



9N90

Power MOSFET

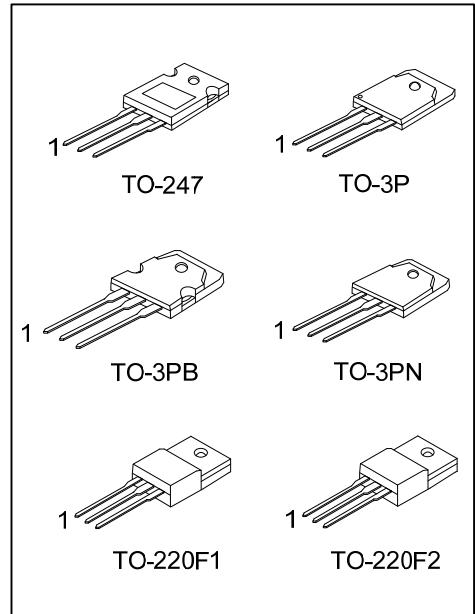
**9A, 900V N-CHANNEL
POWER MOSFET**

■ **DESCRIPTION**

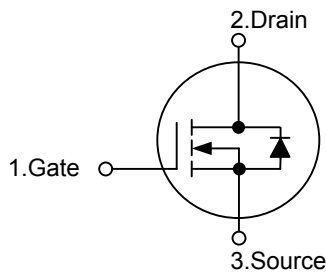
The UTC **9N90** uses UTC's advanced proprietary, planar stripe, DMOS technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

■ **FEATURES**

- * $R_{DS(ON)} \leq 1.2\Omega @ V_{GS}=10V, I_D=4.5A$
- * Ultra Low Gate Charge (Typical 45 nC)
- * Low Reverse Transfer Capacitance (CRSS = Typical 14 pF)
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness



■ **SYMBOL**



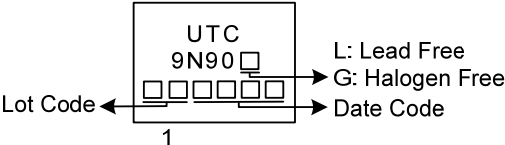
■ **ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9N90L-TF1-T	9N90G-TF1-T	TO-220F1	G	D	S	Tube
9N90L-TF2-T	9N90G-TF2-T	TO-220F2	G	D	S	Tube
9N90L-T3P-T	9N90G-T3P-T	TO-3P	G	D	S	Tube
9N90L-T3B-T	9N90G-T3B-T	TO-3PB	G	D	S	Tube
9N90L-T3N-T	9N90G-T3N-T	TO-3PN	G	D	S	Tube
9N90L-T47-T	9N90G-T47-T	TO-247	G	D	S	Tube

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

<p>9N90G-TF1-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube (2) TF1: TO-220F1, TF2: TO-220F2, T3P: TO-3P, T3B: TO-3PB, T3N: TO-3PN, T47: TO-247 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	900	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current ($T_C = 25^\circ\text{C}$)		I_D	9.0	A
Pulsed Drain Current (Note 2)		I_{DM}	36	A
Avalanche Current (Note 2)		I_{AR}	9.0	A
Avalanche Energy	Single Pulsed(Note 3)	E_{AS}	900	mJ
	Repetitive(Note 2)	E_{AR}	28	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/ns
Power Dissipation	TO-247	P_D	160	W
	TO-3P/TO-3PB		240	W
	TO-3PN			
	TO-220F1			
	TO-220F2			
Linear Derating Factor above $T_C = 25^\circ\text{C}$	TO-247		1.28	
	TO-3P/TO-3PB		1.92	
	TO-3PN			
	TO-220F1		0.448	
	TO-220F2		0.464	
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. $L = 21\text{mH}$, $I_{AS} = 9.0\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 9.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-247	θ_{JA}	50	$^\circ\text{C}/\text{W}$
	TO-3P/TO-3PB		40	
	TO-3PN			
	TO-220F1/ TO-220F2		62.5	
Junction to Case	TO-247	θ_{JC}	0.78	$^\circ\text{C}/\text{W}$
	TO-3P/TO-3PB		0.52	
	TO-3PN			
	TO-220F1		2.25	
	TO-220F2		2.15	

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

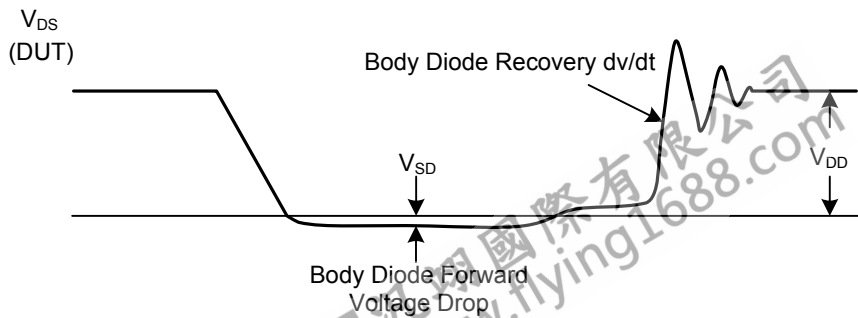
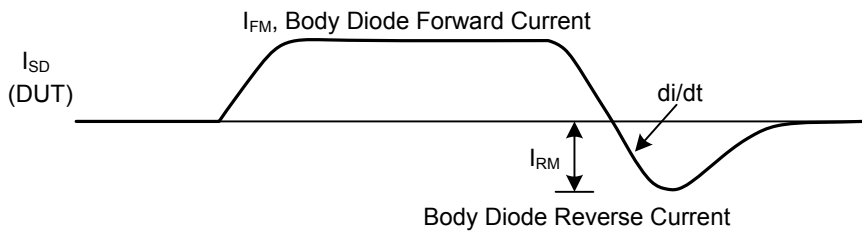
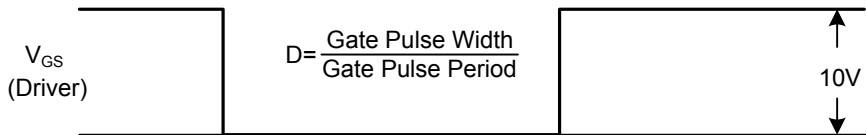
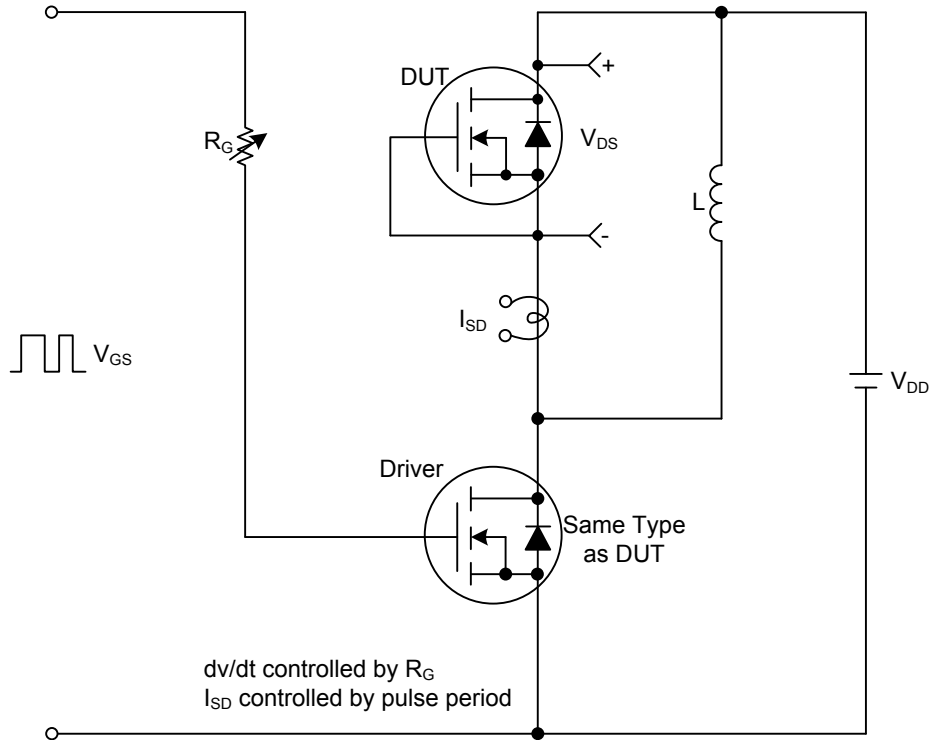
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	900			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=900V, V_{GS}=0V$			10	μA
Gate-Body Leakage Current	Forward	$I_{GSSF}, V_{GS}=30V, V_{DS}=0V$			100	nA
	Reverse	$I_{GSSR}, V_{GS}=-30V, V_{DS}=0V$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3.0		5.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=4.5A$			1.2	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$		1870		pF
Output Capacitance	C_{OSS}			185		pF
Reverse Transfer Capacitance	C_{RSS}			21		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge(Note 1)	Q_G	$V_{DS}=50V, V_{GS}=10V, I_D=1.3A, I_G=100\mu A$ (Note1,2)		215		nC
Gate-Source Charge	Q_{GS}			17		nC
Gate-Drain Charge	Q_{GD}			44		nC
Turn-On Delay Time(Note 1)	$t_{D(ON)}$	$V_{DD}=30V, V_{GS}=10V, I_D=0.5A, R_G=25\Omega$ (Note1,2)		100		ns
Turn-On Rise Time	t_R			170		ns
Turn-Off Delay Time	$t_{D(OFF)}$			410		ns
Turn-Off Fall Time	t_F			175		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				9.0	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				36	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$V_{GS}=0V, I_S=9.0A$			1.4	V
Reverse Recovery Time (Note 1)	t_{rr}	$V_{GS}=0V, I_S=9.0A, dI_F/dt=100A/\mu s$ (Note 1)		550		ns
Reverse Recovery Charge	Q_{rr}			6.5		μC

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

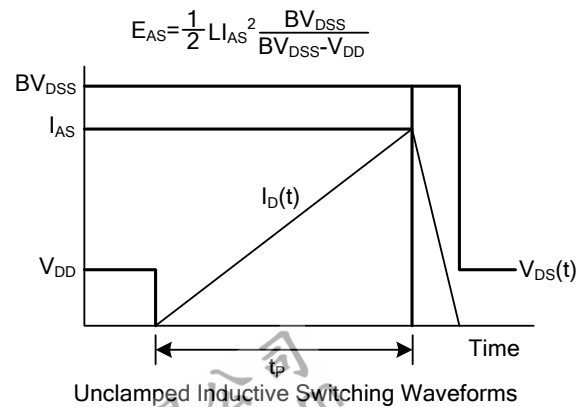
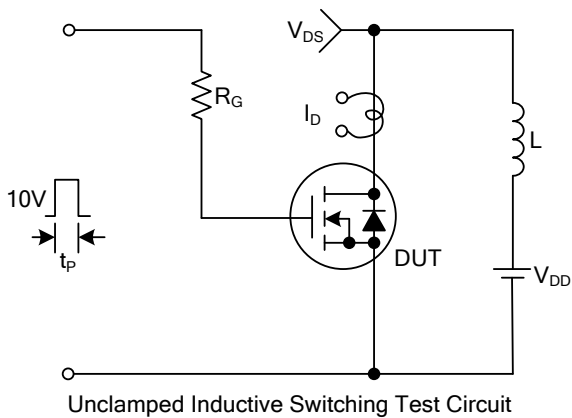
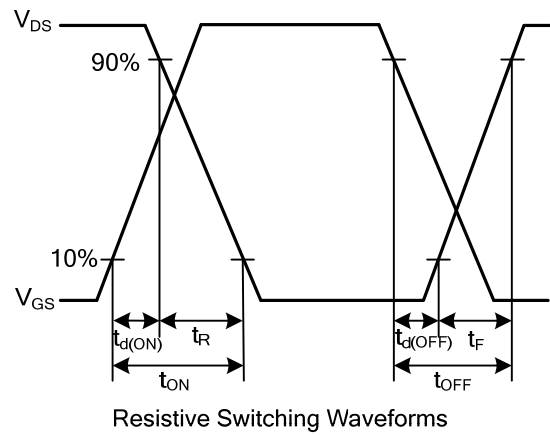
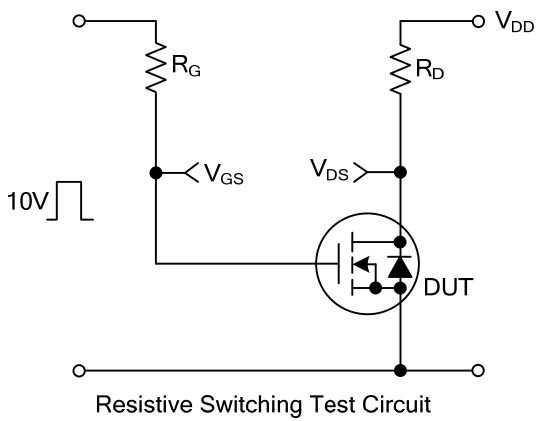
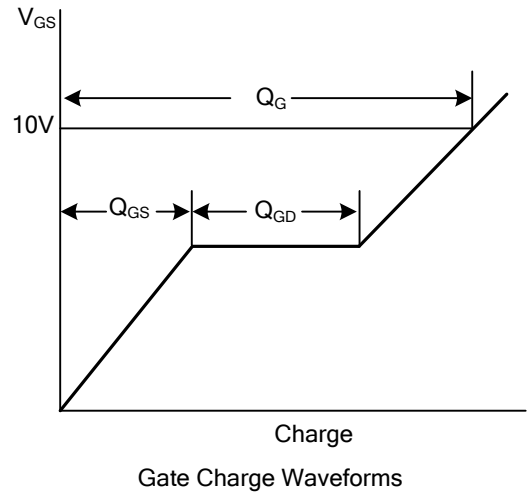
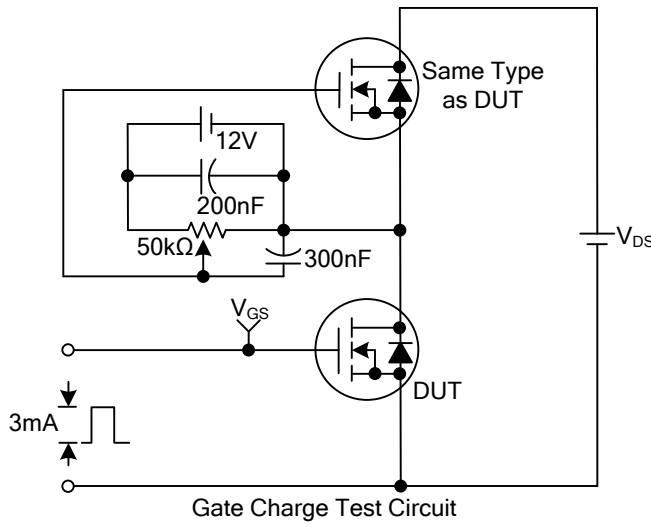
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

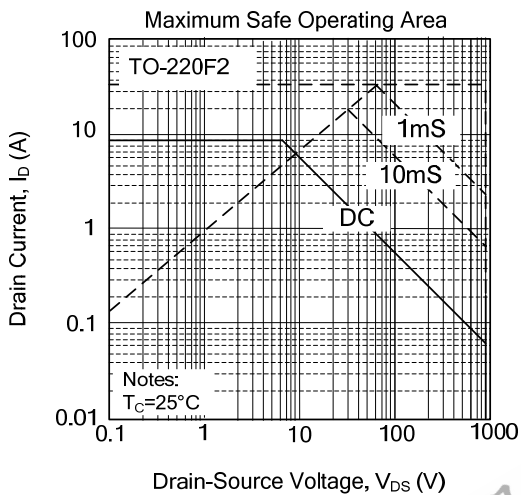
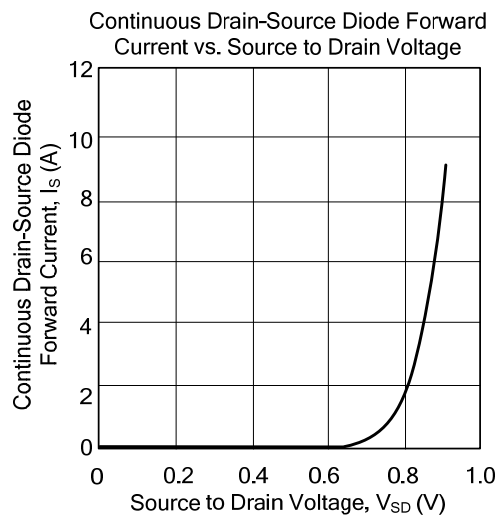
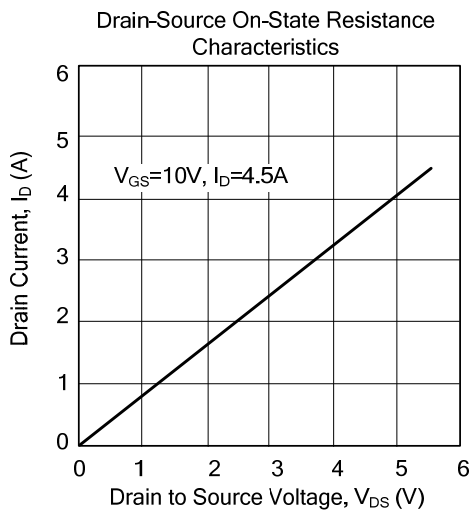
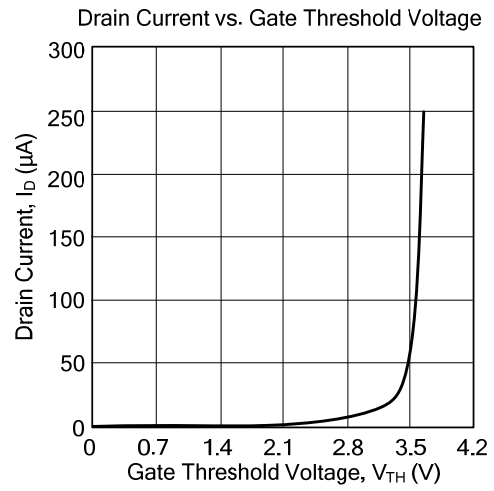
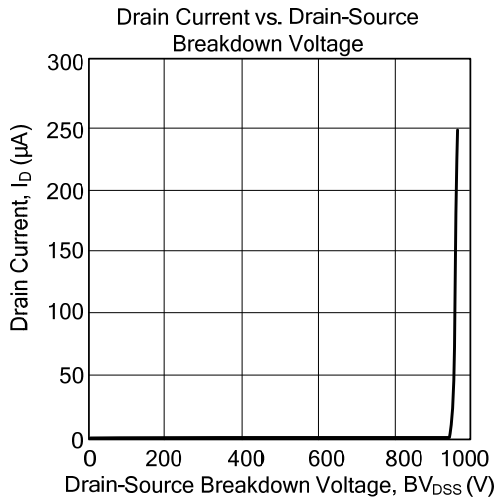
Peak Diode Recovery dv/dt Test Circuit & Waveforms



■ TEST CIRCUITS AND WAVEFORMS



■ TYPICAL CHARACTERISTICS



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