



4N90

Power MOSFET

4 Amps, 900 Volts N-CHANNEL POWER MOSFET

■ DESCRIPTION

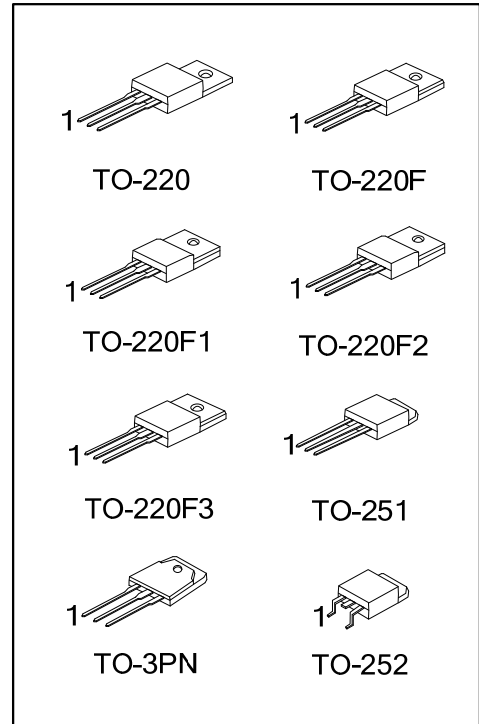
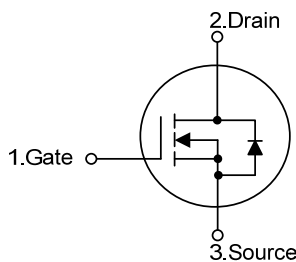
The UTC **4N90** is a N-channel enhancement MOSFET adopting UTC's advanced technology to provide customers with DMOS, planar stripe technology. This technology is designed to meet the requirements of the minimum on-state resistance and perfect switching performance. It also can withstand high energy pulse in the avalanche and communication mode.

The UTC **4N90** is particularly applied in high efficiency switch mode power supplies.

■ FEATURES

- * $R_{DS(ON)} < 4.2\Omega @ V_{GS}=10V$
- * High switching speed
- * 100% avalanche tested
- * Improved dv/dt capability

■ SYMBOL



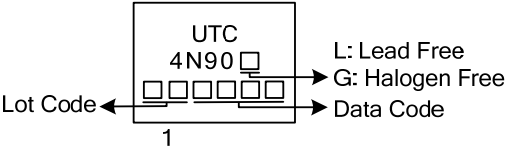
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4N90L-TA3-T	4N90G-TA3-T	TO-220	G	D	S	Tube
4N90L-TF3-T	4N90G-TF3-T	TO-220F	G	D	S	Tube
4N90L-TF1-T	4N90G-TF1-T	TO-220F1	G	D	S	Tube
4N90L-TF2-T	4N90G-TF2-T	TO-220F2	G	D	S	Tube
4N90L-TF3T-T	4N90G-TF3T-T	TO-220F3	G	D	S	Tube
4N90L-TM3-T	4N90G-TM3-T	TO-251	G	D	S	Tube
4N90L-TN3-R	4N90G-TN3-R	TO-252	G	D	S	Tape Reel
4N90L-T3N-T	4N90G-T3N-T	TO-3PN	G	D	S	Tube

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

<p>4N90L-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Free</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1 TF2: TO-220F2, TF3T: TO-220F3, TM3: TO-251 TN3: TO-252, T3N: TO-3PN</p> <p>(3) L: Lead Free, G: Halogen Free</p>
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MARKING



■ ABSOLUTE MAXIMUM RATINGS ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain to Source Voltage		V_{DSS}	900	V
Gate to Source Voltage		V_{GSS}	± 30	V
Avalanche Current (Note 2)		I_{AR}	4	A
Continuous Drain Current	Continuous	I_D	4	A
	Pulsed (Note 2)	I_{DM}	16	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	570	mJ
	Repetitive (Note 2)	E_{AR}	14	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation ($T_C=25^\circ\text{C}$)	TO-220	P_D	140	W
	TO-220F/TO-220F1		38	
	TO-220F3			
	TO-220F2		40	
	TO-251/TO-252		54	
TO-3PN	208			
Derate above 25°C	TO-220		1.12	W/ $^\circ\text{C}$
	TO-220F/TO-220F1		0.304	
	TO-220F3			
	TO-220F2		0.322	
	TO-251/TO-252	0.43		
TO-3PN	1.66			
Operating 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. $L=67\text{mH}$, $I_{AS}=4\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

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

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-220F3		110	
	TO-251/TO-252			
TO-3PN	40			
Junction to Case	TO-220	θ_{JC}	0.89	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.25	
	TO-220F3			
	TO-220F2		3.1	
	TO-251/TO-252		2.3	
TO-3PN	0.6			

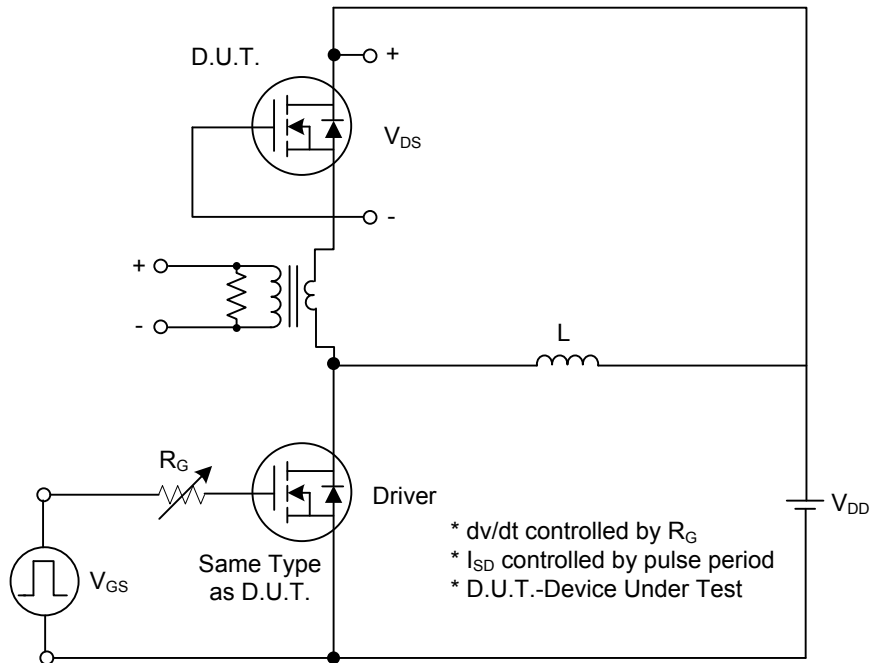
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	900			V
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C		1.05		V/°C
Drain-Source Leakage Current	I _{DSS}	V _{DS} =900V, V _{GS} =0V			10	μA
		V _{DS} =720V, T _C =125°C			100	μA
Gate- Source Leakage Current	Forward	I _{GSS} V _{GS} =+30V, V _{DS} =0V			+100	nA
	Reverse	I _{GSS} V _{GS} =-30V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	3.0		5.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =2A		2.1	4.2	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		1000	1400	pF
Output Capacitance	C _{OSS}			49	85	pF
Reverse Transfer Capacitance	C _{RSS}			13	18	pF
SWITCHING PARAMETERS						
Total Gate Charge	Q _G	V _{DS} =50V, V _{GS} =10V, I _D =1.3A (Note 1,2)		33	50	nC
Gate-Source Charge	Q _{GS}			8.9		nC
Gate-Drain Charge	Q _{GD}			10		nC
Turn-ON Delay Time	t _{D(ON)}	V _{DD} =30V, I _D =0.5A, R _G =25Ω (Note 1,2)		70	100	ns
Turn-ON Rise Time	t _R			188	220	ns
Turn-OFF Delay Time	t _{D(OFF)}			188	220	ns
Turn-OFF Fall Time	t _F			88	120	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				4	A
Maximum Body-Diode Pulsed Current	I _{SM}				16	A
Drain-Source Diode Forward Voltage	V _{SD}	I _S =4A, V _{GS} =0V			1.4	V

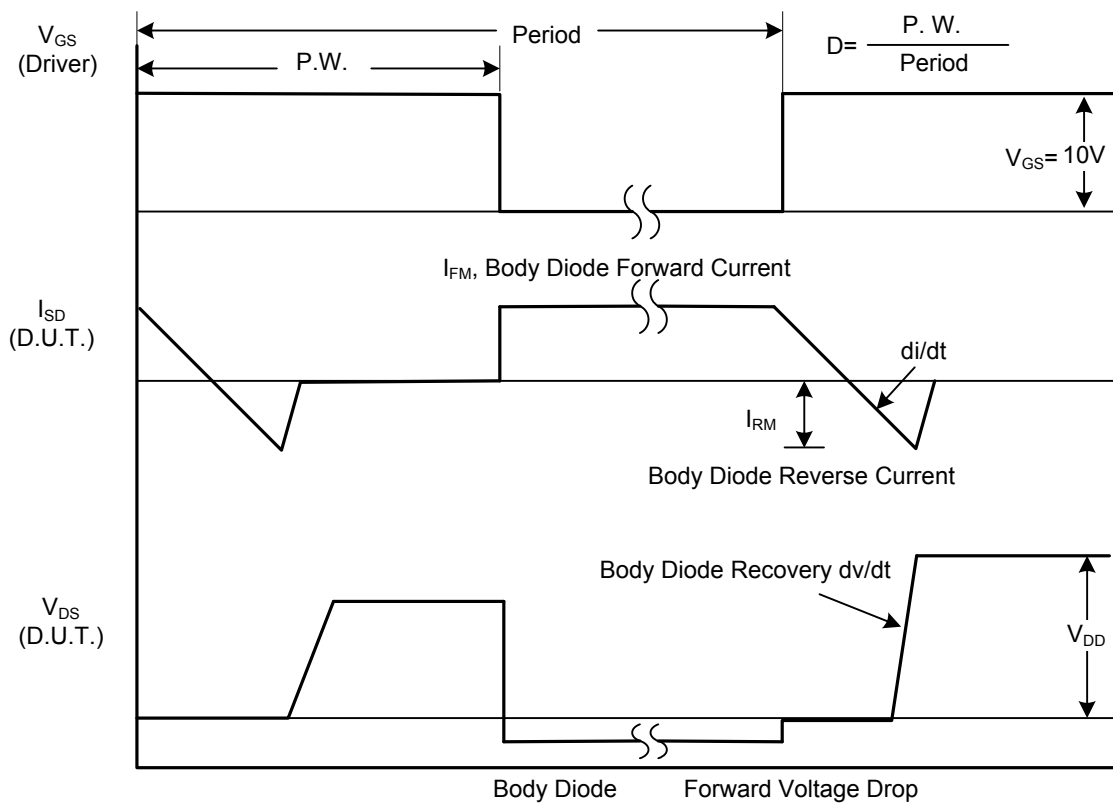
Notes: 1. Pulse Test : Pulse width≤300μs, Duty cycle≤2%

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

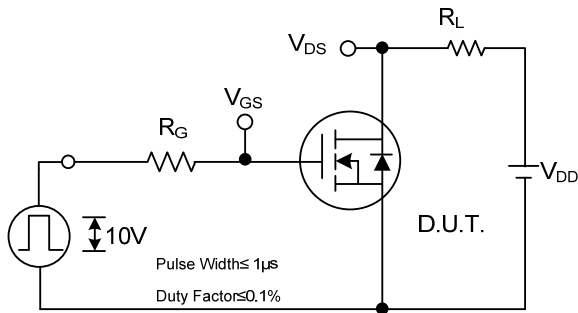


Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

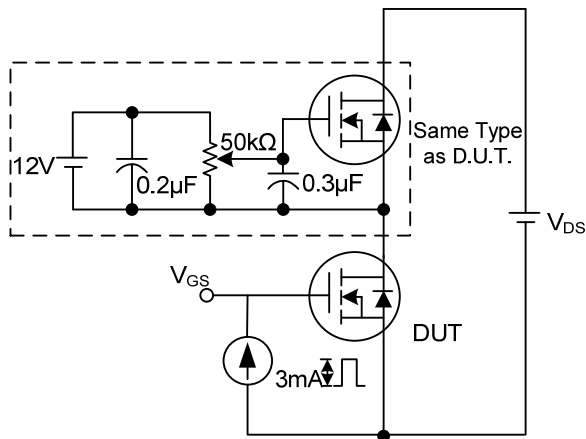
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



Switching Test Circuit



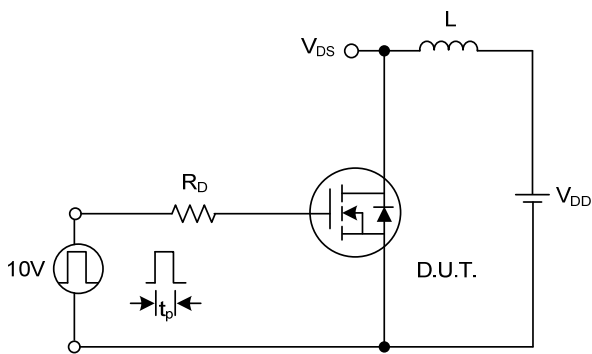
Switching Waveforms



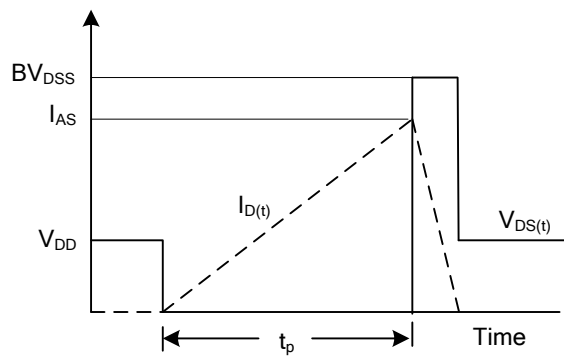
Gate Charge Test Circuit



Gate Charge Waveform

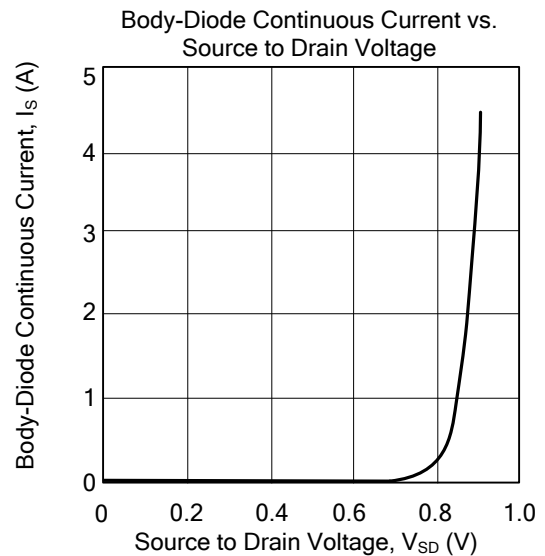
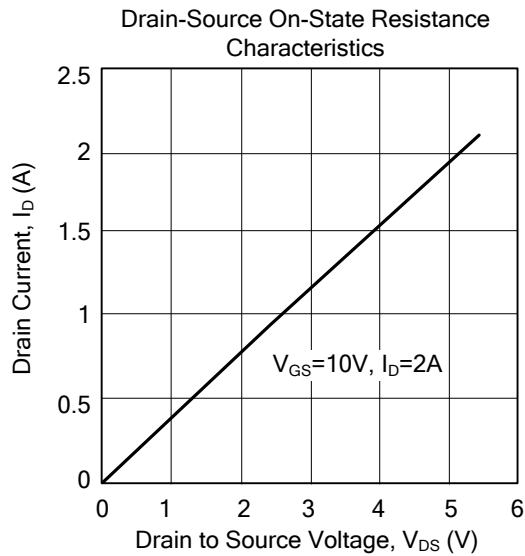
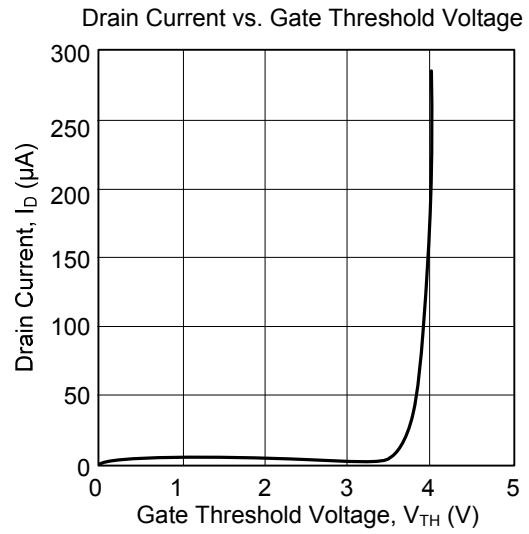
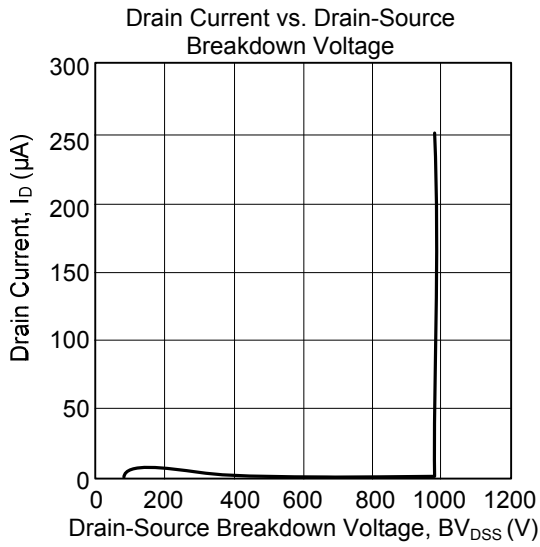


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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