



# 5N90

**Power MOSFET**

## 5A, 900V N-CHANNEL POWER MOSFET

■ DESCRIPTION

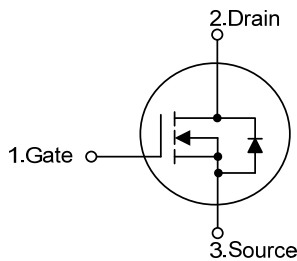
The UTC **5N90** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **5N90** is universally applied in high efficiency switch mode power supply.

■ FEATURES

- \*  $R_{DS(ON)} < 2.8\Omega @ V_{GS}=10V, I_D=2.5A$
- \* High switching speed
- \* Improved dv/dt capability
- \* 100% avalanche tested

■ SYMBOL

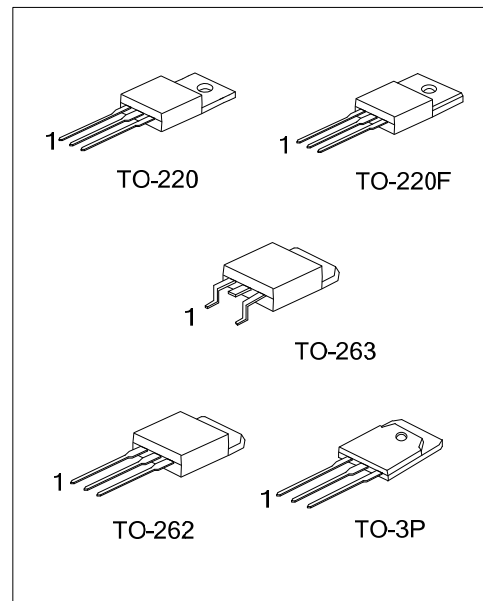


■ ORDERING INFORMATION

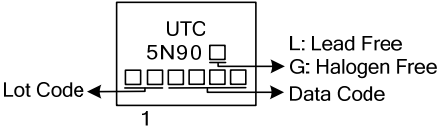
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N90L-TA3-T	5N90G-TA3-T	TO-220	G	D	S	Tube
5N90L-TF3-T	5N90G-TF3-T	TO-220F	G	D	S	Tube
5N90L-TF1T	5N90G-TF1T	TO-220F1	G	D	S	Tube
5N90L-T2Q-T	5N90G-T2Q-T	TO-262	G	D	S	Tube
5N90L-TQ2-T	5N90G-TQ2-T	TO-263	G	D	S	Tube
5N90L-TQ2-R	5N90G-TQ2-R	TO-263	G	D	S	Tape Reel
5N90L-T3P-T	5N90G-T3P-T	TO-3P	G	D	S	Tube

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

<p>5N90L-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1 T2Q: TO-262, TQ2: TO-263, T3P: TO-3P (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	5	A
	Pulsed (Note 2)	$I_{DM}$	12	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	350	mJ
	Repetitive (Note 2)	$E_{AR}$	5.1	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/ns
Power Dissipation	TO-220/TO-262/TO-263	$P_D$	125	W
	TO-220F/TO-220F1		47	
	TO-3P		240	
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.  $L=28\text{mH}$ ,  $I_{AS}=5\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$

4.  $I_{SD} \leq 5.4\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-262 TO-263	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-3P		40	
	TO-220/TO-262 TO-263		1	
Junction to Case	TO-220F/TO-220F1	$\theta_{JC}$	3.66	$^\circ\text{C}/\text{W}$
	TO-3P		0.52	

■ ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C, unless otherwise specified)

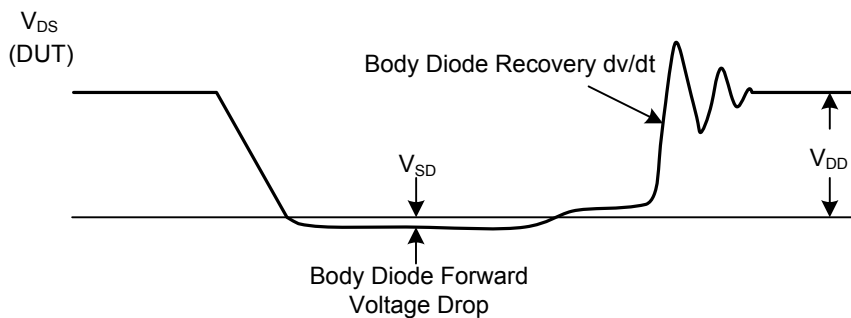
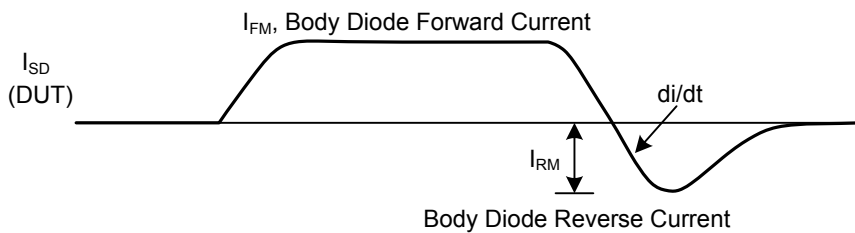
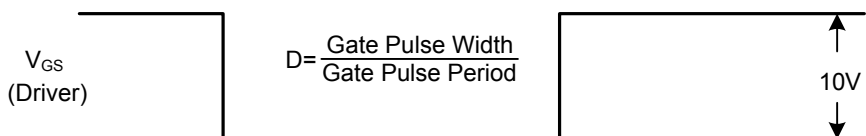
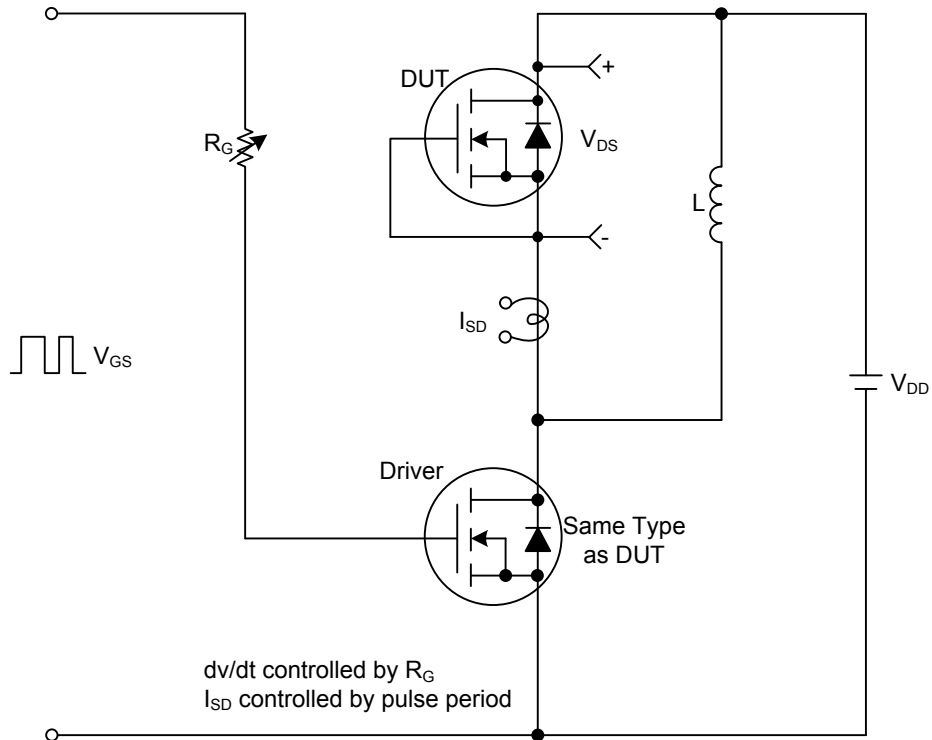
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	900			V
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA, Referenced to 25°C		1.0		V/°C
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =900V, V <sub>GS</sub> =0V			10	μA
		V <sub>DS</sub> =720V, T <sub>C</sub> =125°C			100	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>			100	nA
	Reverse					
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	3.0		5.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =2.5A		2.0	2.8	Ω
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =50V, I <sub>D</sub> =2.5A (Note 1)		4.0		S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz I <sub>G</sub> =3.3mA		1200	1550	pF
Output Capacitance	C <sub>OSS</sub>			110	145	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			13	17	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =120V, V <sub>GS</sub> =10V, I <sub>D</sub> =5A (Note 1,2)		140	160	nC
Gate-Source Charge	Q <sub>GS</sub>			12		nC
Gate-Drain Charge	Q <sub>GD</sub>			30		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =30V, I <sub>D</sub> =1A, R <sub>G</sub> =25Ω (Note 1,2)		70	90	ns
Turn-ON Rise Time	t <sub>R</sub>			106	140	ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			196	220	ns
Turn-OFF Fall Time	t <sub>F</sub>			110	130	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				5	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				12	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =5A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =5.4A,		610		ns
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	dI <sub>F</sub> /dt=100A/μs (Note 1)		5.26		μC

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

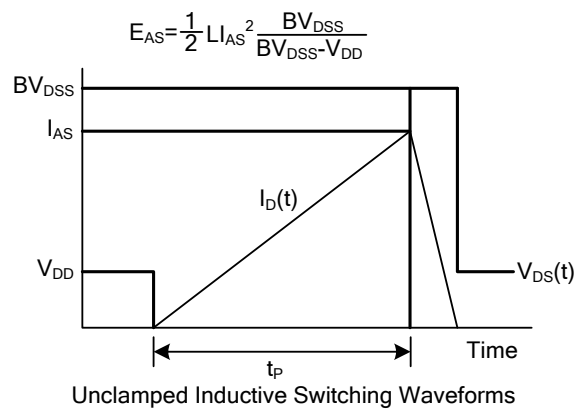
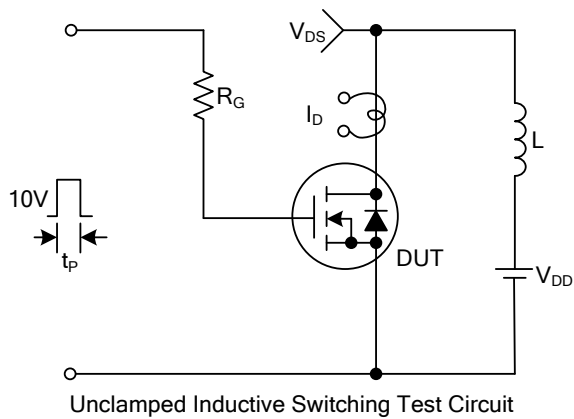
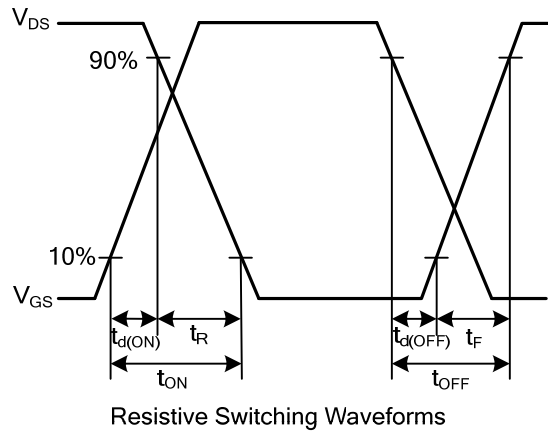
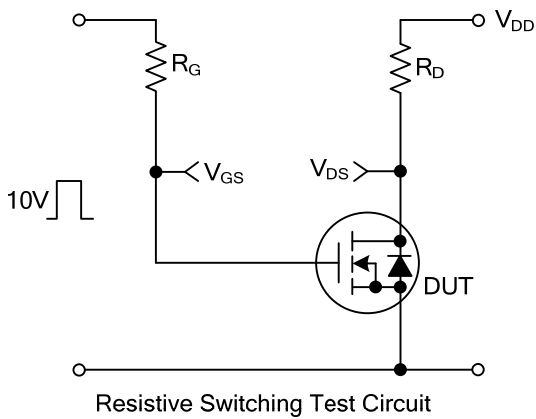
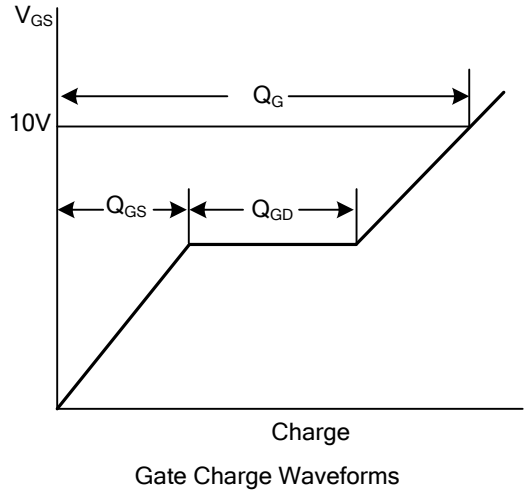
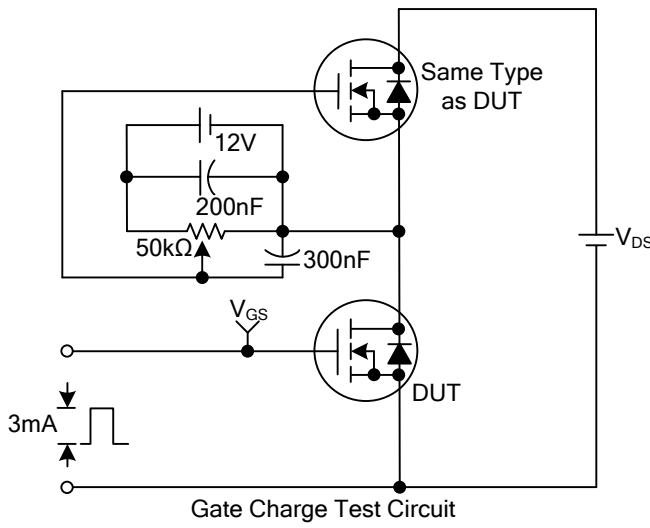
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

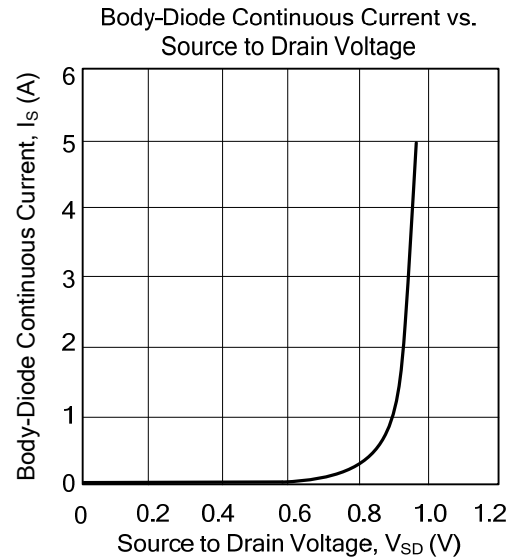
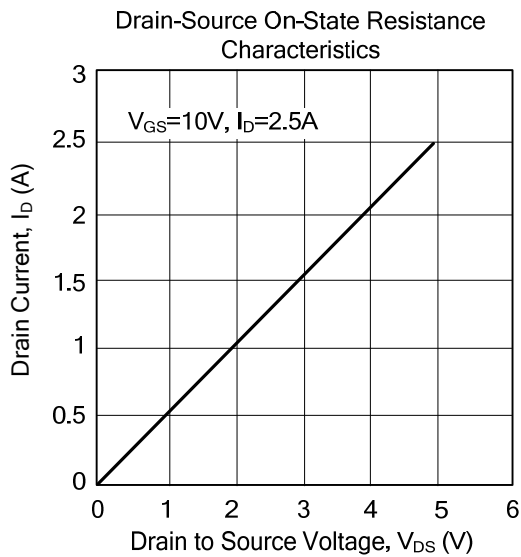
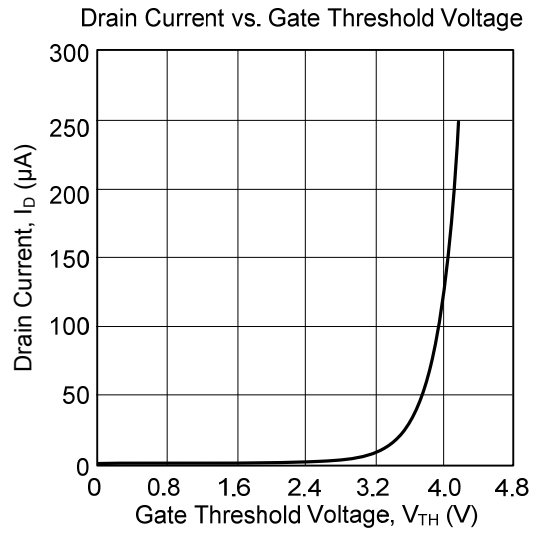
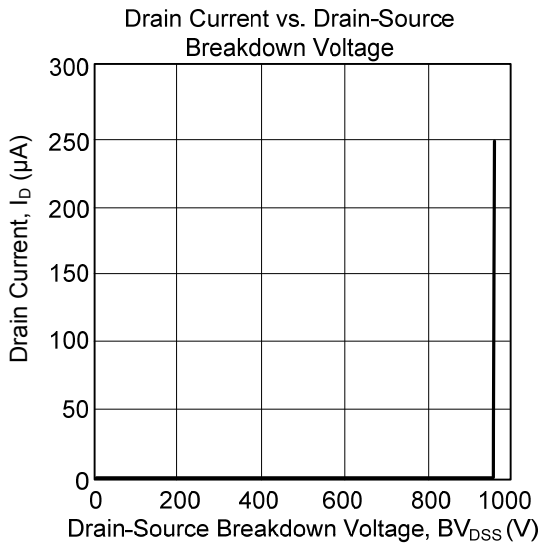
Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms



■ TEST CIRCUITS AND WAVEFORMS(Cont.)



■ TYPICAL CHARACTERISTICS



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