



9NM95Z

Preliminary

Power MOSFET

9.0A, 950V N-CHANNEL SUPER-JUNCTION MOSFET

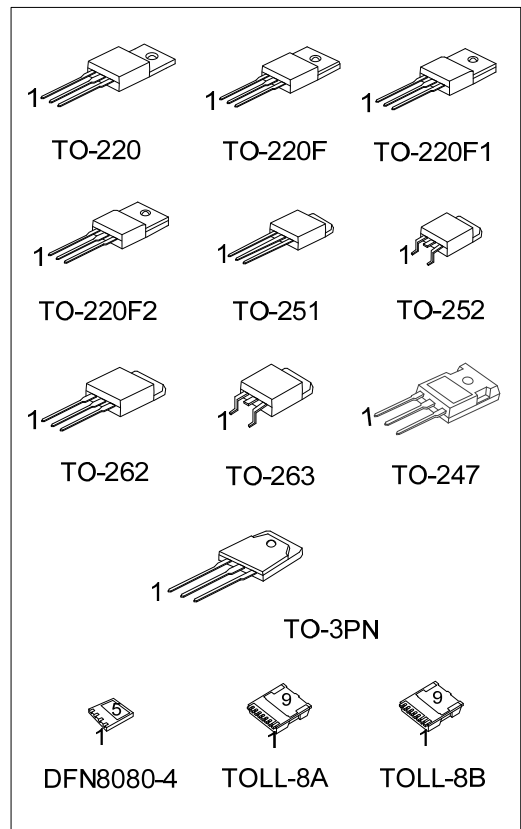
DESCRIPTION

The UTC **9NM95Z** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

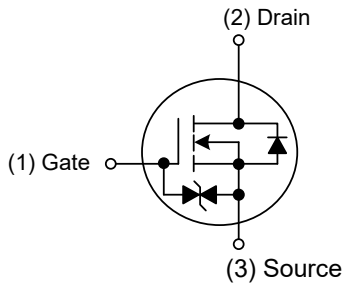
FEATURES

* $R_{DS(ON)} \leq 1.5 \Omega$ @ $V_{GS}=10V, I_D=4.5A$

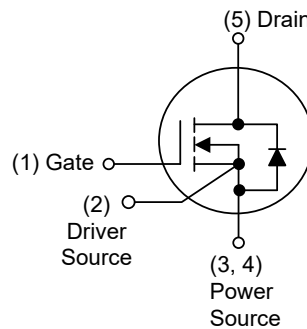
* High Switching Speed



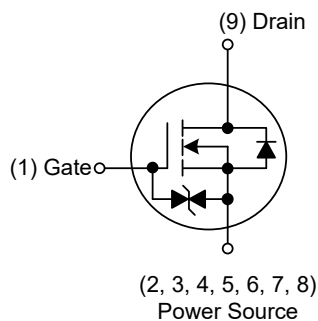
SYMBOL



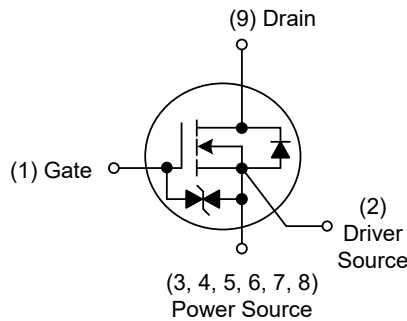
TO-220 / TO-220F / TO-220F1
TO-220F2 / TO-251 / TO-252
TO-3PN / TO-247 / TO-262 / TO-263



DFN8080-4



TOLL-8A



TOLL-8B

ORDERING INFORMATION

Ordering Number		Package	Pin Assignment									Packing	
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9		
9NM95ZL-TA3-T	9NM95ZG-TA3-T	TO-220	G	D	S	-	-	-	-	-	-	Tube	
9NM95ZL-TF1-T	9NM95ZG-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube	
9NM95ZL-TF2-T	9NM95ZG-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	-	Tube	
9NM95ZL-TF3-T	9NM95ZG-TF3-T	TO-220F	G	D	S	-	-	-	-	-	-	Tube	
9NM95ZL-TM3-T	9NM95ZG-TM3-T	TO-251	G	D	S	-	-	-	-	-	-	Tube	
9NM95ZL-TN3-R	9NM95ZG-TN3-R	TO-252	G	D	S	-	-	-	-	-	-	Tape Reel	
9NM95ZL-T2Q-T	9NM95ZG-T2Q-T	TO-262	G	D	S	-	-	-	-	-	-	Tube	
9NM95ZL-TQ2-T	9NM95ZG-TQ2-T	TO-263	G	D	S	-	-	-	-	-	-	Tube	
9NM95ZL-TQ2-R	9NM95ZG-TQ2-R	TO-263	G	D	S	-	-	-	-	-	-	Tape Reel	
9NM95ZL-T47-T	9NM95ZG-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube	
9NM95Z L-T3N-T	9NM95Z G-T3N-T	TO-3PN	G	D	S	-	-	-	-	-	-	Tube	
9NM95ZL-K04-8080-R	9NM95ZG-K04-8080-R	DFN8080-4	G	S	S	S	S	D	-	-	-	Tape Reel	
9NM95ZL-T8A-R	9NM95ZG-T8A-R	TOLL-8A	G	S	S	S	S	S	S	S	S	D	Tape Reel
9NM95ZL-T8B-R	9NM95ZG-T8B-R	TOLL-8B	G	S	S	S	S	S	S	S	S	D	Tape Reel

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

<p>9NM95ZG-TA3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TM3: TO-251, TN3: TO-252, T2Q: TO-262, TQ2: TO-263, T3N: TO-3PN, T47: TO-247, T8A: TOLL-8A, T8B: TOLL-8B, K04-8080: DFN8080-4</p> <p>(3) G: Halogen Free and Lead Free L: Lead Free</p>
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MARKING

TO-220 / TO-220F / TO-220F1 TO-220F2 / TO-251 / TO-252 TO-3PN / TO-247 / TO-262 / TO-263	DFN8080-4
<p>UTC 9NM95Z</p> <p>Lot Code ← [] → Date Code</p> <p>L: Lead Free G: Halogen Free</p> <p>1</p>	<p>UTC 9NM95Z</p> <p>Lot Code ← [] → Date Code</p>
TOLL-8A / TOLL-8B	-
<p>UTC 9NM95Z</p> <p>Lot Code ← [] → Date Code</p> <p>L: Lead Free G: Halogen Free</p> <p>1</p>	-

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	950	V
Gate-Source Voltage		V_{GSS}	± 20	V
Drain Current	Continuous	I_D	9	A
	Pulsed (Note 2)	I_{DM}	27	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	98	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.1	V/ns
Power Dissipation	TO-220/TO-262 TO-263	P_D	70	W
	TO-220F/TO-220F1 TO-220F2		27	W
	TO-3PN		130	W
	TO-247		120	W
	TO-251/TO-252		36	W
	DFN8080-4		50	W
	TOLL-8A/TOLL-8A		150	W
	Junction Temperature		T_J	+150
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. $L = 100\text{mH}$, $I_{AS} = 1.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$ 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 DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-262/TO-263	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-3PN		30	$^\circ\text{C}/\text{W}$
	TO-247		40	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
	DFN8080-4/TOLL-8A/TOLL-8A		35	$^\circ\text{C}/\text{W}$
	Junction to Case		TO-220/TO-262/TO-263	θ_{JC}
	TO-220F/TO-220F1 TO-220F2	4.62	$^\circ\text{C}/\text{W}$	
	TO-3PN	0.96	$^\circ\text{C}/\text{W}$	
	TO-247	1.04	$^\circ\text{C}/\text{W}$	
	TO-251/TO-252	3.47 (Note)	$^\circ\text{C}/\text{W}$	
	DFN8080-4	2.5 (Note)	$^\circ\text{C}/\text{W}$	
	TOLL-8A/TOLL-8A	0.83 (Note)	$^\circ\text{C}/\text{W}$	

Note: Device mounted on FR-4 substrate P_c board, 2oz copper, with 1inch square copper plate.

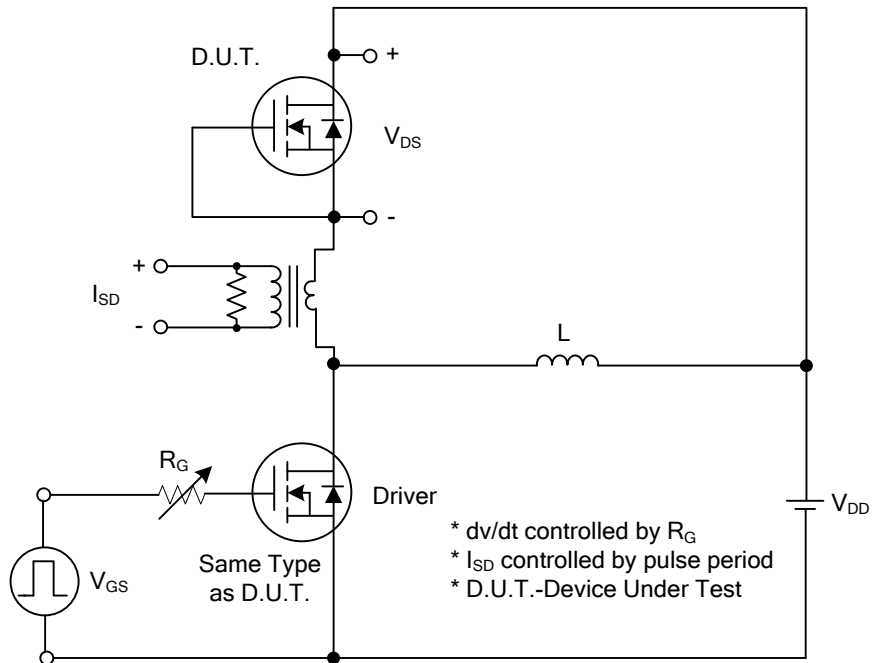
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D = 250μA	950			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =950V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}			10	μA
	Reverse					
		V _{GS} =-20V, V _{DS} =0V			-10	μA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.5		4.5	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =4.5A		1.3	1.5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1.0 MHz		700		pF
Output Capacitance	C _{OSS}			52		pF
Reverse Transfer Capacitance	C _{RSS}			2.7		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =760V, V _{GS} =10V, I _D =9.0A (Note 1, 2)		28		nC
Gate-source Charge	Q _{GS}			6		nC
Gate-drain Charge	Q _{GD}			12		nC
Turn-on Delay Time (Note 1)	t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =9.0A, R _G =25Ω (Note 1, 2)		9		ns
Rise Time	t _R			17		ns
Turn-off Delay Time	t _{D(OFF)}			44		ns
Fall-Time	t _F			32		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				9	A
Maximum Body-Diode Pulsed Current	I _{SM}				27	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =9.0A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)	t _{rr}	I _S =9.0A, V _{GS} =0V		540		ns
Reverse Recovery Charge	Q _{rr}	di/dt=100A/μs (Note1)		6.2		μC

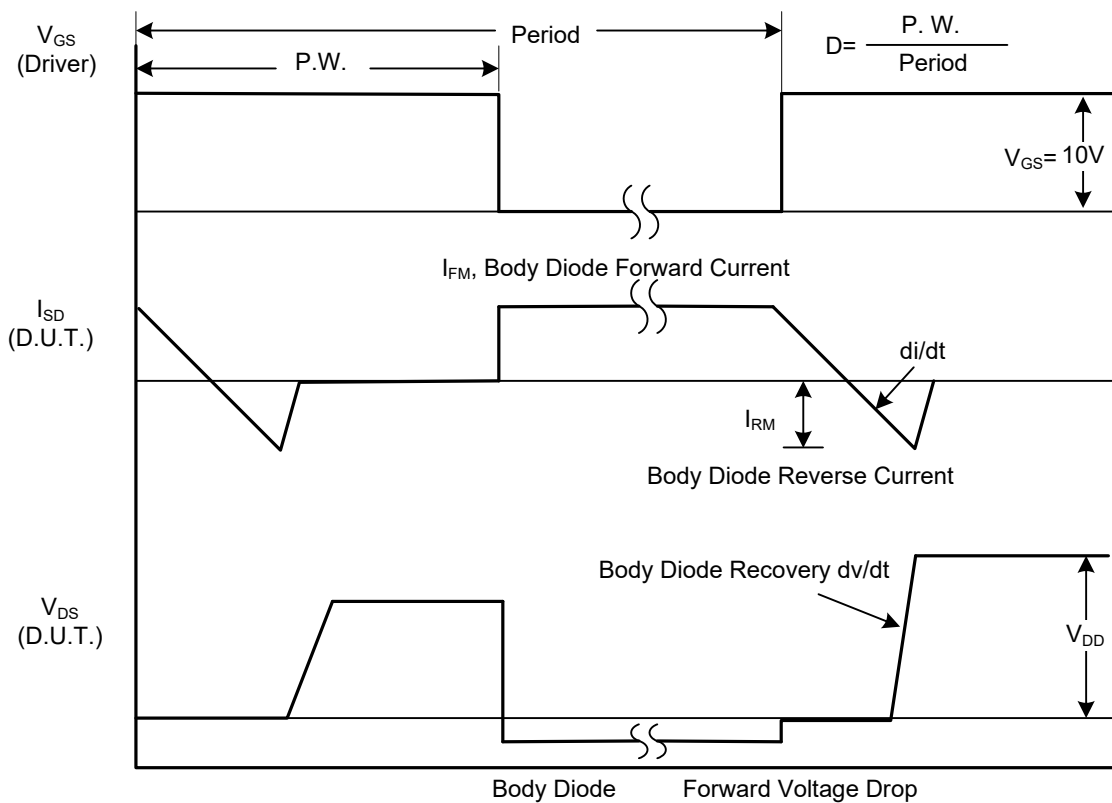
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

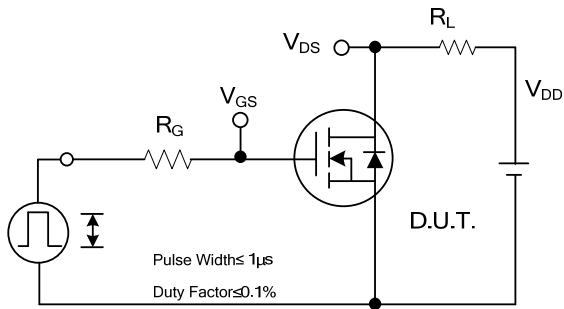


Peak Diode Recovery dv/dt Test Circuit

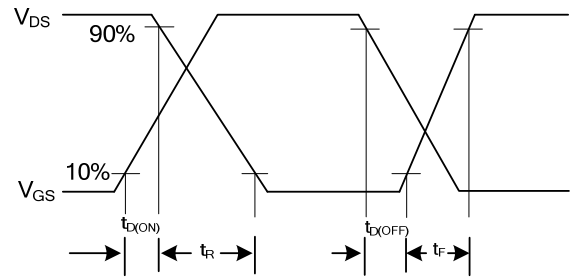


Peak Diode Recovery dv/dt Waveforms

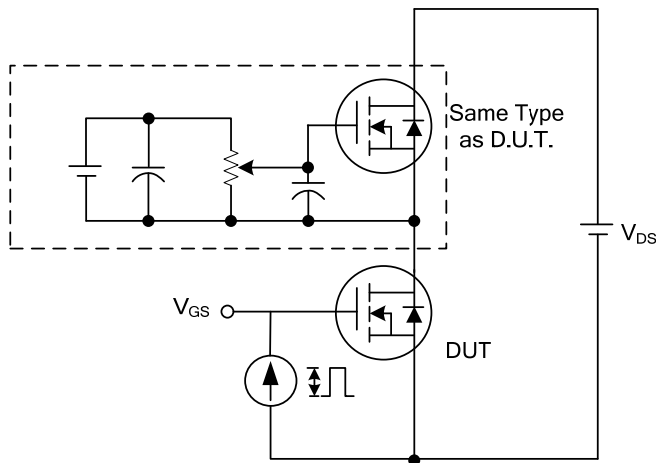
■ TEST CIRCUITS AND WAVEFORMS



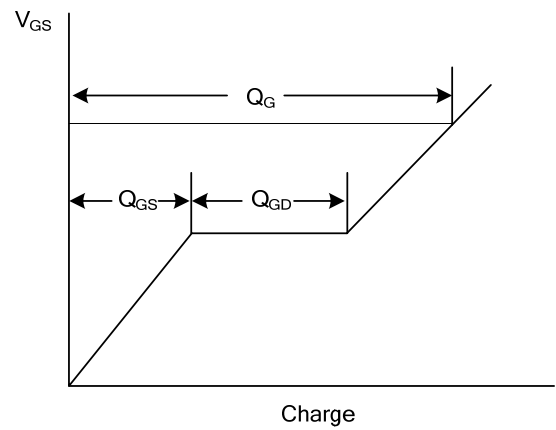
Switching Test Circuit



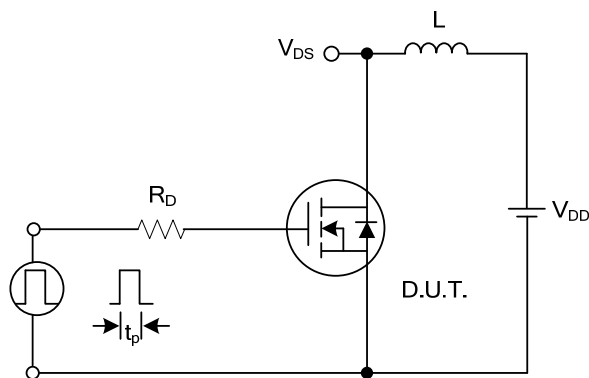
Switching Waveforms



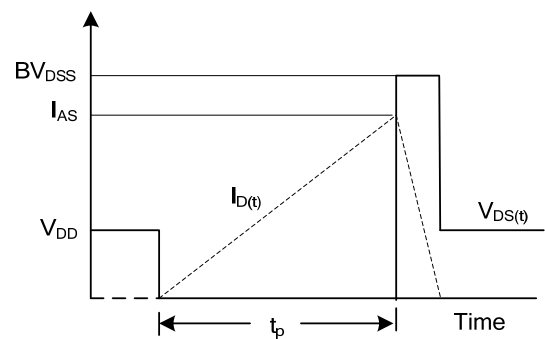
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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