



**9A, 800V N-CHANNEL  
POWER MOSFET**

■ DESCRIPTION

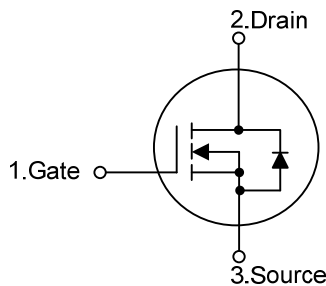
The UTC **9N80** is an N-channel mode power MOSFET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **9N80** is universally applied in high efficiency switch mode power supply.

■ FEATURES

- \*  $R_{DS(on)} = 1.3\Omega @ V_{GS} = 10V$
- \* Improved Gate Charge
- \* Lower Input Capacitance
- \* Lower Leakage Current:  $25\mu A (Max.) @ V_{DS} = 800V$

■ SYMBOL

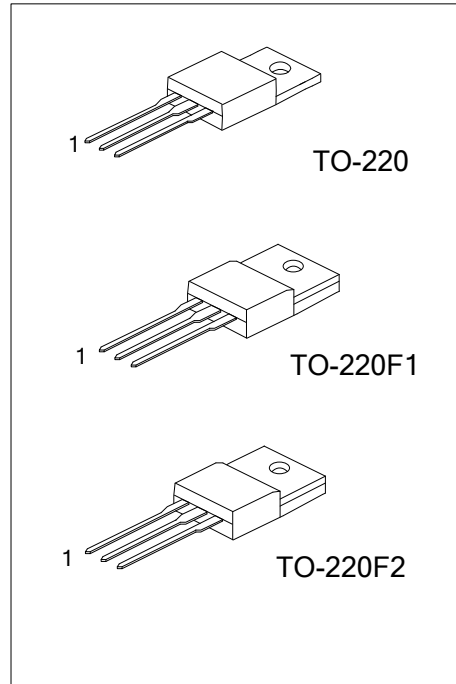


■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9N80L-TA3-T	9N80G-TA3-T	TO-220	G	D	S	Tube
9N80L-TF1-T	9N80G-TF1-T	TO-220F1	G	D	S	Tube
9N80L-TF2-T	9N80G-TF2-T	TO-220F2	G	D	S	Tube

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

<p>9N80L-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Free</p>	<p>(1) T: Tube (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2 (3) G: Halogen Free, L: Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	800	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Avalanche Current (Note 2)		$I_{AR}$	9	A
Drain Current (Continuous)	Continuous	$I_D$	9	A
	Pulsed (Note 2)	$I_{DM}$	36	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	900	mJ
	Repetitive (Note 2)	$E_{AR}$	24	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.0	V/ns
Power Dissipation	TO-220	$P_D$	147	W
	TO-220F1		49	
	TO-220F2		51	
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-55~+150	$^\circ\text{C}$

Note: 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.  $L = 21\text{mH}$ ,  $I_{AS} = 9\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 27\Omega$ , Starting  $T_J = 25^\circ\text{C}$
4.  $I_{SD} \leq 9\text{A}$ ,  $di/dt \leq 180\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	0.85	$^\circ\text{C}/\text{W}$
	TO-220F1		2.55	
	TO-220F2		2.45	

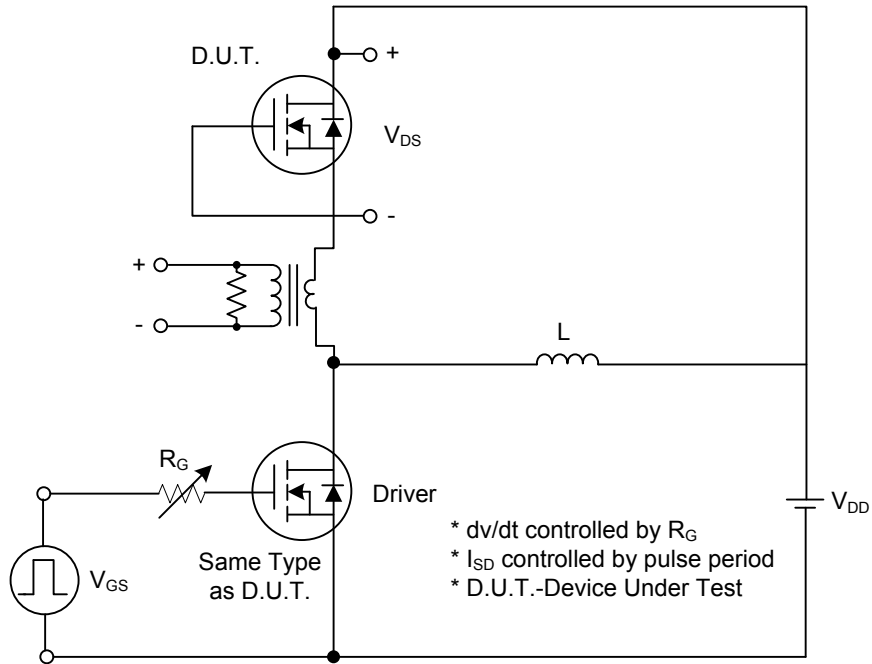
■ ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	800			V
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA		0.96		V/°C
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =800V			25	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub> V <sub>GS</sub> =+30V V <sub>GS</sub> =-30V			+100	nA
	Reverse				-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =250μA	3		5	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A		1.05	1.3	Ω
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =50V, I <sub>D</sub> =4.5A (Note 1)		5.54		S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz,		2020	2600	pF
Output Capacitance	C <sub>OSS</sub>			195	230	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			82	95	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =640V, I <sub>D</sub> =9A, (Note 1, 2)		93	120	nC
Gate to Source Charge	Q <sub>GS</sub>			14.3		nC
Gate to Drain Charge	Q <sub>GD</sub>			42.1		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =400V, I <sub>D</sub> =9 A, R <sub>G</sub> =16Ω, (Note 1, 2)		25	60	ns
Rise Time	t <sub>R</sub>			37	85	ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			113	235	ns
Fall-Time	t <sub>F</sub>			42	95	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>	Integral reverse pn-diode in the mosfet			9	A
Maximum Pulsed Drain-Source Diode Forward Current (Note 1)	I <sub>SM</sub>				36	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =9A, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C			1.4	V
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> =25°C, I <sub>F</sub> =9A,		560		ns
Reverse Recovery Charge	Q <sub>RR</sub>	dI <sub>F</sub> /dt=100A/μs, (Note 1)		8.4		μC

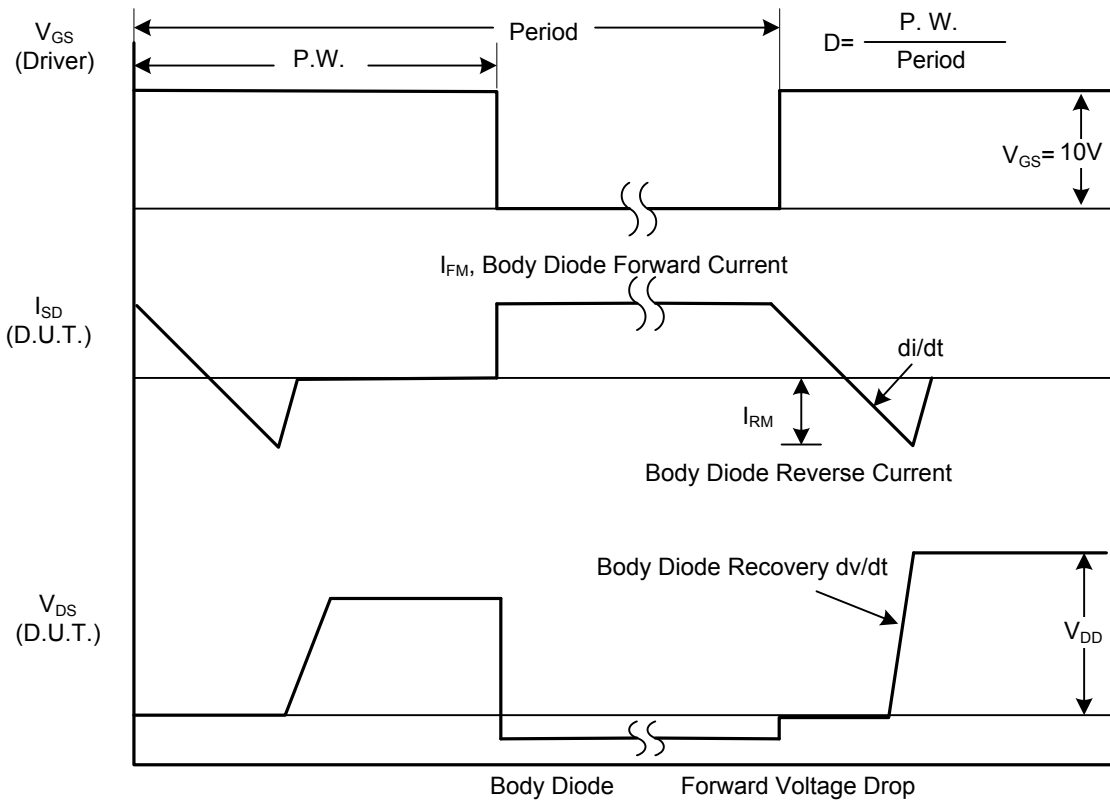
Note: 1. Pulse Test: Pulse width ≤ 250μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

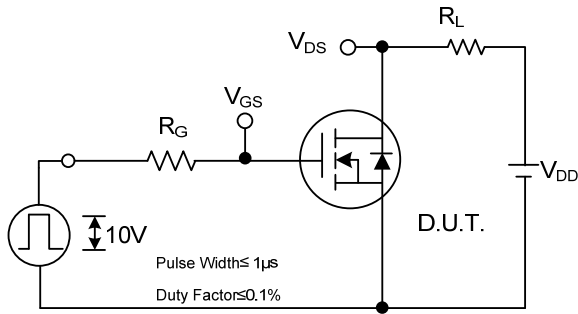


Peak Diode Recovery  $dv/dt$  Test Circuit

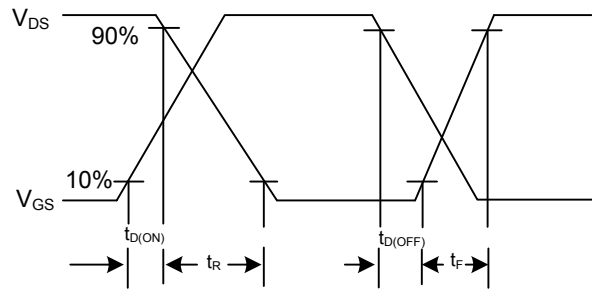


Peak Diode Recovery  $dv/dt$  Waveforms

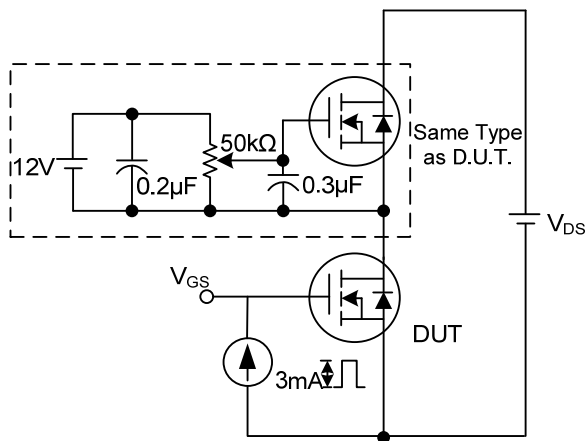
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



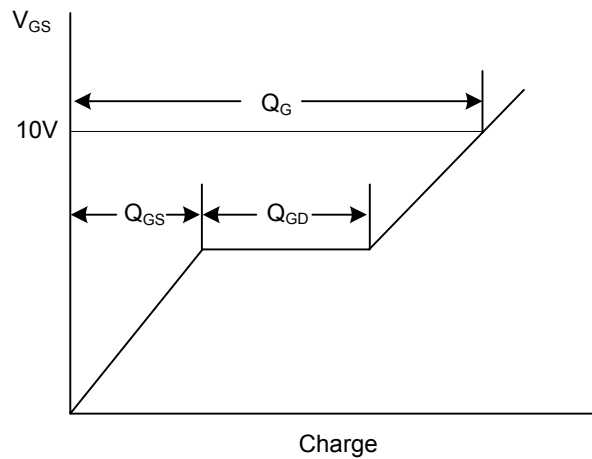
Switching Test Circuit



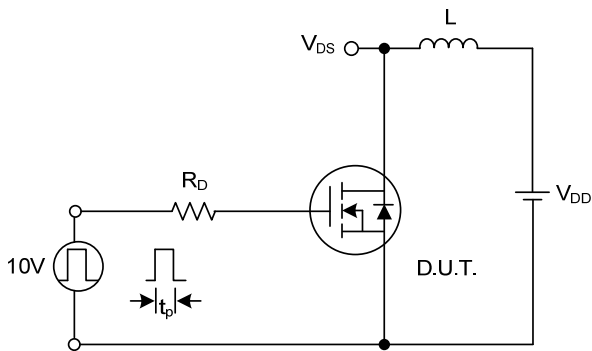
Switching Waveforms



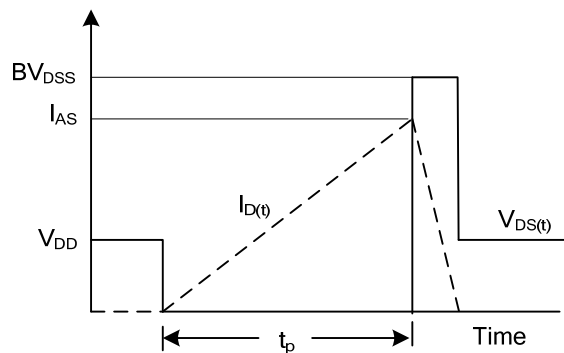
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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