



## 16N50

Power MOSFET

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

#### DESCRIPTION

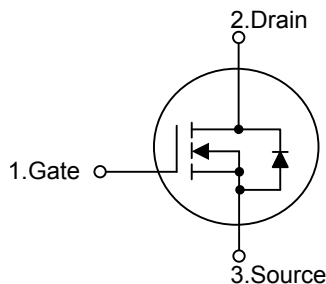
The UTC **16N50** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **16N50** is generally applied in high efficiency switch mode power supplies, active power factor correction and electronic lamp ballasts based on half bridge topology.

#### FEATURES

- \*  $R_{DS(ON)} < 0.38\Omega$  @  $V_{GS}=10V$ ,  $I_D=8A$
- \* High Switching Speed
- \* 100% Avalanche Tested

#### SYMBOL



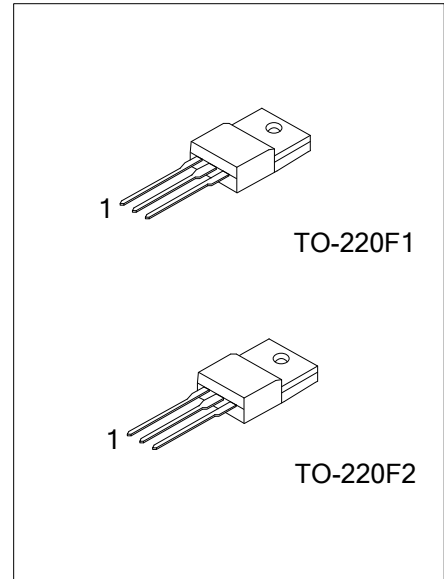
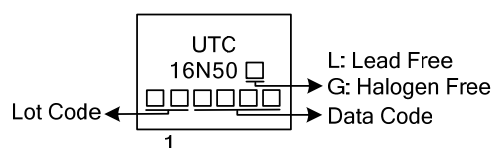
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
16N50L-TF1-T	16N50G-TF1-T	TO-220F1	G	D	S	Tube
16N50L-TF2-T	16N50G-TF2-T	TO-220F2	G	D	S	Tube

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

<p>16N50L-TF1-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>		<p>(1) T: Tube</p> <p>(2) TF1: TO-220F1, TF2: TO-220F2</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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#### MARKING



■ 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
Drain Current	Continuous ( $T_C=25^\circ\text{C}$ )	$I_D$	16 (Note 2)	A
	Pulsed (Note 3)	$I_{DM}$	64 (Note 2)	A
Avalanche Energy	Single Pulsed (Note 4)	$E_{AS}$	780	mJ
Peak Diode Recovery $dv/dt$ (Note 5)		$dv/dt$	4.5	V/ns
Power Dissipation ( $T_C=25^\circ\text{C}$ )	TO-220F1	$P_D$	52	W
	TO-220F2		62	
Linear Derating Factor above $T_C=25^\circ\text{C}$	TO-220F1		0.41	W/ $^\circ\text{C}$
	TO-220F2		0.31	
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.  $L = 6.1\text{mH}$ ,  $I_{AS} = 16\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

5.  $I_{SD} \leq 16\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , 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	TO-220F1	$\theta_{JC}$	2.4	$^\circ\text{C}/\text{W}$
	TO-220F2		2.0	

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

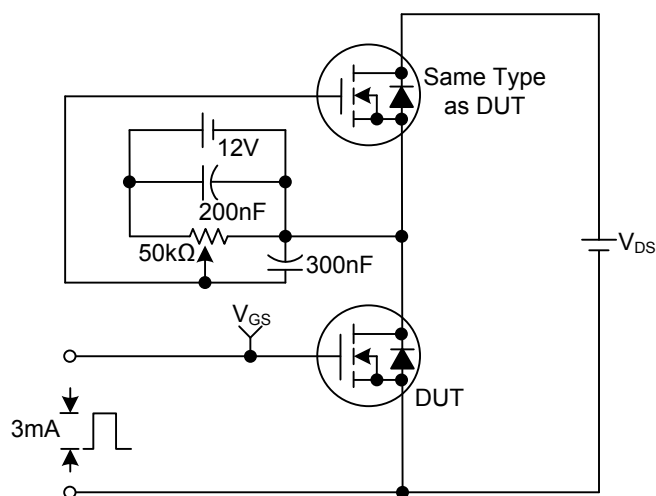
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	500			V
Drain-Source Leakage Current		I <sub>DSS</sub>	V <sub>DS</sub> =500V, V <sub>GS</sub> =0V			1	μA
			V <sub>DS</sub> =400V, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C			10	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V			+100	nA
	Reverse		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =8A		0.31	0.38	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		1100	1945	pF
Output Capacitance		C <sub>OSS</sub>			235	310	pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			25	30	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q <sub>G</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =50V, I <sub>D</sub> =1.3A (Note 1, 2)		32	45	nC
Gate to Source Charge		Q <sub>GS</sub>			8.5		nC
Gate to Drain Charge		Q <sub>GD</sub>			14		nC
Turn-ON Delay Time		t <sub>D(ON)</sub>	V <sub>DD</sub> =30V, I <sub>D</sub> =0.5A, R <sub>G</sub> =25Ω (Note 1, 2)		70	90	ns
Rise Time		t <sub>R</sub>			200	310	ns
Turn-OFF Delay Time		t <sub>D(OFF)</sub>			750	900	ns
Fall-Time		t <sub>F</sub>			380	500	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I <sub>S</sub>				16	A
Maximum Body-Diode Pulsed Current		I <sub>SM</sub>				64	A
Drain-Source Diode Forward Voltage		V <sub>SD</sub>	I <sub>S</sub> =16A, V <sub>GS</sub> =0V			1.4	V

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

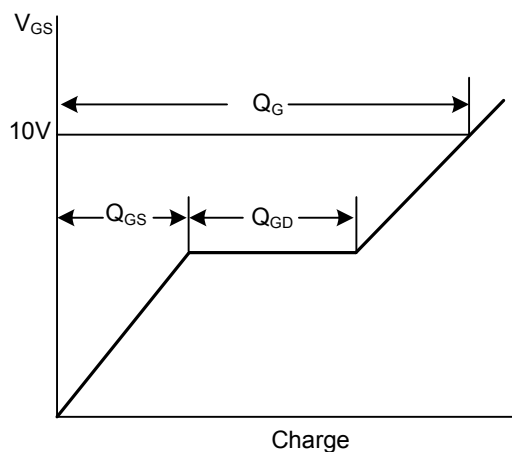
2. Essentially independent of operating temperature

# TEST CIRCUITS AND WAVEFORMS

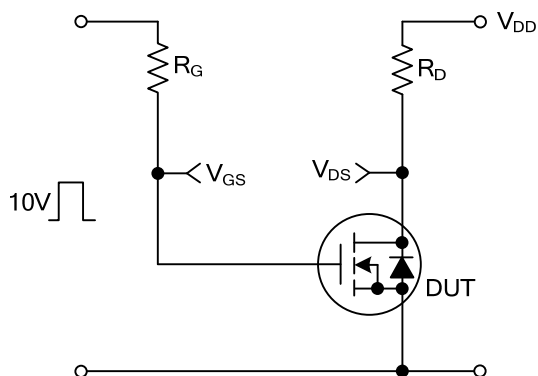
Gate Charge Test Circuit



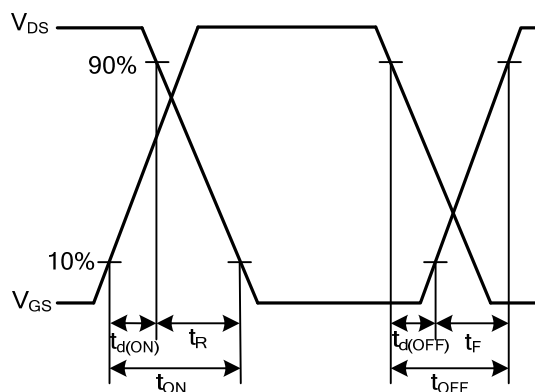
Gate Charge Waveforms



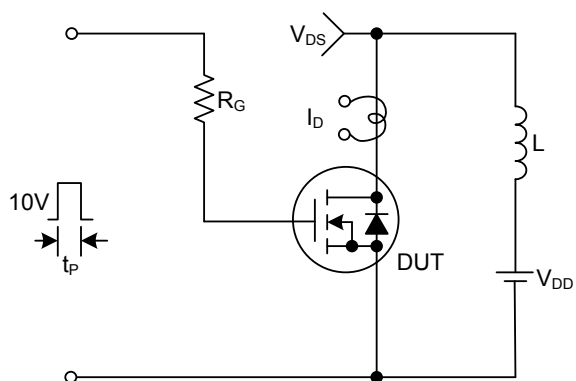
Resistive Switching Test Circuit



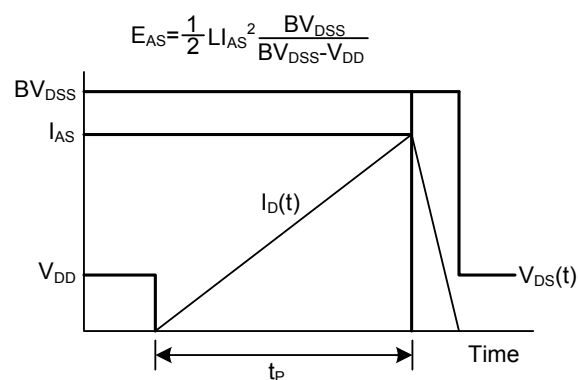
Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit

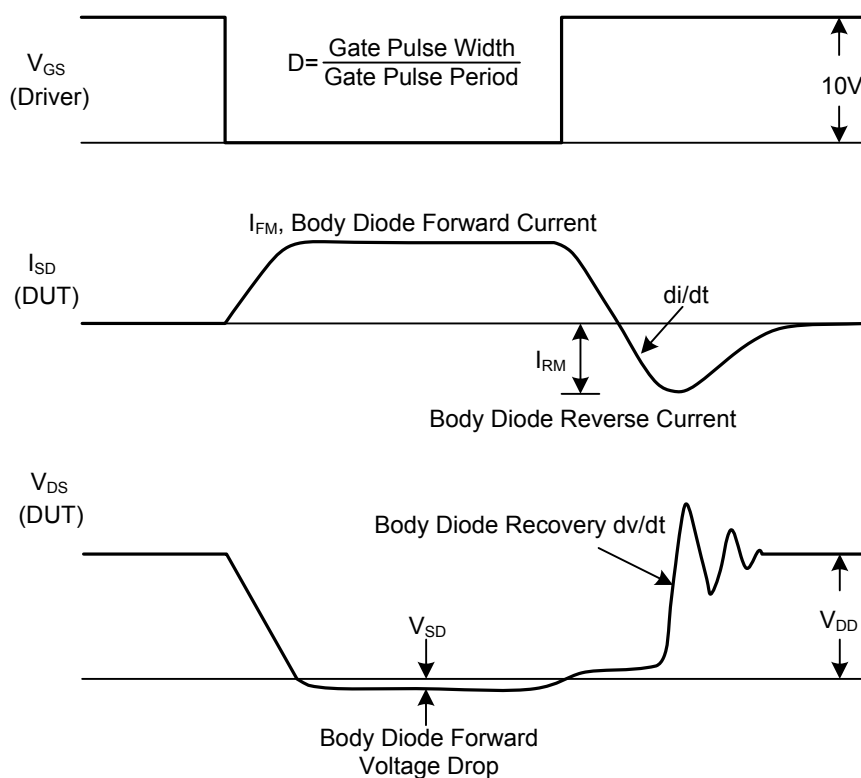
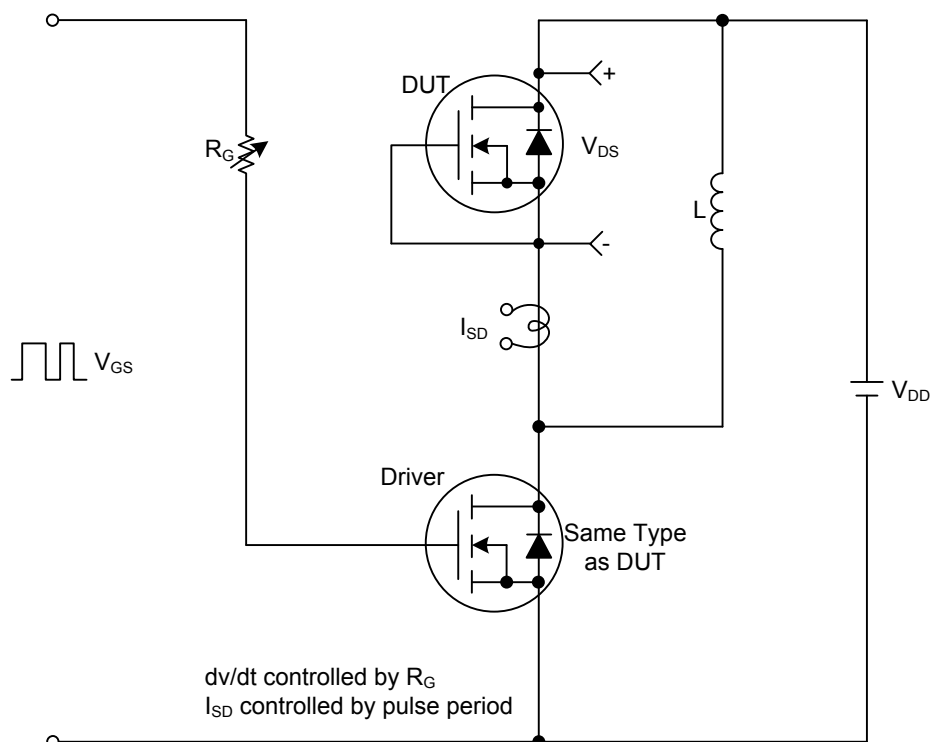


Unclamped Inductive Switching Waveforms

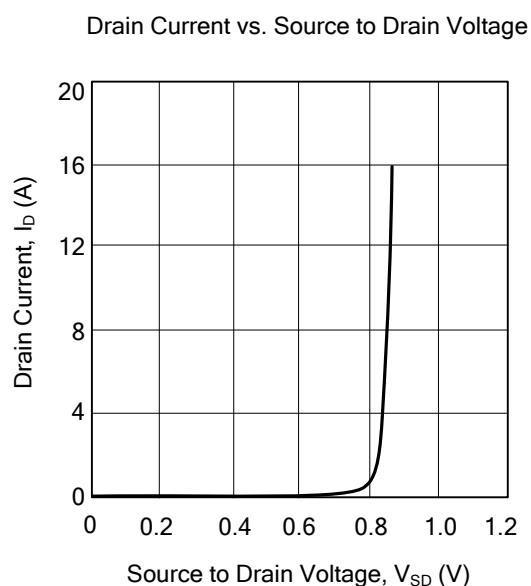
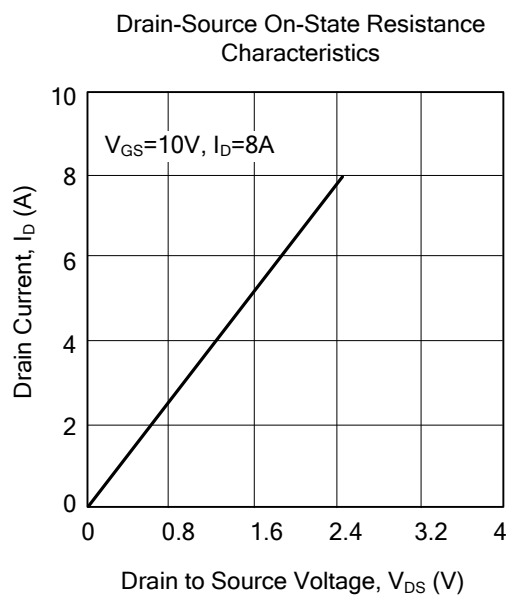
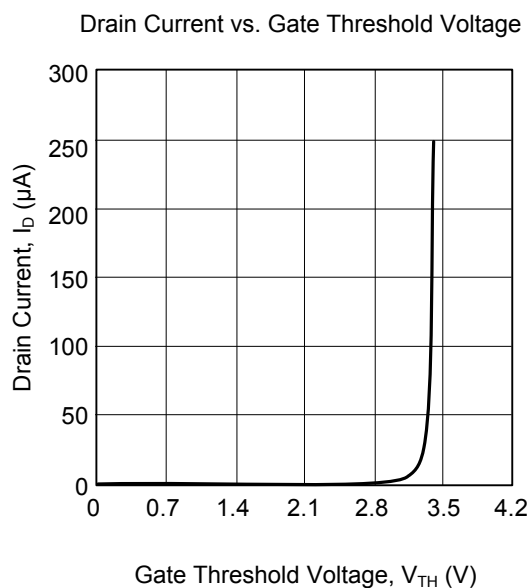
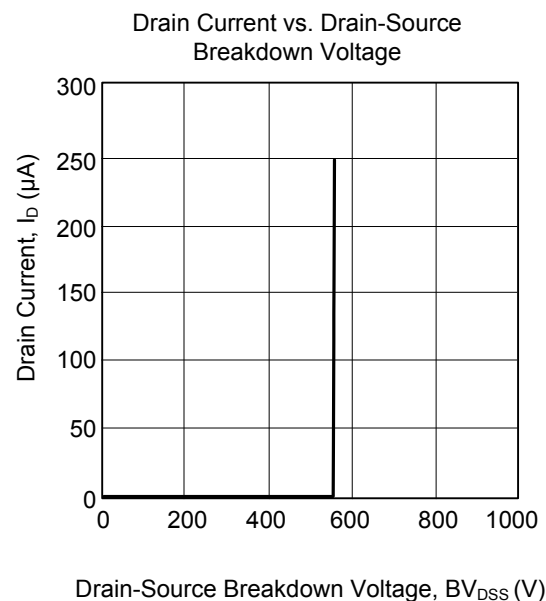


## ■ TEST CIRCUITS AND WAVEFORMS(Cont.)

## Peak Diode Recovery dv/dt Test Circuit & Waveforms



## ■ TYPICAL CHARACTERISTICS



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