



# 1N50Z

*Power MOSFET*

## 1.3A, 500V N-CHANNEL POWER MOSFET

### DESCRIPTION

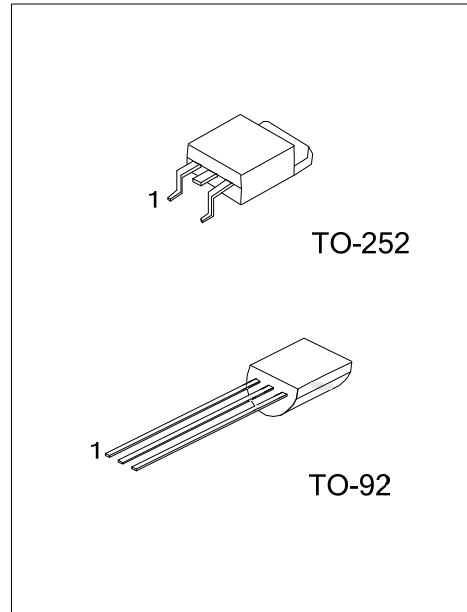
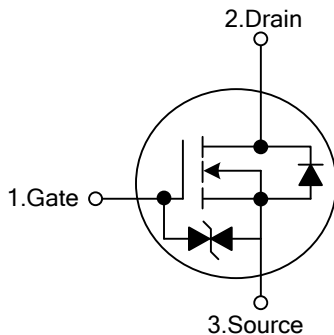
The UTC **1N50Z** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **1N50Z** is generally applied in high efficiency switch mode power supplies, active power factor correction and electronic lamp ballasts based on half bridge topology.

### FEATURES

- \*  $R_{DS(ON)} < 6.0\Omega @ V_{GS}=10V$
- \* High Switching Speed
- \* 100% Avalanche Tested

### SYMBOL



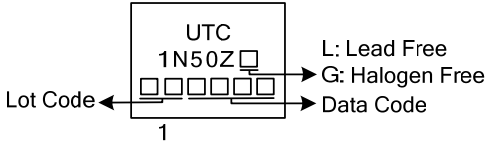
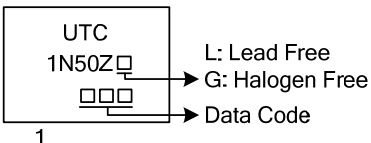
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N50ZL-T92-B	1N50ZG-T92-B	TO-92	G	D	S	Tape Box
1N50ZL-T92-K	1N50ZG-T92-K	TO-92	G	D	S	Bulk
1N50ZL-TN3-R	1N50ZG-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>1N50ZL-T92-B</p> <p>(1) Packing Type (2) Package Type (3) Lead Free</p>	<p>(1) B: Tape Box, K: Bulk, R: Tape Reel (2) T92: TO-92, TN3: TO-252 (3) L: Lead Free, G: Halogen Free</p>
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### MARKING

TO-252	TO-92
 <p>Diagram of TO-252 marking: A rectangular box contains the text "UTC" and "1N50Z" followed by a small square. Below this is a row of five small squares. An arrow labeled "Lot Code" points to the first square. An arrow labeled "Data Code" points to the last square. Below the row of squares is the number "1". To the right of the box, the text "L: Lead Free" and "G: Halogen Free" is shown with an arrow pointing to the right.</p>	 <p>Diagram of TO-92 marking: A rectangular box contains the text "UTC" and "1N50Z" followed by a small square. Below this is a row of two small squares. An arrow labeled "Data Code" points to the last square. Below the row of squares is the number "1". To the right of the box, the text "L: Lead Free" and "G: Halogen Free" is shown with an arrow pointing to the right.</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		$V_{GSS}$	$\pm 20$	V
Drain Current	Continuous ( $T_C=25^\circ\text{C}$ )	$I_D$	1.3 (Note 2)	A
	Pulsed (Note 3)	$I_{DM}$	5 (Note 2)	A
Avalanche Current (Note 3)		$I_{AR}$	1.3	A
Avalanche Energy	Single Pulsed (Note 4)	$E_{AS}$	113	mJ
	Repetitive (Note 5)	$E_{AR}$	2.6	mJ
Power Dissipation	TO-92	$P_D$	40	W
	TO-252		45	
Derate above $25^\circ\text{C}$	TO-92		0.32	W/ $^\circ\text{C}$
	TO-252		0.36	
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.  $I_{SD} \leq 1.5\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-92	$\theta_{JA}$	160	$^\circ\text{C}/\text{W}$
	TO-252		110	
Junction to Case	TO-92	$\theta_{JC}$	80	$^\circ\text{C}/\text{W}$
	TO-252		4.53	

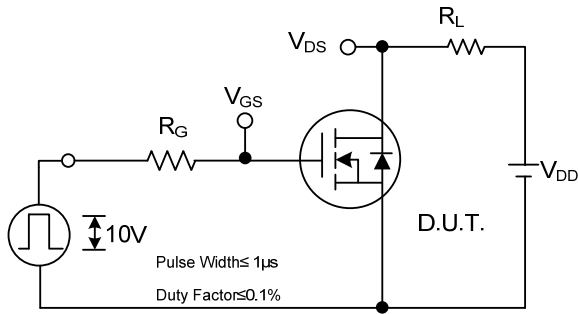
■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	500			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=500\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate- Source Leakage Current	Forward	$I_{GSS}$			+5	$\mu\text{A}$
	Reverse				-5	$\mu\text{A}$
<b>ON CHARACTERISTICS</b>						
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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=0.5\text{A}$		4.6	6.0	$\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1.0\text{MHz}$		220	290	pF
Output Capacitance	$C_{OSS}$			30	35	pF
Reverse Transfer Capacitance	$C_{RSS}$			11	13	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	$Q_G$	$V_{GS}=10\text{V}$ , $V_{DS}=50\text{V}$ , $I_D=1.3\text{A}$ (Note 1, 2)		12.5	16	nC
Gate to Source Charge	$Q_{GS}$			3.2		nC
Gate to Drain Charge	$Q_{GD}$			2.7		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=30\text{V}$ , $I_D=0.5\text{A}$ , $R_G=25\Omega$ (Note 1, 2)		20	35	ns
Rise Time	$t_R$			40	50	ns
Turn-OFF Delay Time	$t_{D(OFF)}$			70	90	ns
Fall-Time	$t_F$			48	60	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				1.3	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				5	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$I_S=1.3\text{A}$ , $V_{GS}=0\text{V}$			1.15	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_S=1.5\text{A}$ , $V_{GS}=0\text{V}$ ,		130		ns
Body Diode Reverse Recovery Charge	$Q_{RR}$	$di_F/dt=100\text{A}/\mu\text{s}$ (Note 1)		0.32		$\mu\text{C}$

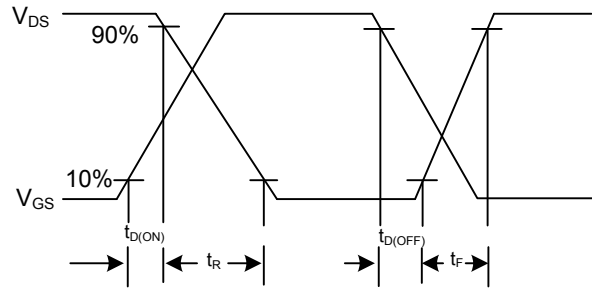
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

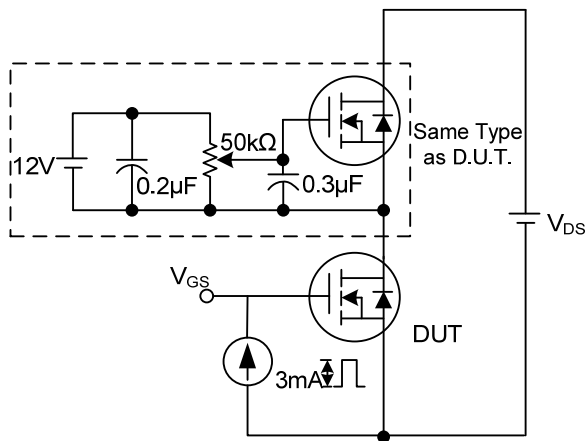
## TEST CIRCUITS AND WAVEFORMS



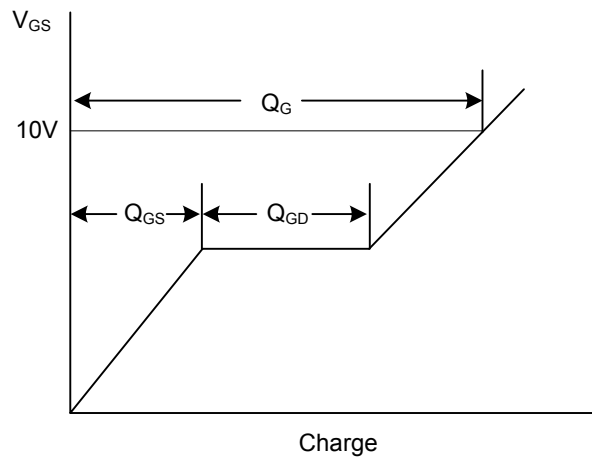
**Switching Test Circuit**



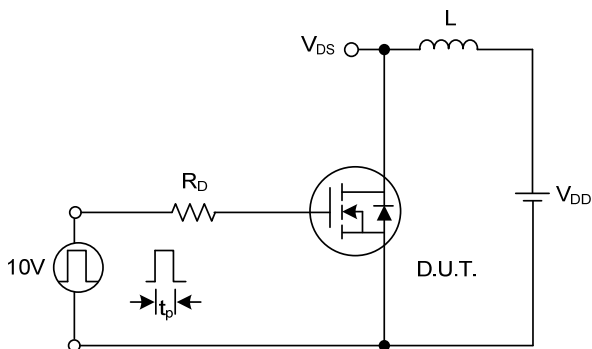
**Switching Waveforms**



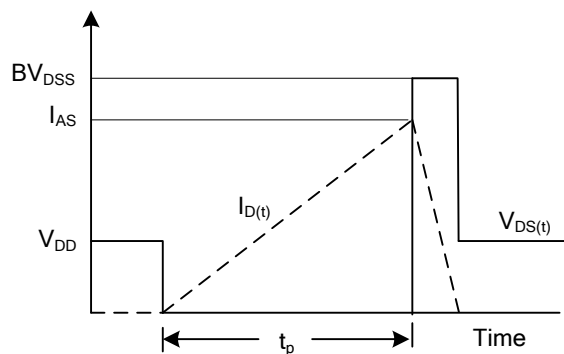
**Gate Charge Test Circuit**



**Gate Charge Waveform**

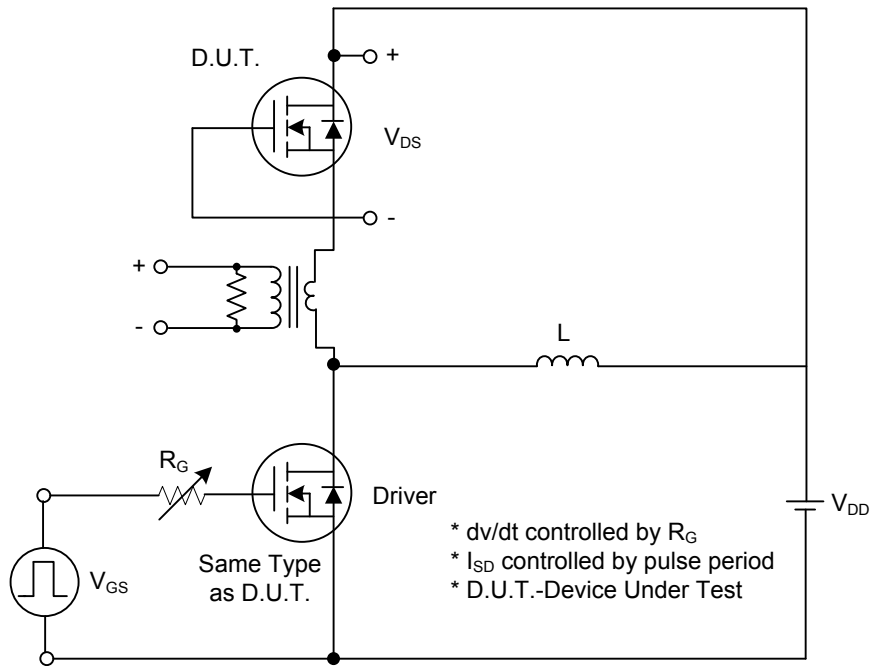


**Unclamped Inductive Switching Test Circuit**

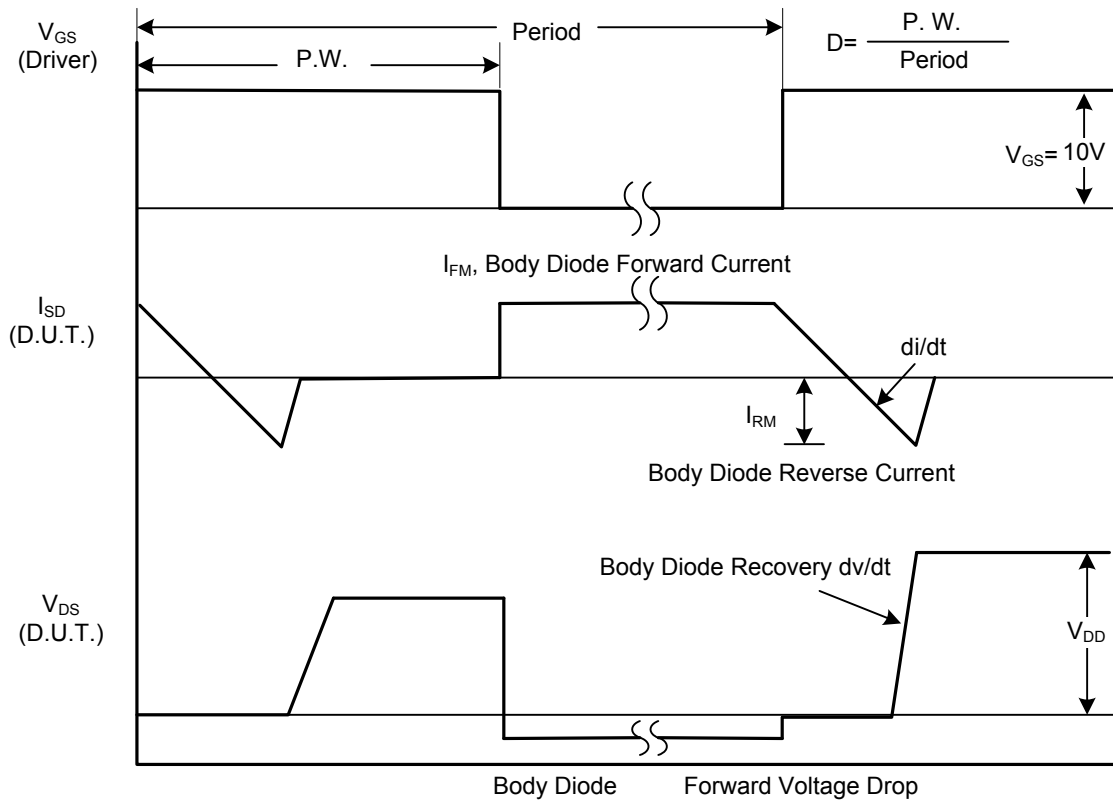


**Unclamped Inductive Switching Waveforms**

■ TEST CIRCUITS AND WAVEFORMS(Cont.)

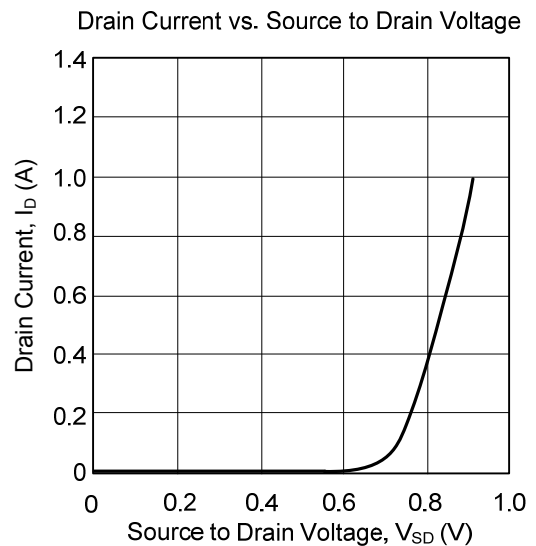
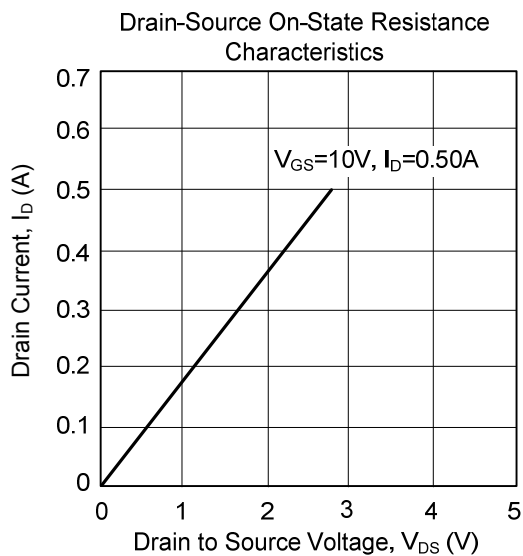
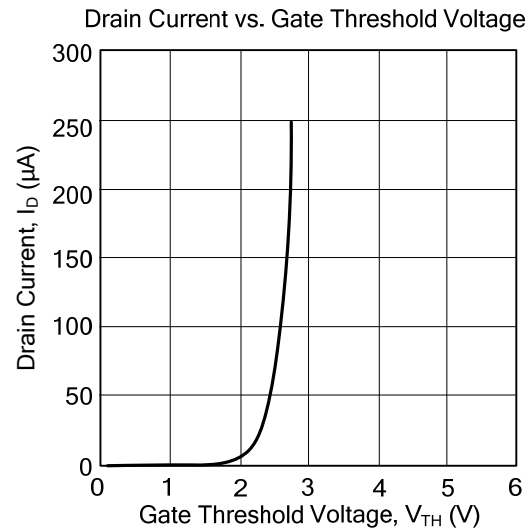
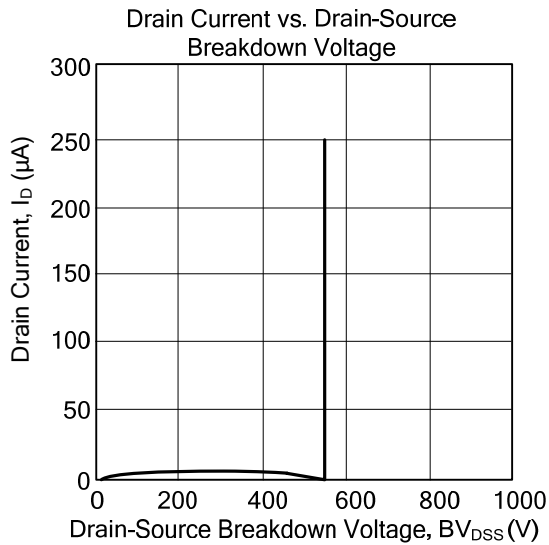


Peak Diode Recovery  $dv/dt$  Test Circuit



Peak Diode Recovery  $dv/dt$  Waveforms

### TYPICAL CHARACTERISTICS



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