



4NM90A

Power MOSFET

4A, 900V N-CHANNEL SUPER-JUNCTION MOSFET

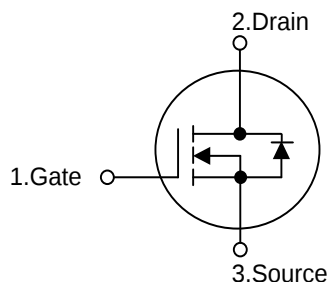
DESCRIPTION

The UTC 4NM90A 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

- * $R_{DS(ON)} \leq 3.2 \Omega$ @ $V_{GS}=10V$, $I_D=2.0A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4NM90AL-AA2-R	4NM90AG-AA2-R	SOT-223-2	G	D	S	Tape Reel
4NM90AL-AA3-R	4NM90AG-AA3-R	SOT-223	G	D	S	Tape Reel
4NM90AL-TA3-T	4NM90AG-TA3-T	TO-220	G	D	S	Tube
4NM90AL-TF1-T	4NM90AG-TF1-T	TO-220F1	G	D	S	Tube
4NM90AL-TF2-T	4NM90AG-TF2-T	TO-220F2	G	D	S	Tube
4NM90AL-TM3-T	4NM90AG-TM3-T	TO-251	G	D	S	Tube
4NM90AL-TMS2-T	4NM90AG-TMS2-T	TO-251S2	G	D	S	Tube
4NM90AL-TN3-R	4NM90AG-TN3-R	TO-252	G	D	S	Tape Reel

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

4NM90AG-AA3-R (1) Packing Type (2) Package Type (3) Green Package	(1) R: Tape Reel, T: Tube (2) AA2: SOT-223-2, AA3: SOT-223, TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TMS2: TO-251S2, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

SOT-223-2 / SOT-223	TO-220 / TO-220F1 / TO-220F2 TO-251 / TO-251S2 / TO-252
4NM90A 1 L: Lead Free G: Halogen Free Date Code	UTC 4NM90A 1 Lot Code L: Lead Free G: Halogen Free Date Code

■ **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}	± 30	V
Continuous Drain Current	Continuous	I_D	4.0	A
Pulsed Drain Current	Pulsed (Note 2)	I_{DM}	16	A
Avalanche Current (Note 2)		I_{AR}	1.4	A
Single Pulsed Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	156	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.43	V/ns
Power Dissipation	SOT-223-2/SOT-223	P_D	3	W
	TO-220		42	W
	TO-220F1/TO-220F2		24	W
	TO-251/TO-251S2		25	W
	TO-252			
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. $L = 159\text{mH}$, $I_{AS} = 1.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$.

4. $I_{SD} \leq 4.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$.

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-223-2/SOT-223	θ_{JA}	150	$^\circ\text{C/W}$
	TO-220/TO-220F1		62.5	$^\circ\text{C/W}$
	TO-220F2			
	TO-251/TO-251S2		110	$^\circ\text{C/W}$
	TO-252			
Junction to Case	SOT-223-2/SOT-223	θ_{JC}	41.6 (Note)	$^\circ\text{C/W}$
	TO-220		2.98	$^\circ\text{C/W}$
	TO-220F1/TO-220F2		5.21	$^\circ\text{C/W}$
	TO-251/TO-251S2		5 (Note)	$^\circ\text{C/W}$
	TO-252			

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

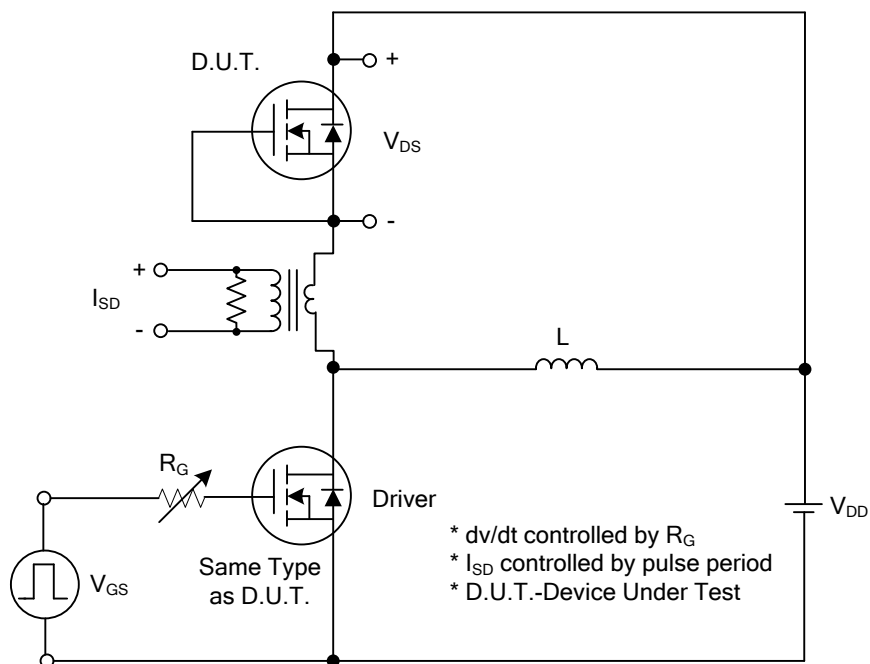
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = 250μA	900			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 900V, V _{GS} = 0V			10	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} = 30V, V _{DS} = 0V			100	nA
		V _{GS} = -30V, V _{DS} = 0V			-100	nA
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 = 2.0A			3.2	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		310		pF
Output Capacitance	C _{OSS}			105		pF
Reverse Transfer Capacitance	C _{RSS}			5		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =50V, I _D =1.3A, I _G =100μA V _{GS} =10V (Note 1,2)		46		nC
Gate to Source Charge	Q _{GS}			4		nC
Gate to Drain Charge	Q _{GD}			10		nC
Turn-ON Delay Time (Note 1)	t _{D(ON)}	V _{DD} =30V, I _D =0.5A, R _G =25Ω, V _{GS} =10V (Note 1,2)		42		nS
Rise Time	t _R			60		nS
Turn-OFF Delay Time	t _{D(OFF)}			150		nS
Fall-Time	t _F			35		nS
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				4	A
Maximum Body-Diode Pulsed Current	I _{SM}				16	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =4.0A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =4.0A, V _{GS} =0V,		475		nS
Body Diode Reverse Recovery Charge	Q _{rr}	dl _F /dt=100A/μs		4.0		μC

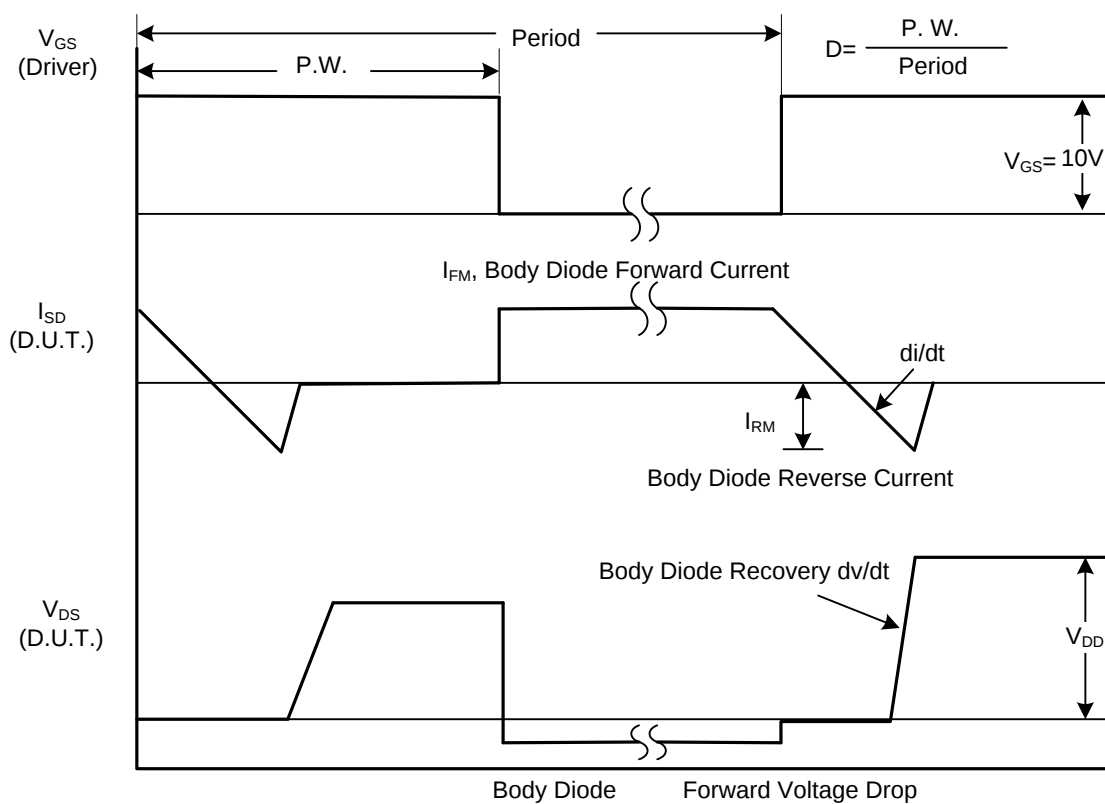
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

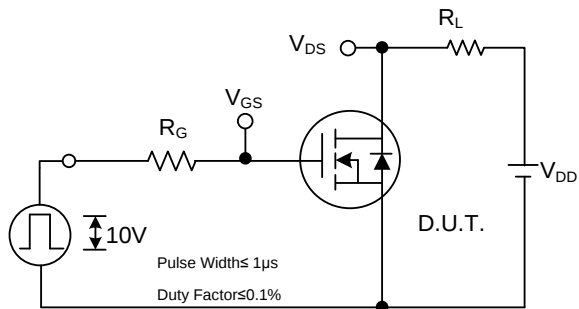


Peak Diode Recovery dv/dt Test Circuit

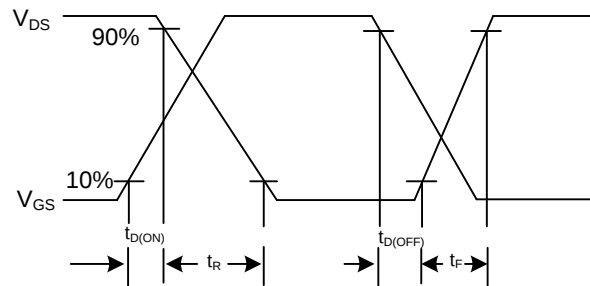


Peak Diode Recovery dv/dt Waveforms

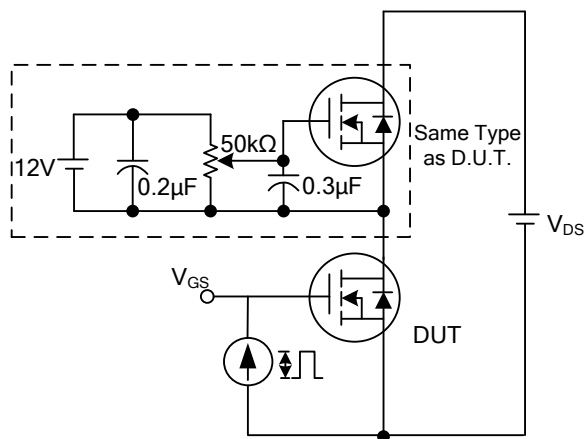
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



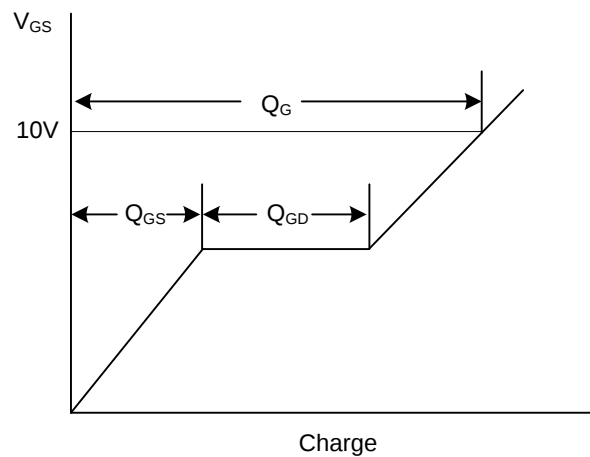
Switching Test Circuit



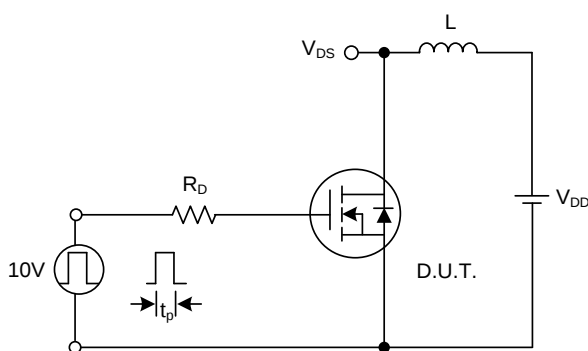
Switching Waveforms



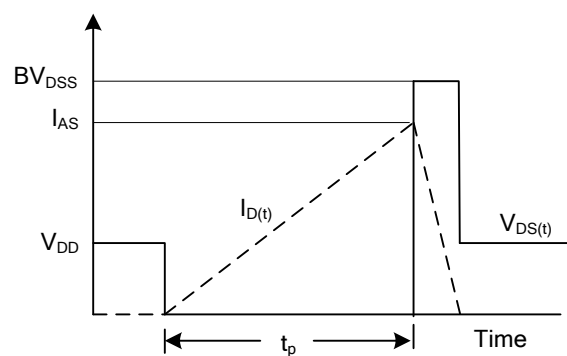
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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