



## 14N50

Preliminary

Power MOSFET

### 14A, 500V N-CHANNEL POWER MOSFET

#### DESCRIPTION

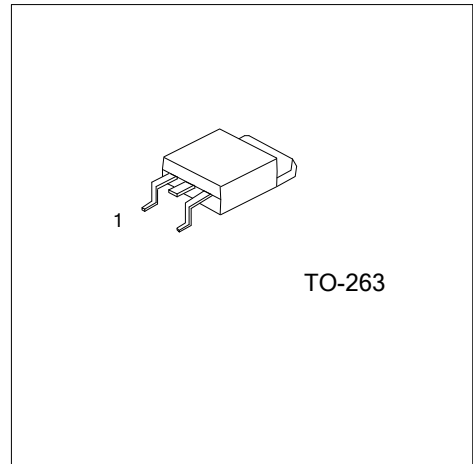
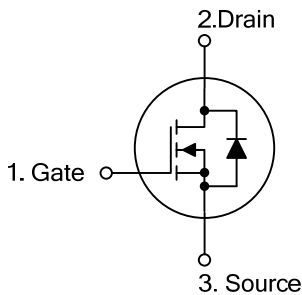
The UTC **14N50** is an N-Channel enhancement mode power MOSFET. The device adopts planar stripe and uses DMOS technology to minimize and provide lower on-state resistance and faster switching speed. It can also withstand high energy pulse under the avalanche and commutation mode conditions.

The UTC **14N50** is ideally suitable for high efficiency switch mode power supply, power factor correction and electronic lamp ballast based on half bridge topology.

#### FEATURES

- \*  $R_{DS(ON)} = 0.38\Omega @ V_{GS} = 10V$
- \* 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	
14N50L-TQ2-T	14N50G-TQ2-T	TO-263	G	D	S	Tube
14N50L-TQ2-R	14N50G-TQ2-R	TO-263	G	D	S	Tape Reel

<p>14N50L-TQ2-T</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TQ2: TO-263</p> <p>(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	$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	14	A
Pulsed Drain Current (Note 2)	$I_{DM}$	48	A
Avalanche Current (Note 2)	$I_{AR}$	14	A
Single Pulsed Avalanche Energy (Note 3)	$E_{AS}$	400	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	150	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.  $L = 9.3\text{mH}$ ,  $I_{AS} = 13\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , 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	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	0.83	$^\circ\text{C}/\text{W}$

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

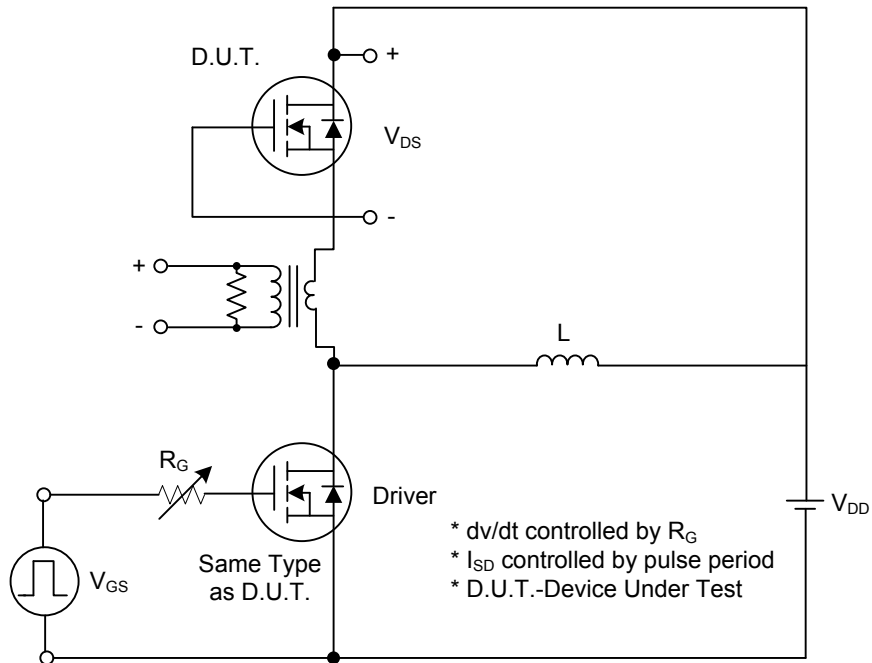
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{V}$ , $I_D = 1\text{mA}$	500			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 500\text{V}$ , $V_{GS} = 0\text{V}$			10	$\mu\text{A}$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = 20\text{V}$ , $V_{DS} = 0\text{V}$			100	nA
		$V_{GS} = -20\text{V}$ , $V_{DS} = 0\text{V}$			-100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250\text{mA}$ , Referenced to $25^\circ\text{C}$		0.5		$\text{V}/^\circ\text{C}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}$ , $I_D = 100\mu\text{A}$	3	3.75	4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{V}$ , $I_D = 6\text{A}$		0.34	0.38	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$		2000		pF
Output Capacitance	$C_{OSS}$			238		pF
Reverse Transfer Capacitance	$C_{RSS}$			55		pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 250\text{V}$ , $I_D = 14\text{A}$ , $R_G = 25\Omega$ (Note 1,2)		24		nS
Turn-On Rise Time	$t_R$			16		nS
Turn-Off Delay Time	$t_{D(OFF)}$			54		nS
Turn-Off Fall Time	$t_F$			12		nS
Total Gate Charge	$Q_G$	$V_{DS} = 400\text{V}$ , $I_D = 12\text{A}$ , $V_{GS} = 10\text{V}$ (Note 1,2)		69	92	nC
Gate-Source Charge	$Q_{GS}$			12		nC
Gate-Drain Charge	$Q_{GD}$			31		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

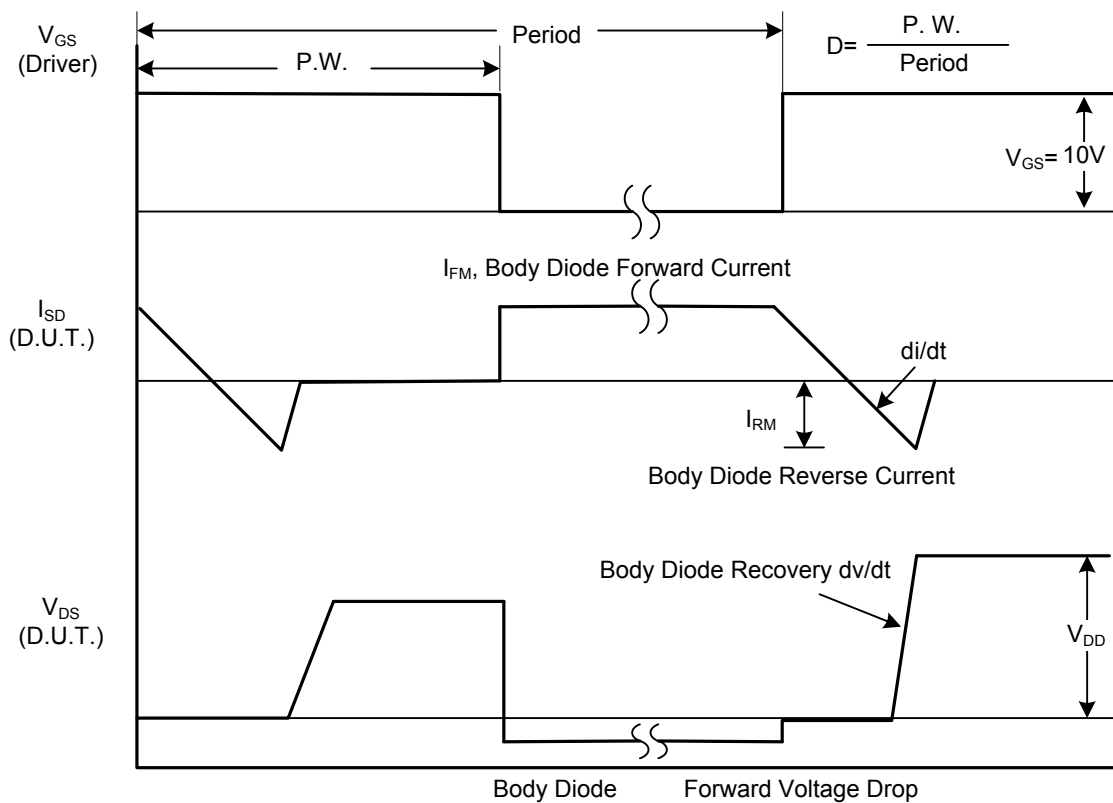
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0V, I_S = 13 A$			1.6	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				12	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				48	A
Reverse Recovery Time	$t_{rr}$	$V_{GS} = 0V, I_S = 13A,$		470		nS
Reverse Recovery Charge	$Q_{RR}$	$di_F / dt = 100A/\mu s$ (Note 1)		3.1		$\mu C$

Note: 1. Pulse Test : Pulse width $\leq$ 300 $\mu s$ , Duty cycle $\leq$ 2%  
 2. Essentially independent of operating ambient temperature

■ TEST CIRCUITS AND WAVEFORMS

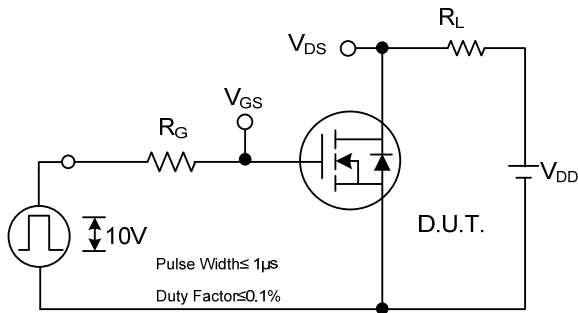


Peak Diode Recovery  $dv/dt$  Test Circuit

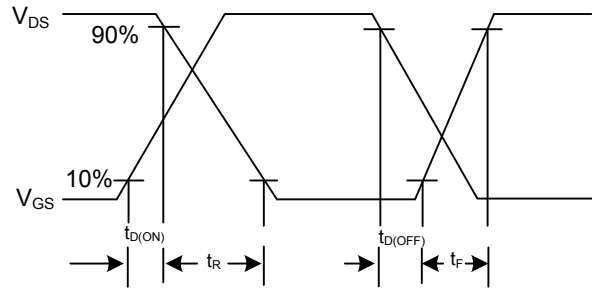


Peak Diode Recovery  $dv/dt$  Waveforms

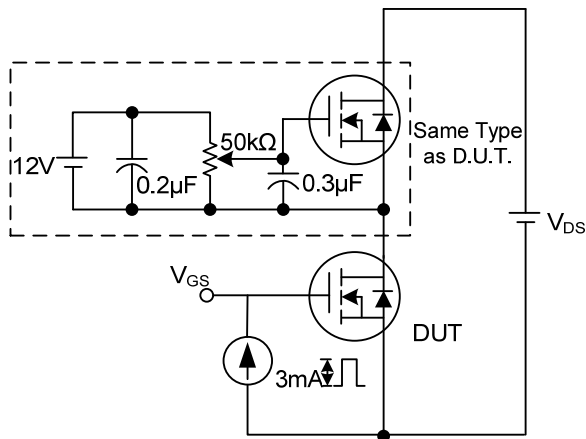
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



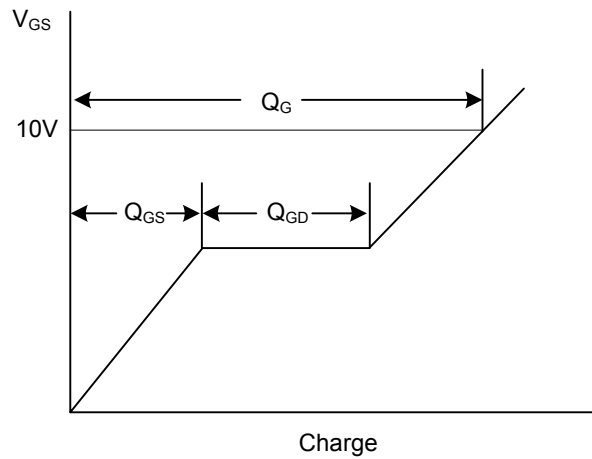
Switching Test Circuit



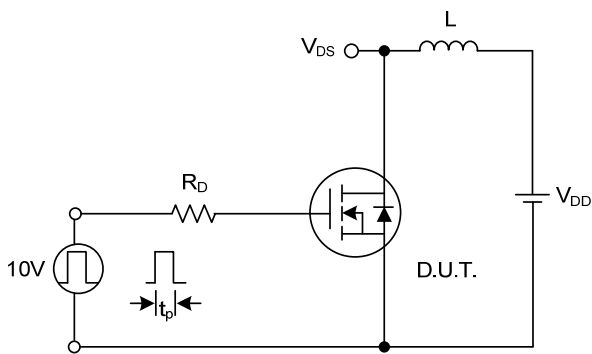
Switching Waveforms



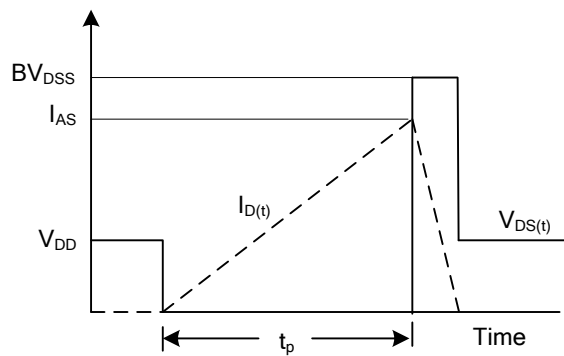
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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