



1N90

Power MOSFET

1 Amps, 900 Volts N-CHANNEL POWER MOSFET

DESCRIPTION

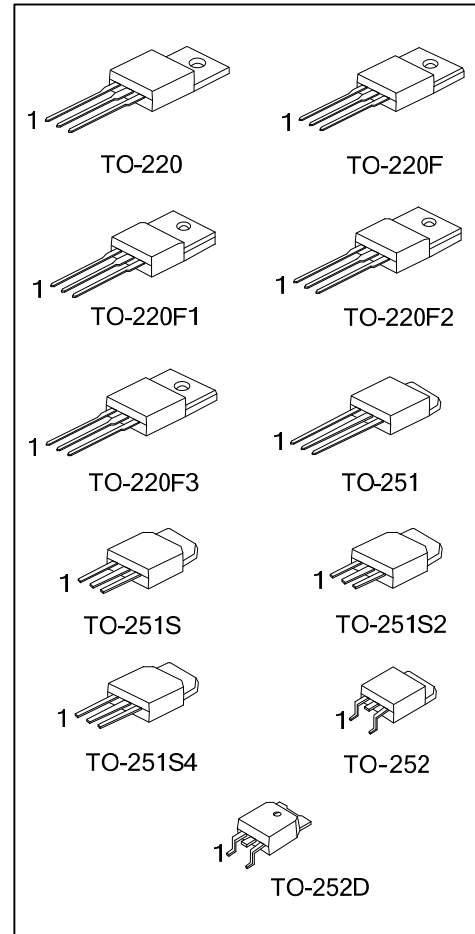
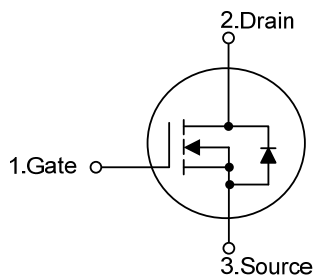
The UTC **1N90** is an N-channel mode power MOSFET, using UTC's advanced technology to provide customers planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance, superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **1N90** is universally applied in high efficiency switch mode power supply.

FEATURES

- * $R_{DS(on)} < 16\Omega$ @ $V_{GS}=10V$, $I_D = 0.5A$
- * High switching speed
- * Improved dv/dt capability
- * 100% avalanche tested

SYMBOL



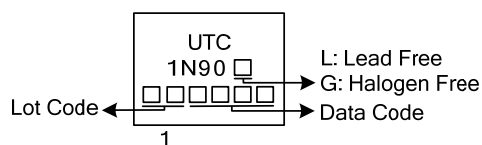
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N90L-TA3-T	1N90G-TA3-T	TO-220	G	D	S	Tube
1N90L-TF3-T	1N90G-TF3-T	TO-220F	G	D	S	Tube
1N90L-TF1-T	1N90G-TF1-T	TO-220F1	G	D	S	Tube
1N90L-TF2-T	1N90G-TF2-T	TO-220F2	G	D	S	Tube
1N90L-TF3-T	1N90G-TF3-T	TO-220F3	G	D	S	Tube
1N90L-TM3-T	1N90G-TM3-T	TO-251	G	D	S	Tube
1N90L-TMS-T	1N90G-TMS-T	TO-251S	G	D	S	Tube
1N90L-TMS2-T	1N90G-TMS2-T	TO-251S2	G	D	S	Tube
1N90L-TMS4-T	1N90G-TMS4-T	TO-251S4	G	D	S	Tube
1N90L-TN3-R	1N90G-TN3-R	TO-252	G	D	S	Tape Reel
1N90L-TND-R	1N90G-TND-R	TO-252D	G	D	S	Tape Reel

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

1N90L-TA3-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F3, TM3: TO-251, TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TND: TO-252D (3) L: Lead Free, G: Halogen Free and Lead Free
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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}	900	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	1.0	A
	Pulsed (Note 2)	I_{DM}	4.0	A
Avalanche Current (Note 2)		I_{AR}	1.0	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	90	mJ
	Repetitive (Note 2)	E_{AR}	4.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/ns
Power Dissipation	TO-220	P_D	40	W
	TO-220F/TO-220F1 TO-220F3		23	W
	TO-220F2		24	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		28	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. $L=170\text{mH}$, $I_{AS}=1.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, 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-220	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2/TO-220F3		62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		110	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	3.13	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F3		5.35	$^\circ\text{C}/\text{W}$
	TO-220F2		5.3	$^\circ\text{C}/\text{W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		4.53	$^\circ\text{C}/\text{W}$

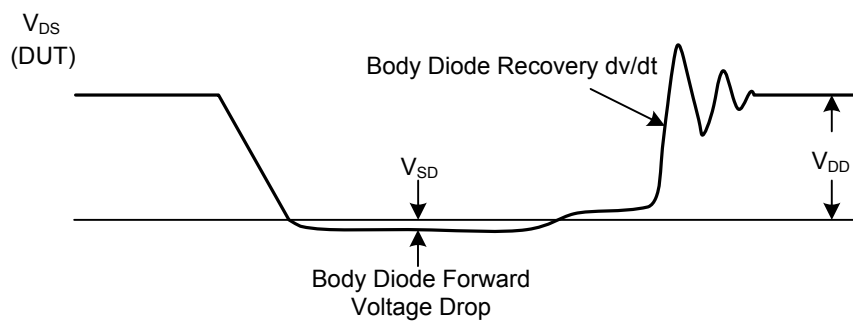
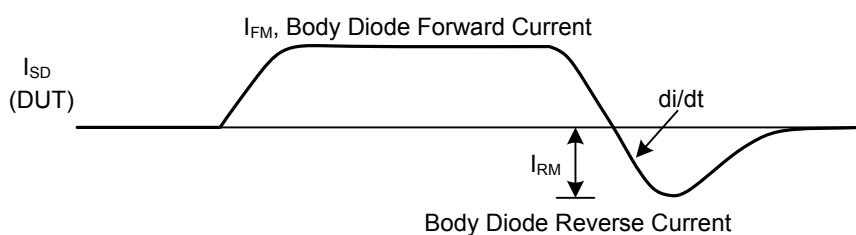
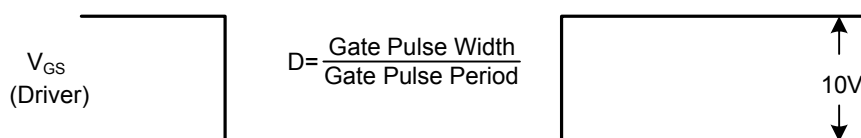
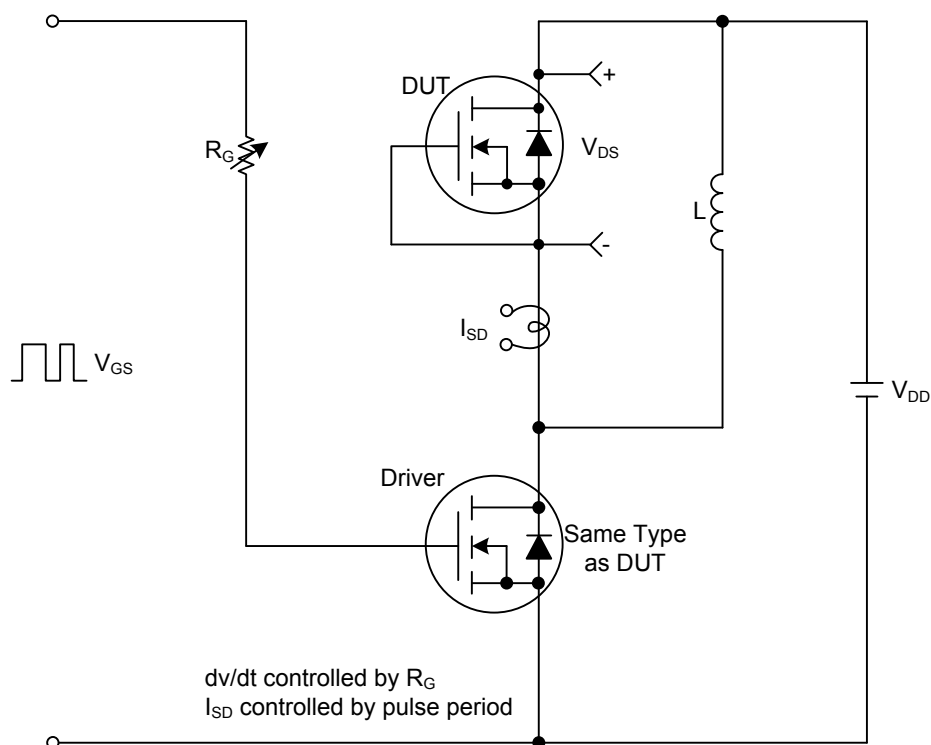
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

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		1.0		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 _{DS} =0V ,V _{GS} =30V			100	nA
	Reverse		V _{DS} =0V ,V _{GS} =-30V			-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 =0.5A		12	16	Ω
Forward Transconductance		g _{FS}	V _{DS} =50V, I _D =0.5A (Note 1)		0.75		S
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{DS} =25V,V _{GS} =0V,f=1.0MHz		200	250	pF
Output Capacitance		C _{OSS}			22	26	pF
Reverse Transfer Capacitance		C _{RSS}			5	7	pF
SWITCHING PARAMETERS							
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =30V, I _D =1.0A, R _G =25Ω (Note 1,2)		37	45	ns
Turn-ON Rise Time		t _R			10	40	ns
Turn-OFF Delay Time		t _{D(OFF)}			50	60	ns
Turn-OFF Fall Time		t _F			26	60	ns
Total Gate Charge		Q _G	V _{DS} =120V, V _{GS} =10V, I _D =1.0A (Note 1,2)		25	35	nC
Gate-Source Charge		Q _{GS}			3		nC
Gate-Drain Charge		Q _{GD}			4		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				1.0	A
Maximum Body-Diode Pulsed Current		I _{SM}				4.0	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =1.0A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{RR}	V _{GS} =0V, I _S =1.0A,		300		ns
Body Diode Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs (Note 1)		0.6		μC

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

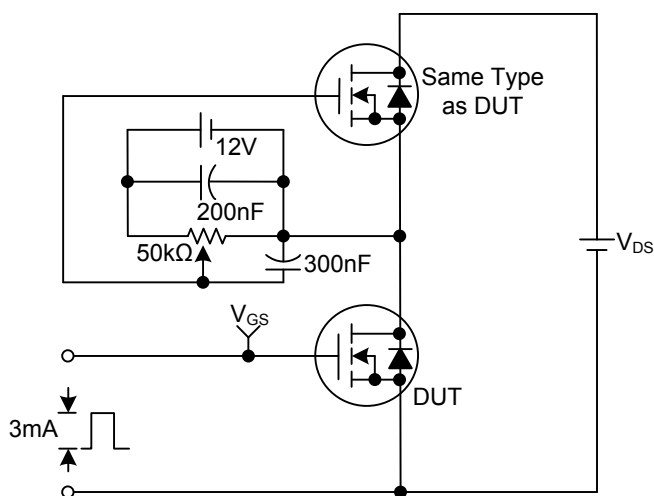
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

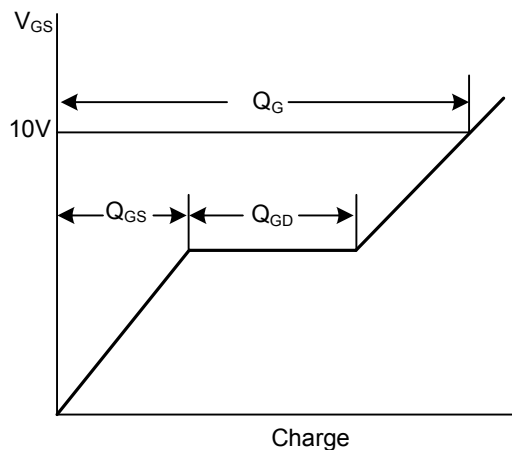
Peak Diode Recovery dv/dt Test Circuit & Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)

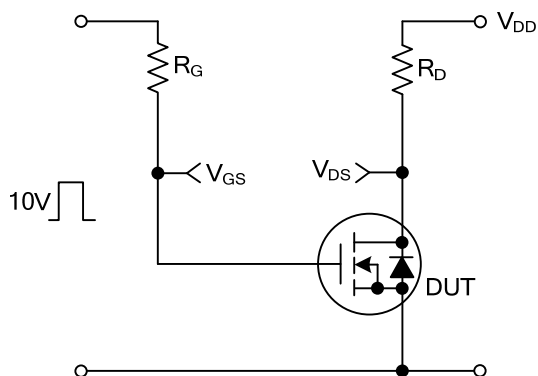
Gate Charge Test Circuit



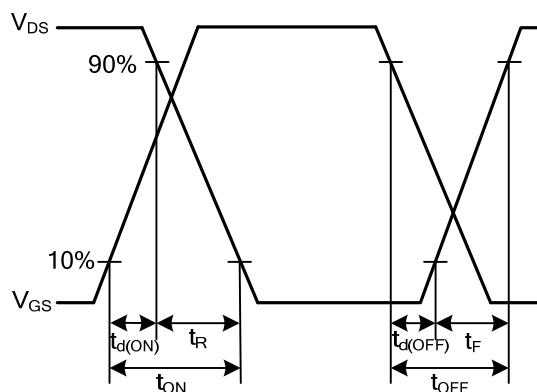
Gate Charge Waveforms



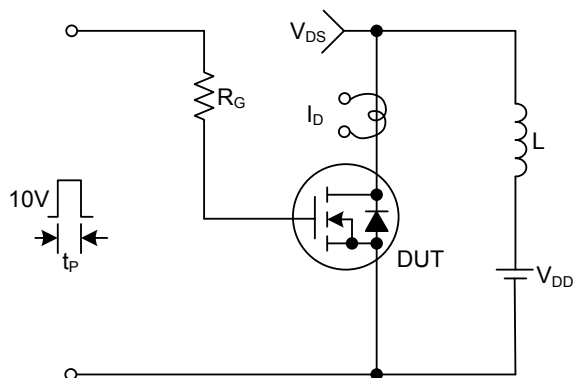
Resistive Switching Test Circuit



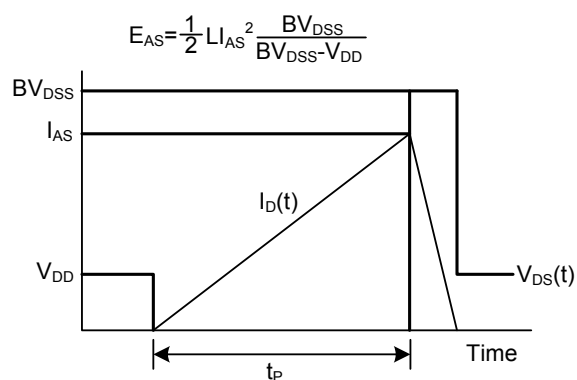
Resistive Switching Waveforms



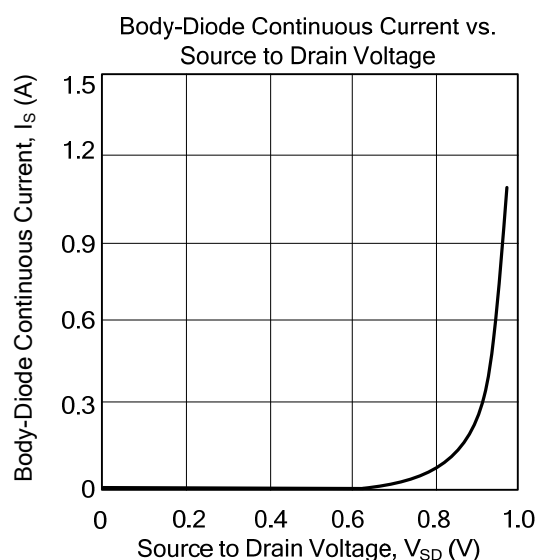
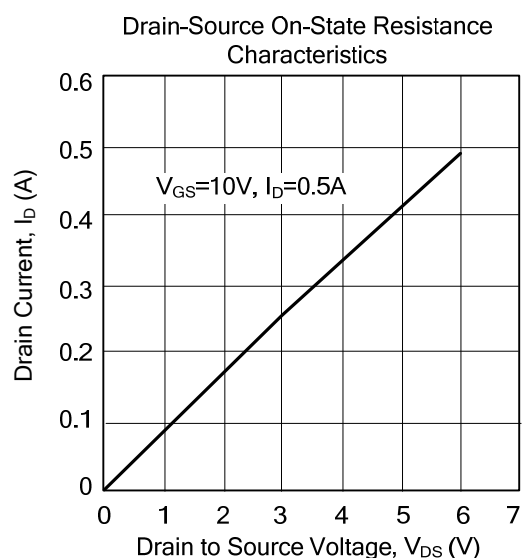
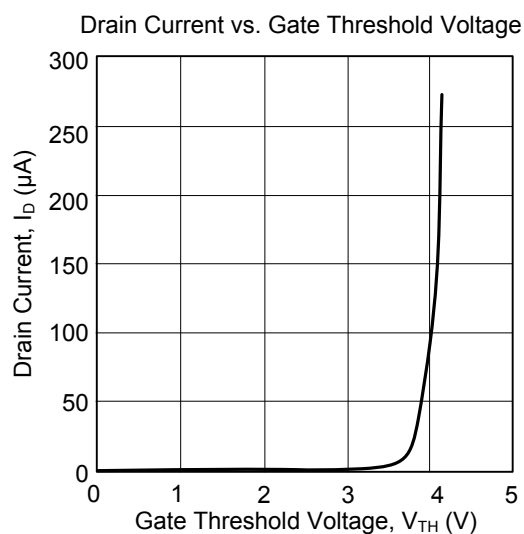
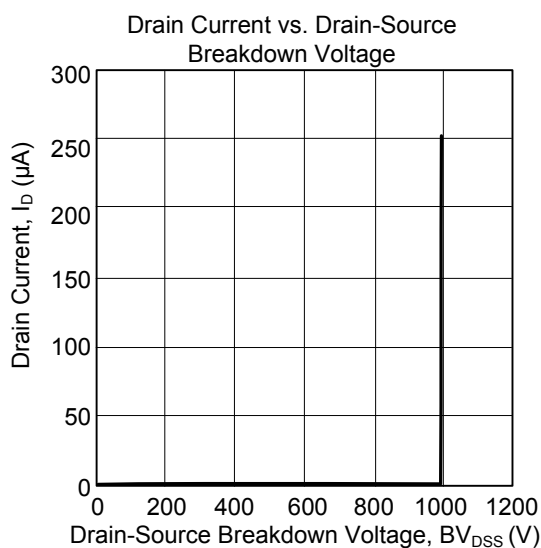
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



■ TYPICAL CHARACTERISTICS



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