



1N50-MS

Preliminary

Power MOSFET

1A, 500V N-CHANNEL POWER MOSFET

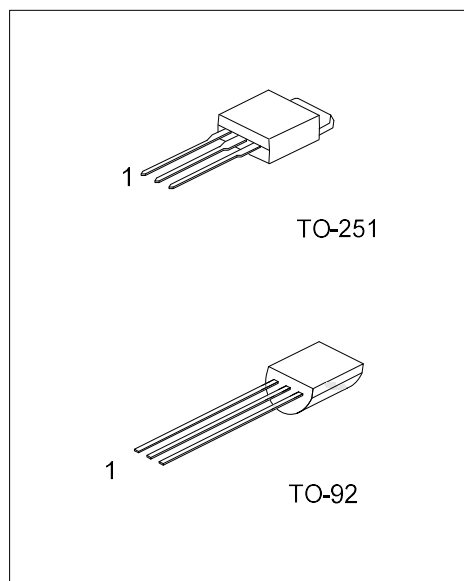
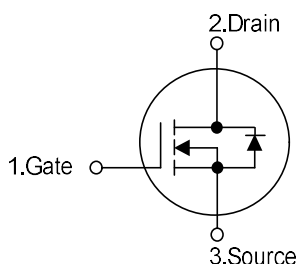
DESCRIPTION

The UTC **1N50-MS** is a high voltage power MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.

FEATURES

- * $R_{DS(ON)} \leq 8.5 \Omega$ @ $V_{GS}=10V$, $I_D=0.5A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

SYMBOL



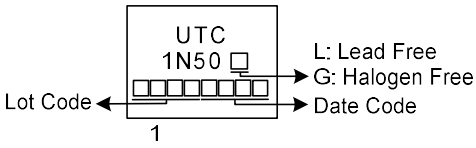
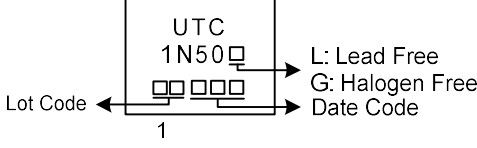
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N50L-TM3-T	1N50G-TM3-T	TO-251	G	D	S	Tube
1N50L-T92-B	1N50G-T92-B	TO-92	G	D	S	Tape Box
1N50L-T92-K	1N50G-T92-K	TO-92	G	D	S	Bulk

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

1N50G-TM3-T	(1)Packing Type	(1) T: Tube, B: Tape Box, K: Bulk
	(2)Package Type	(2) TM3: TO-251, T92: TO-92
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-251	TO-92
 <p>Diagram of TO-251 marking: A rectangular package with 'UTC' and '1N50' printed on top. Below the text is a row of six small squares. An arrow points from the first square to 'Lot Code' on the left and from the last square to 'Date Code' on the right. Below the squares is a '1'.</p> <p>UTC 1N50</p> <p>Lot Code ← → Date Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</p>	 <p>Diagram of TO-92 marking: A rectangular package with 'UTC' and '1N50' printed on top. Below the text is a row of four small squares. An arrow points from the first square to 'Lot Code' on the left and from the last square to 'Date Code' on the right. Below the squares is a '1'.</p> <p>UTC 1N50</p> <p>Lot Code ← → Date Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</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	1	A
Pulsed Drain Current (Note 2)		I_{DM}	2	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	38	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-251	P_D	25	W
	TO-92		2.7	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. $L = 30\text{mH}$, $I_{AS} = 1.6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 1.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-251	θ_{JA}	110	$^\circ\text{C/W}$
	TO-92		160 (Note)	$^\circ\text{C/W}$
Junction to Case	TO-251	θ_{JC}	5 (Note)	$^\circ\text{C/W}$
	TO-92		45 (Note)	$^\circ\text{C/W}$

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

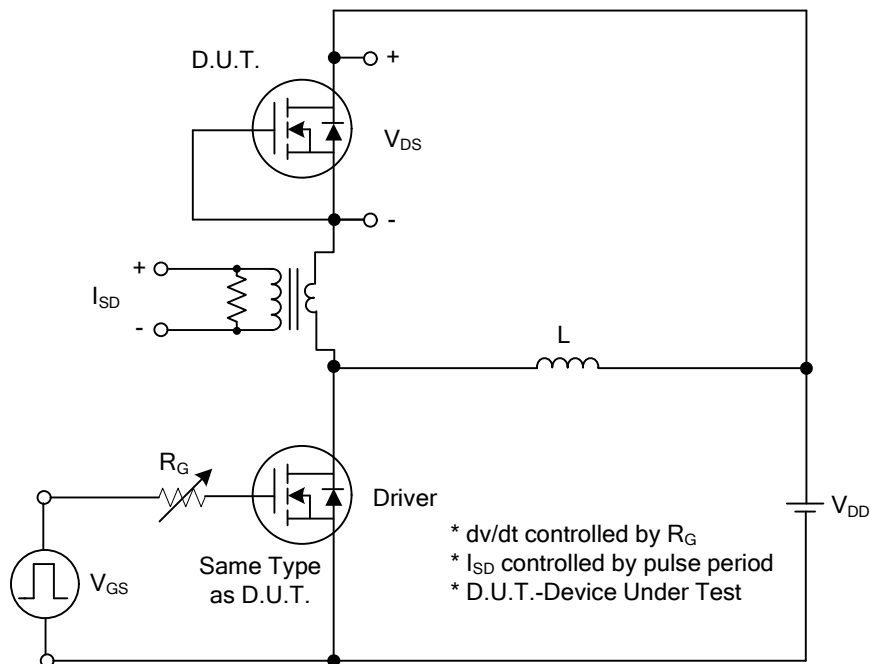
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

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	Forward	I _{GSS}	V _{GS} =30V, V _{DS} =0V			100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-100	nA
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 =0.5A			8.5	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		86		pF
Output Capacitance		C _{OSS}			18		pF
Reverse Transfer Capacitance		C _{RSS}			2		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =400V, V _{GS} =10V, I _D =1A I _G =1mA (Note 1, 2)		3.6		nC
Gate-Source Charge		Q _{GS}			1.8		nC
Gate-Drain Charge		Q _{GD}			0.4		nC
Turn-On Delay Time (Note 1)		t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =1A, R _G =25Ω (Note 1, 2)		3		ns
Turn-On Rise Time		t _R			16		ns
Turn-Off Delay Time		t _{D(OFF)}			11		ns
Turn-Off Fall Time		t _F			29		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Body-Diode Continuous Current		I _S				1	A
Maximum Body-Diode Pulsed Current		I _{SM}				2	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =1A , V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	I _S =1A , V _{GS} =0V		145		ns
Reverse Recovery Charge		Q _{rr}	di/dt=100A/μs		0.86		μC

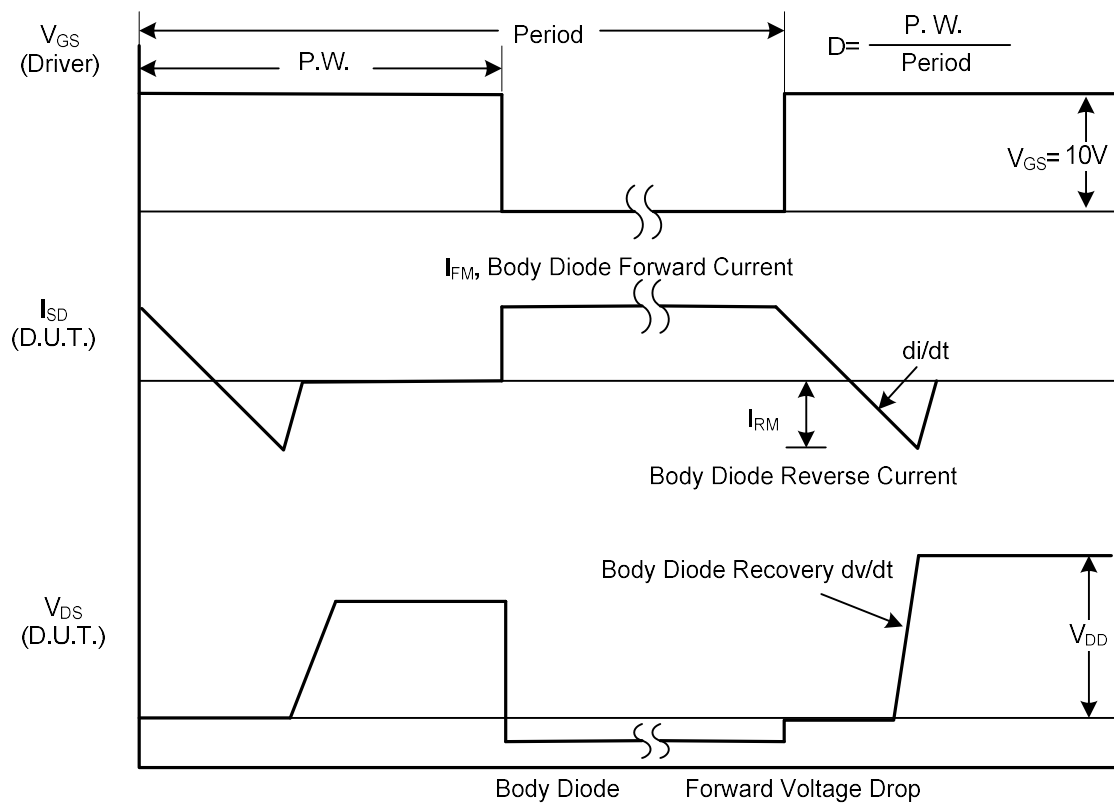
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

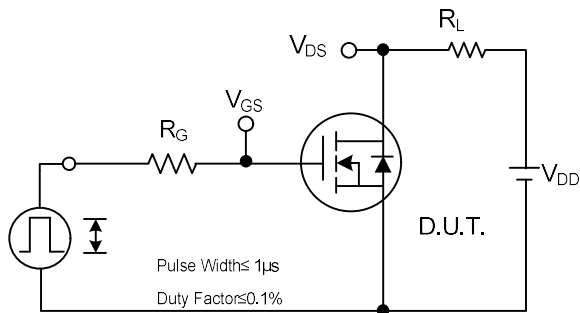


Peak Diode Recovery dv/dt Test Circuit

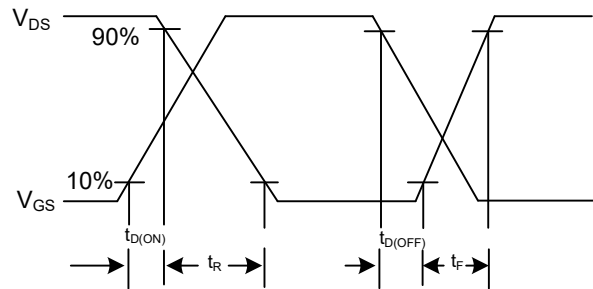


Peak Diode Recovery dv/dt Waveforms

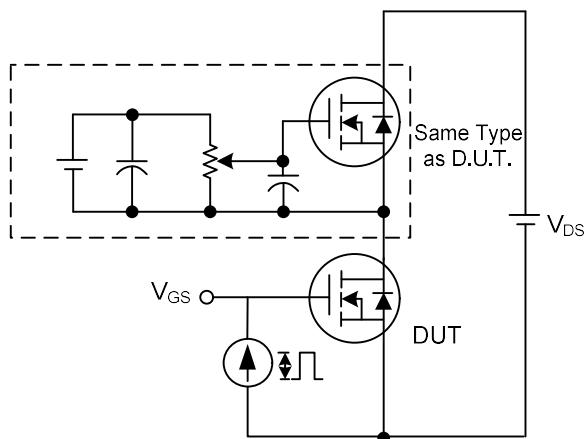
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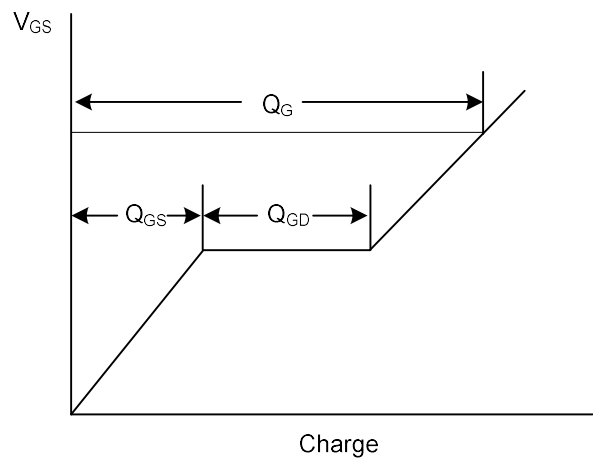
Switching Test Circuit



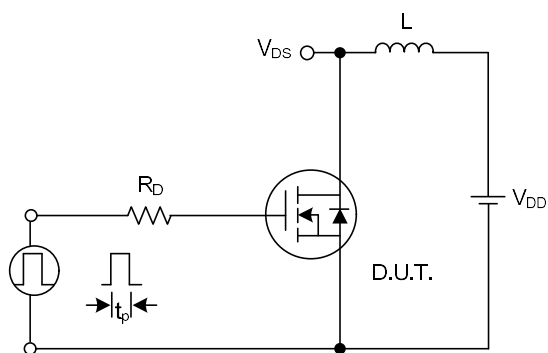
Switching Waveforms



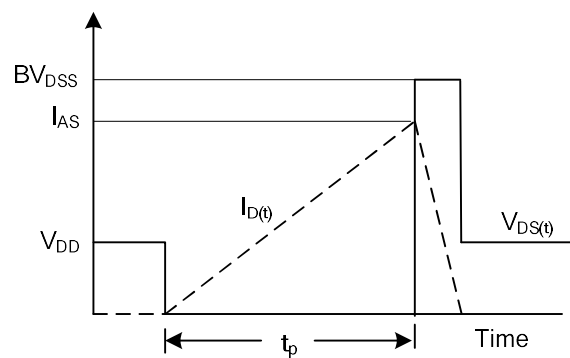
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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