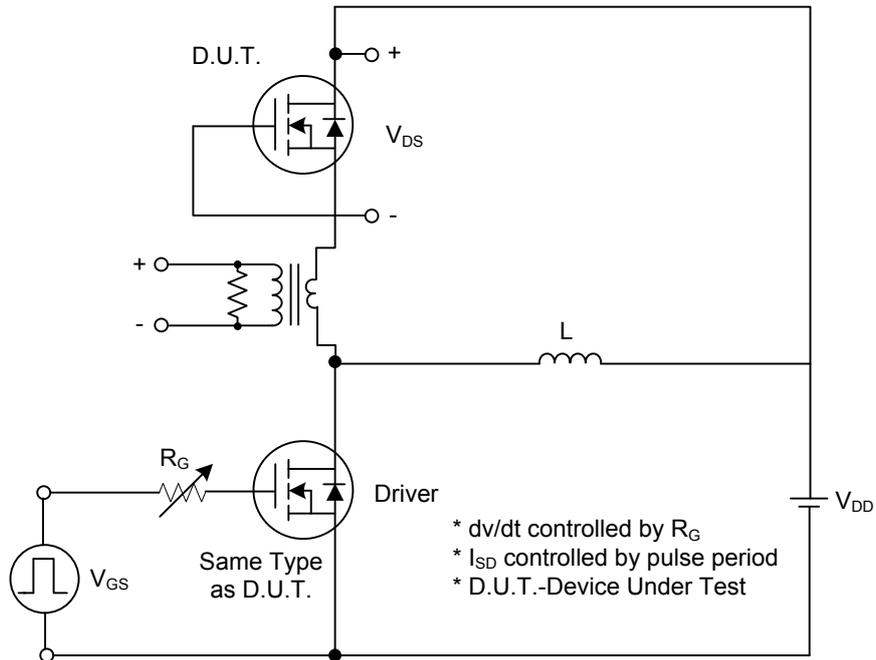
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

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)		39	60	nC
Gate-Source Charge	Q _{GS}		12		nC	
Gate-Drain Charge	Q _{GD}		11		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

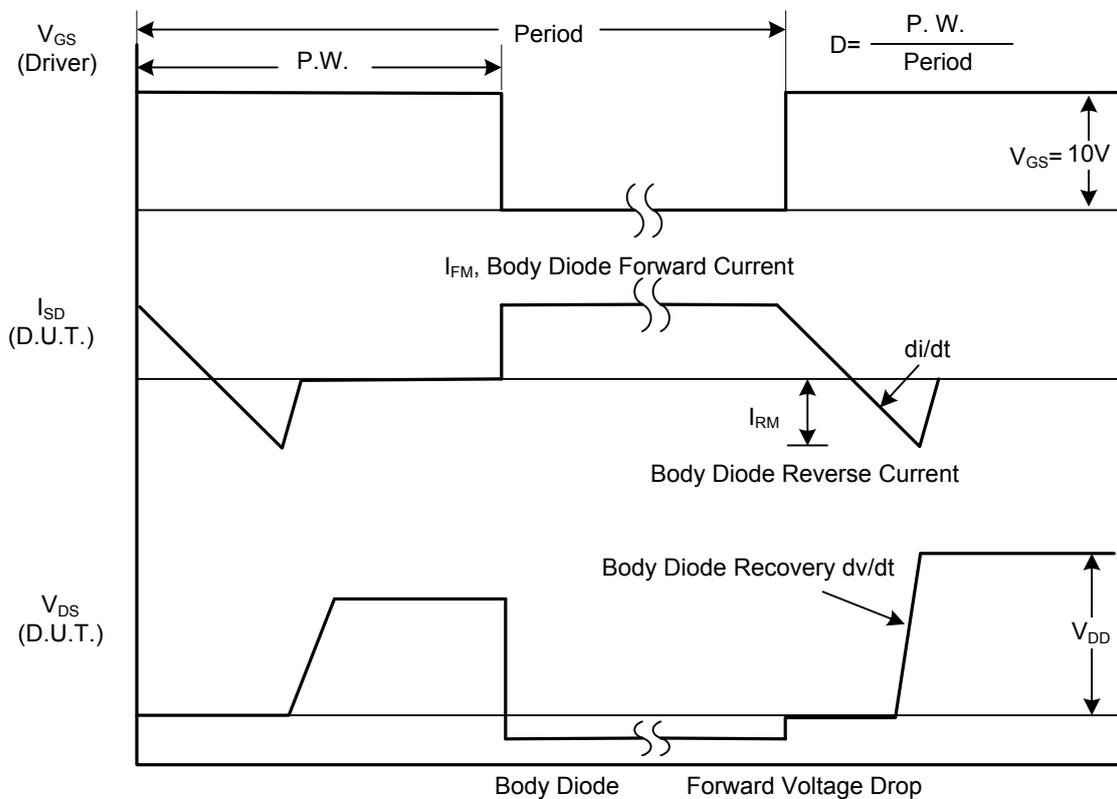
Notes: 1. Pulse Test : Pulse width≤300μs, Duty cycle≤2%

2. Essentially independent of operating ambient temperature

■ TEST CIRCUITS AND WAVEFORMS

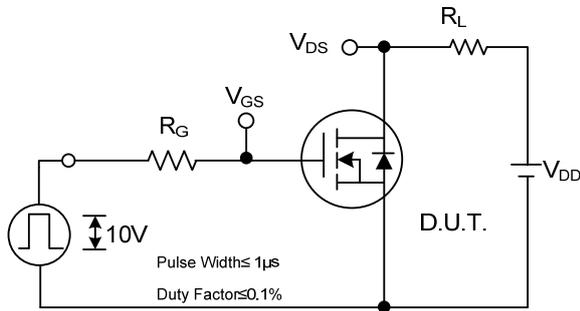


Peak Diode Recovery dv/dt Test Circuit

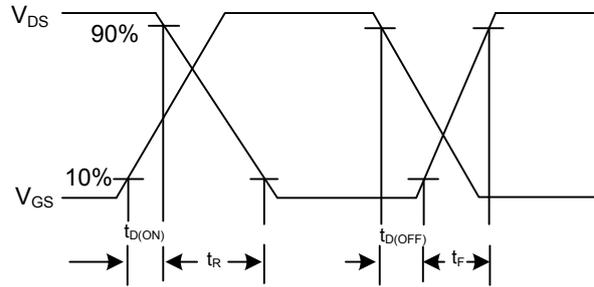


Peak Diode Recovery dv/dt Waveforms

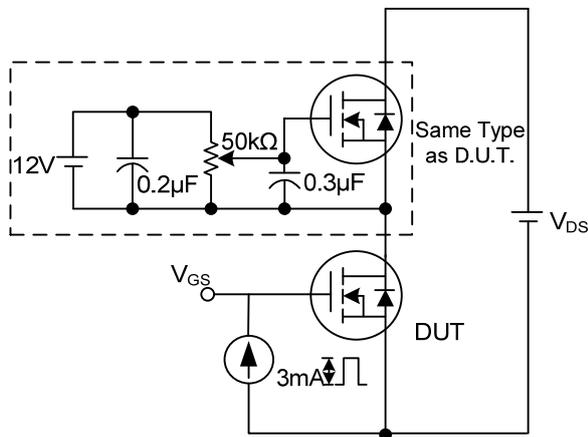
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



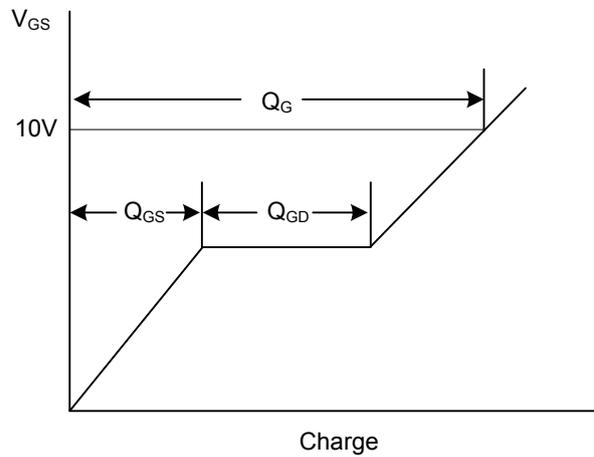
Switching Test Circuit



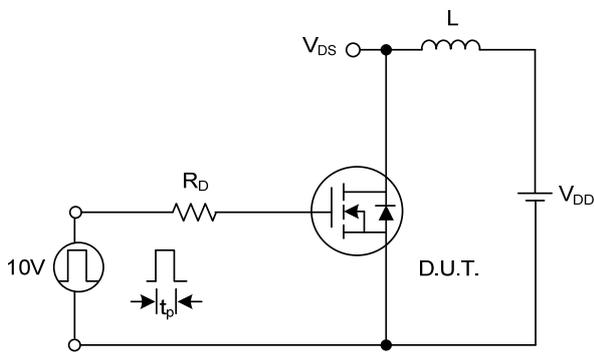
Switching Waveforms



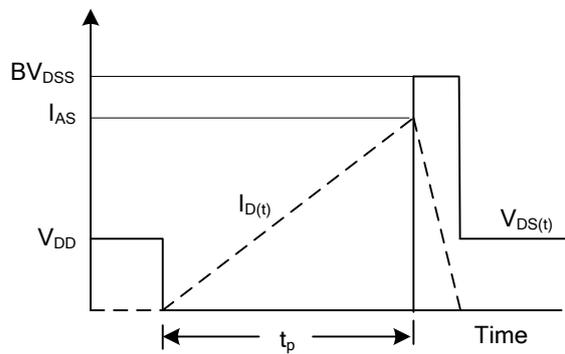
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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