



12NM95SZ

Preliminary

POWER MOSFET

12A, 950V N-CHANNEL SUPER-JUNCTION MOSFET

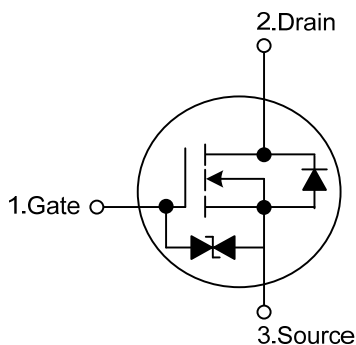
DESCRIPTION

The UTC **12NM95SZ** 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

- * $R_{DS(ON)} \leq 0.6 \Omega$ @ $V_{GS}=10V$, $I_D=3.0A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness
- * With ESD protection

SYMBOL

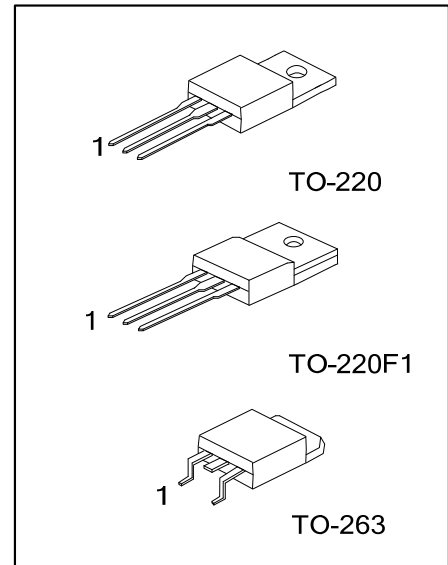


ORDERING INFORMATION

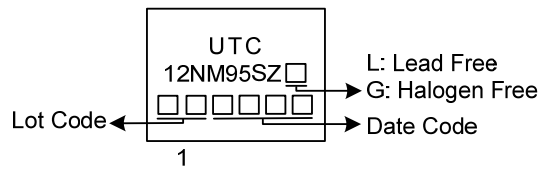
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
12NM95SZL-TA3-T	12NM95SZG-TA3-T	TO-220	G	D	S	Tube
12NM95SZL-TF1-T	12NM95SZG-TF1-T	TO-220F1	G	D	S	Tube
12NM95SZL-TQ2-T	12NM95SZG-TQ2-T	TO-263	G	D	S	Tube
12NM95SZL-TQ2-R	12NM95SZG-TQ2-R	TO-263	G	D	S	Tape Reel

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

12NM95SZG-TA3-T	(1)Packing Type	(1) T: Tube, R: Tape Reel
	(2)Package Type	(2) TA3: TO-220, TF1: TO-220F1, TQ2: TO-263
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free



■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	950	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current	DC	I_D	12	A
	Pulsed (Note 2)	I_{DM}	36	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	21.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.6	V/ns
Power Dissipation	TO-220/TO-263	P_D	85	W
	TO-220F1		29	W
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature Range		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. $L = 10\text{mH}$, $I_{AS} = 2.1\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 12\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220/TO-263	θ_{JC}	1.47	$^{\circ}\text{C}/\text{W}$
	TO-220F1		4.31	$^{\circ}\text{C}/\text{W}$

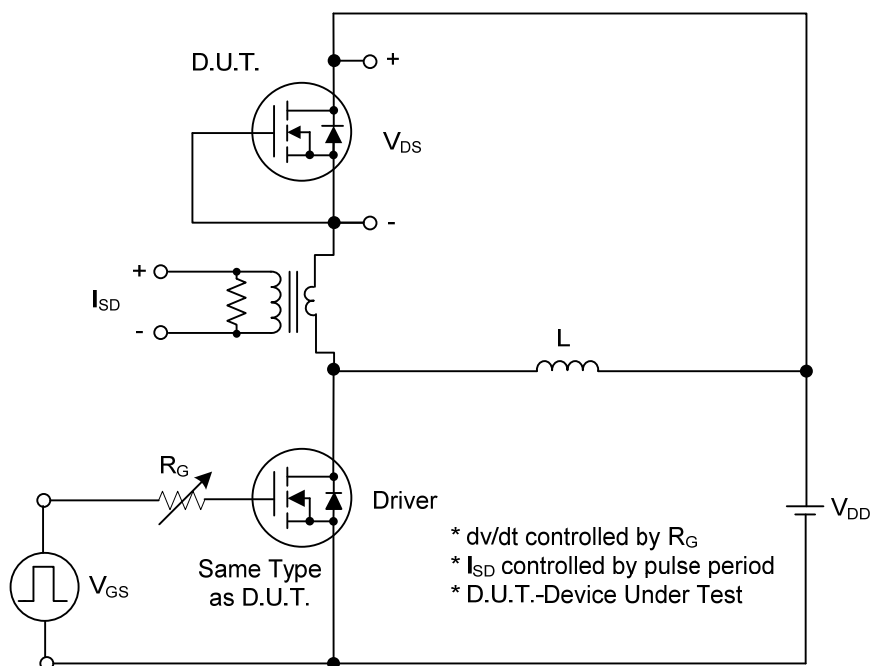
■ **ELECTRICAL CHARACTERISTICS** ($T_A=25^\circ\text{C}$ unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	950			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =950V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+20V, V _{DS} =0V			+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 =3.0A			0.6	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1.0MHz		1031		pF
Output Capacitance		C _{OSS}			127		pF
Reverse Transfer Capacitance		C _{RSS}			5.1		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =760V, V _{GS} =10V, I _D =12A (Note 1, 2)		34		nC
Gate to Source Charge		Q _{GS}			9.7		nC
Gate to Drain Charge		Q _{GD}			9		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =12A, R _G =25Ω (Note 1, 2)		16		ns
Rise Time		t _R			22		ns
Turn-OFF Delay Time		t _{D(OFF)}			74		ns
Fall-Time		t _F			34		ns
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				12	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				36	A
Diode Forward Voltage		V _{SD}	I _F =12A, V _{GS} =0V			1.4	V
Reverse Recovery Time		t _{rr}	I _S =12A, V _{GS} =0V,		525		ns
Reverse Recovery Charge (Note 1)		Q _{rr}	dl _F /dt = 100 A/μs		8.3		nc

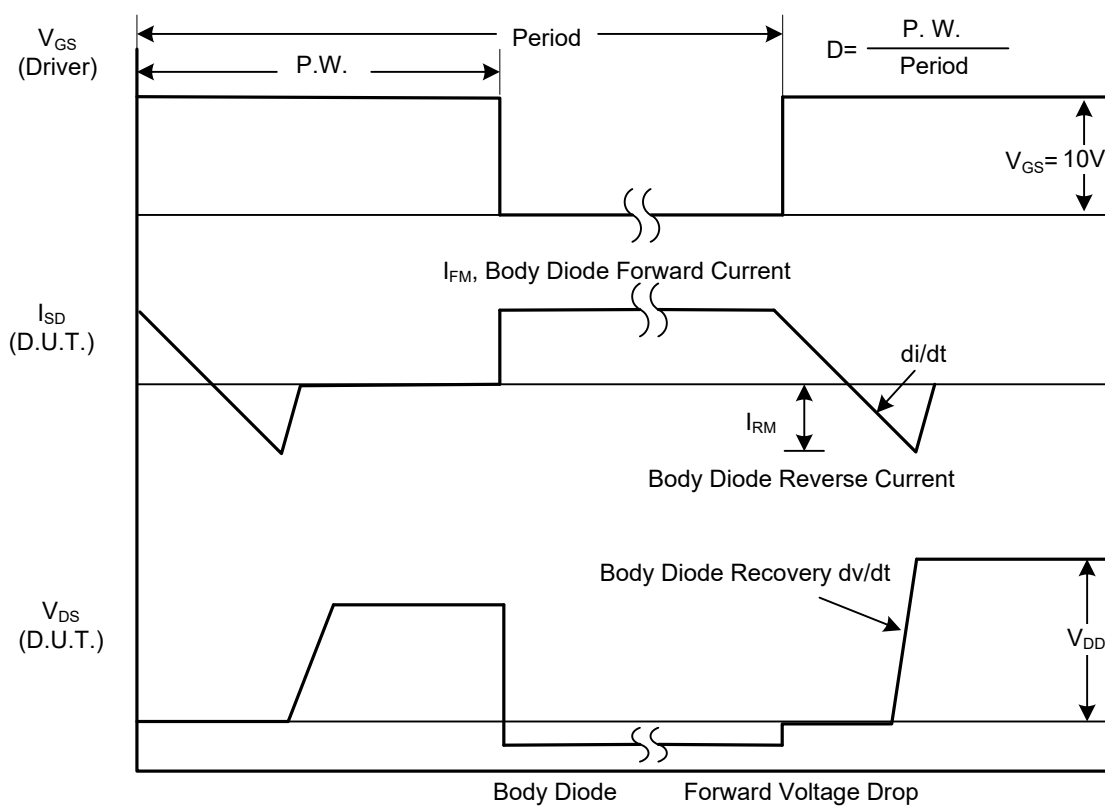
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

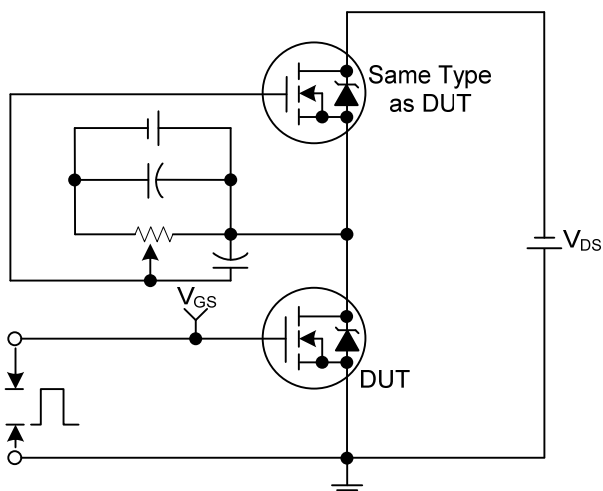


Peak Diode Recovery dv/dt Test Circuit

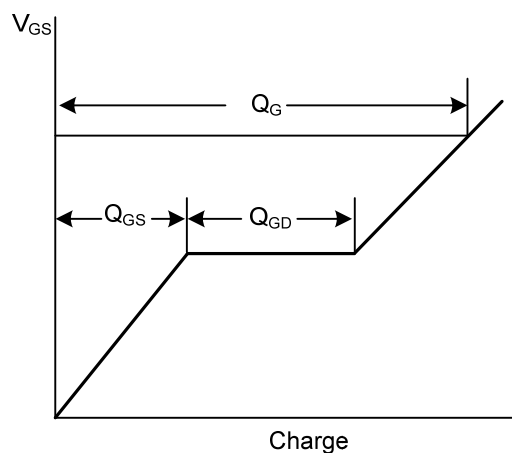


Peak Diode Recovery dv/dt Waveforms

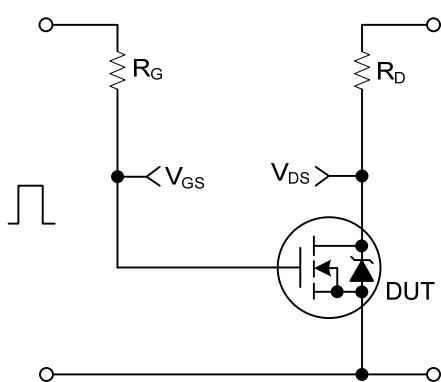
■ TEST CIRCUITS AND WAVEFORMS



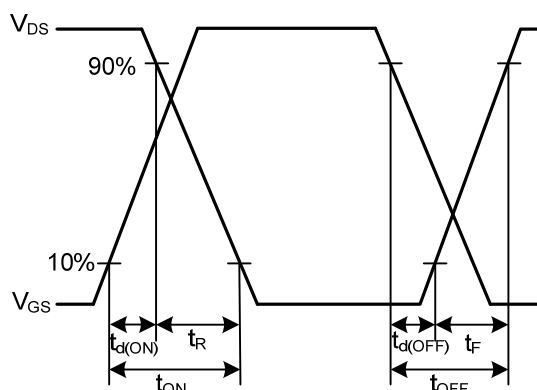
Gate Charge Test Circuit



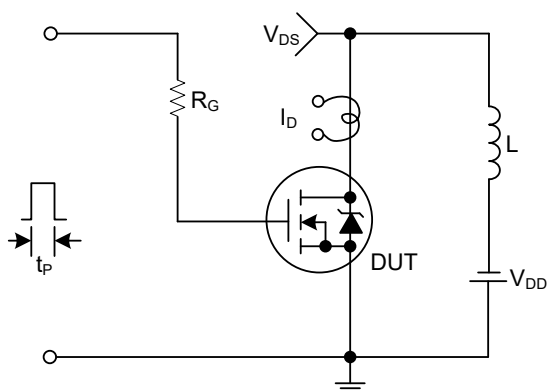
Gate Charge Waveforms



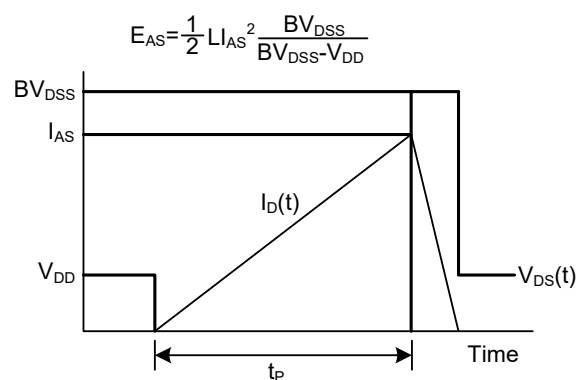
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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