

# 4N90

Power MOSFET

## 4A, 900V N-CHANNEL POWER MOSFET

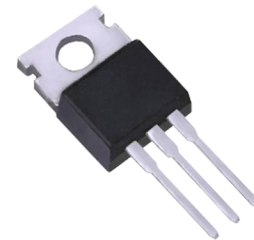
### ■ DESCRIPTION

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.

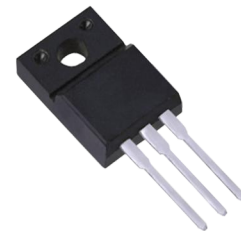
The UTC **4N90** is particularly applied in high efficiency switch mode power supplies.

### ■ FEATURES

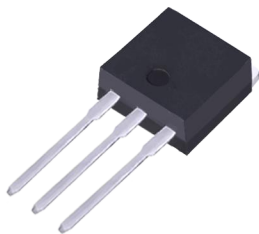
- \*  $R_{DS(ON)} < 4.2\Omega$  @  $V_{GS}=10V, I_D=2.0A$
- \* High switching speed
- \* 100% avalanche tested
- \* Improved dv/dt capability



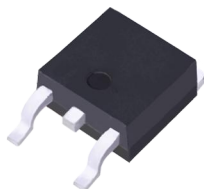
TO-220



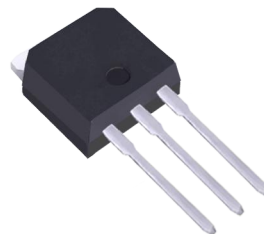
TO-220F



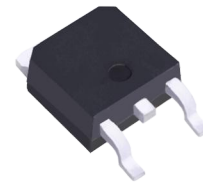
TO-262



TO-263



TO-251



TO-252

■ 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		$V_{GSS}$	$\pm 30$	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			
	TO-251/TO-252			
TO-3PN	208			
Derate above $25^\circ\text{C}$	TO-220		1.12	W/ $^\circ\text{C}$
	TO-220F/TO-220F1		0.304	
	TO-220F3			
	TO-220F2			
	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	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2			
	TO-220F3			
	TO-251/TO-252			
	TO-3PN		40	
Junction to Case	TO-220	$\theta_{JC}$	0.89	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3.25	
	TO-220F3			
	TO-220F2			
	TO-251/TO-252			
TO-3PN	0.6			

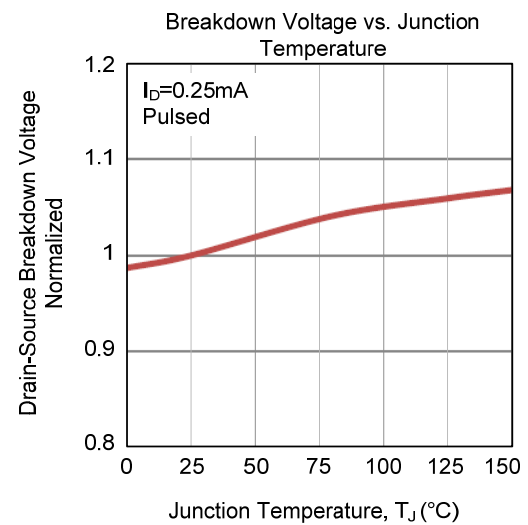
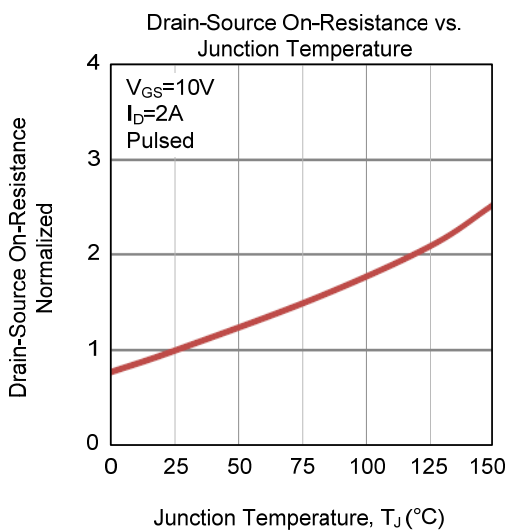
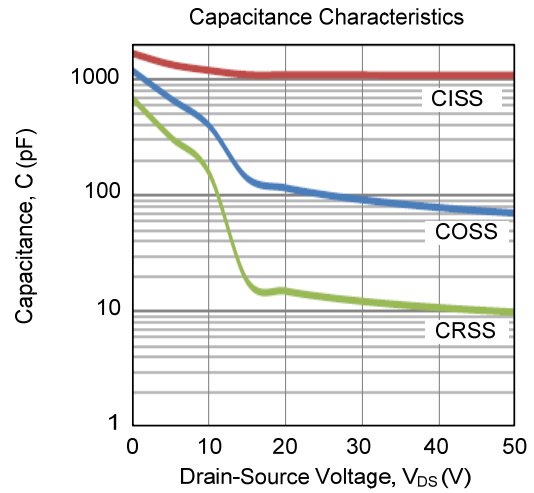
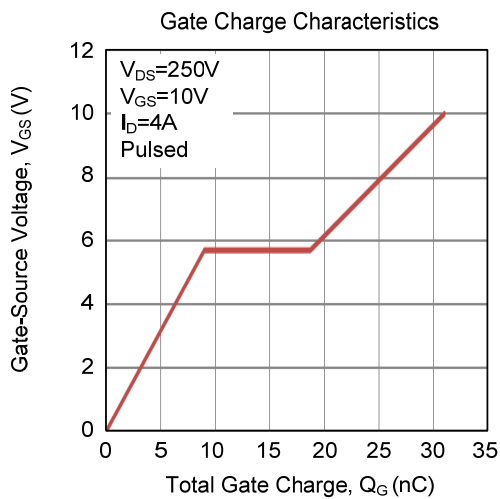
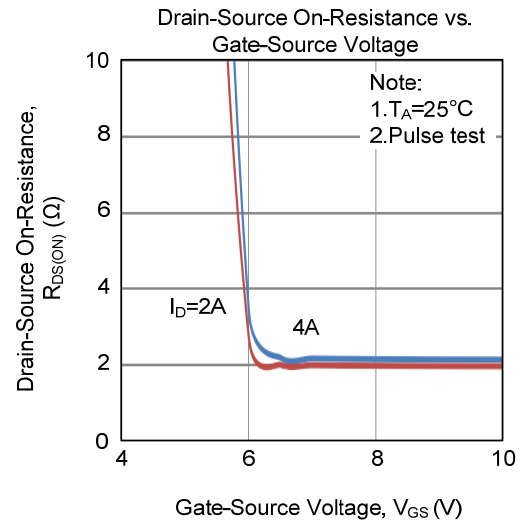
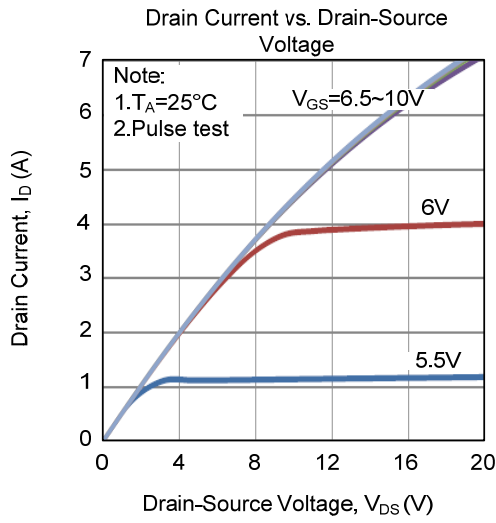
■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>								
Drain-Source Breakdown Voltage		$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	900			V	
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$ , Referenced to $25^\circ\text{C}$		1.05		$V/^\circ\text{C}$	
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=900V, V_{GS}=0V$			10	$\mu A$	
			$V_{DS}=720V, T_C=125^\circ\text{C}$			100	$\mu A$	
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	
<b>ON CHARACTERISTICS</b>								
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	3.0		5.0	V	
Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.0A$			4.2	$\Omega$	
<b>DYNAMIC PARAMETERS</b>								
Input Capacitance		$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$		1094		pF	
Output Capacitance		$C_{OSS}$				101		pF
Reverse Transfer Capacitance		$C_{RSS}$				13.3		pF
<b>SWITCHING PARAMETERS</b>								
Total Gate Charge		$Q_G$	$V_{DS}=250V, V_{GS}=10V, I_D=4.0A$ (Note 1,2)		31		nC	
Gate-Source Charge		$Q_{GS}$				9		nC
Gate-Drain Charge		$Q_{GD}$				9.7		nC
Turn-ON Delay Time		$t_{D(ON)}$	$V_{DD}=30V, I_D=0.5A, R_G=25\Omega$ (Note 1,2)		70		ns	
Turn-ON Rise Time		$t_R$				188		ns
Turn-OFF Delay Time		$t_{D(OFF)}$				188		ns
Turn-OFF Fall Time		$t_F$				88		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>								
Maximum Body-Diode Continuous Current		$I_S$				4	A	
Maximum Body-Diode Pulsed Current		$I_{SM}$				16	A	
Drain-Source Diode Forward Voltage		$V_{SD}$	$I_S=4.0A, V_{GS}=0V$			1.4	V	

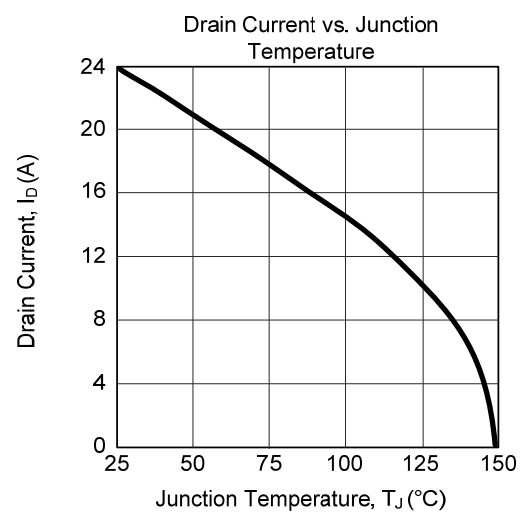
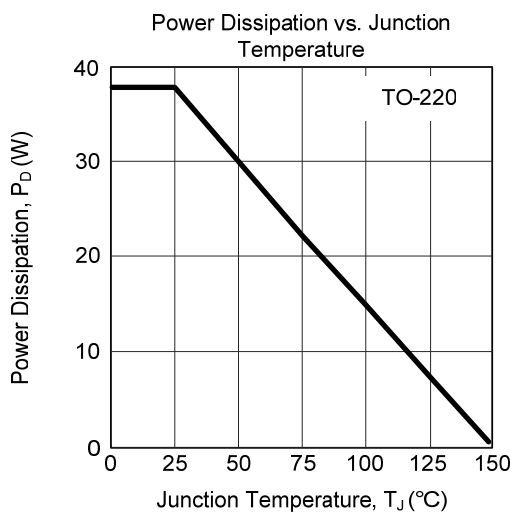
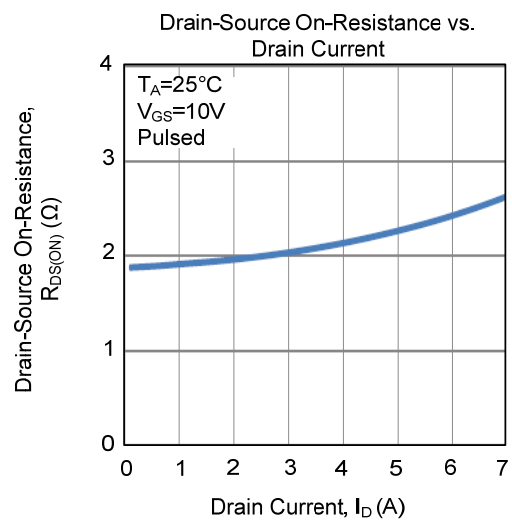
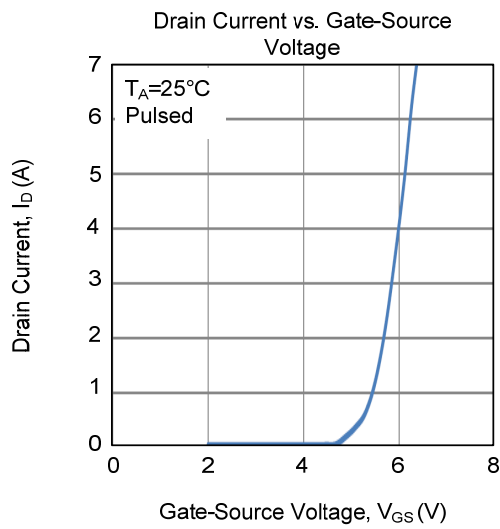
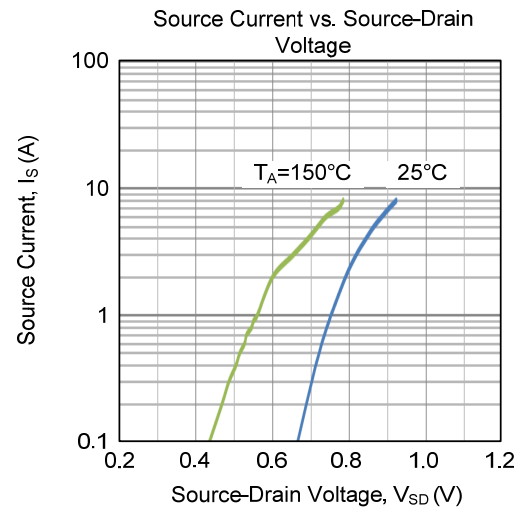
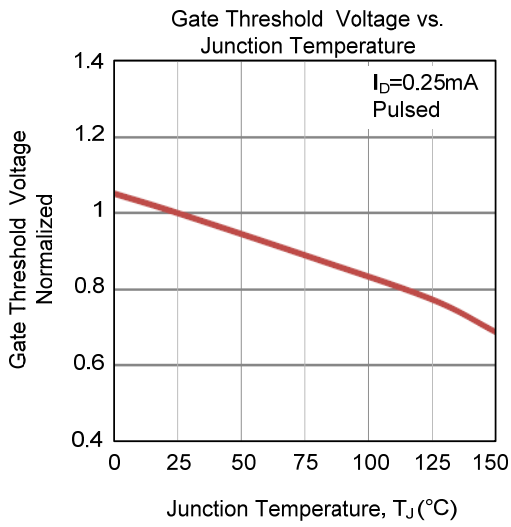
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$ , Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

## TYPICAL CHARACTERISTICS



## ■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)

