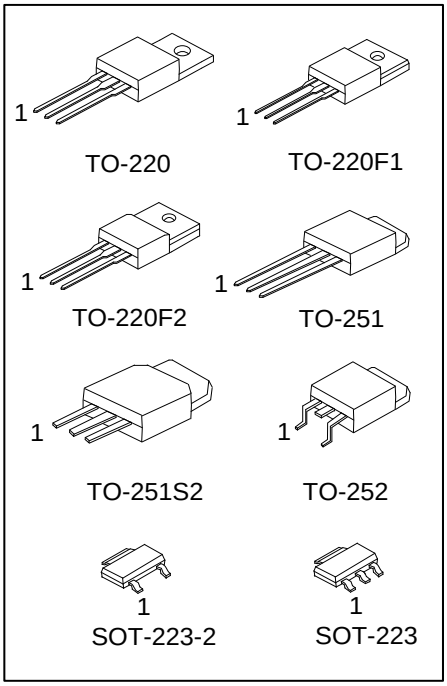
4A, 900V N-CHANNEL SUPER-JUNCTION MOSFET



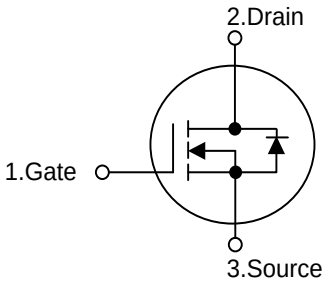
■ DESCRIPTION

The **UTC 4NM90** 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

* $R_{DS(ON)} \leq 4.1\ \Omega$ @ V_{GS}=10V, I_D=2.0A
* Fast switching capability
* Avalanche energy tested
* Improved dv/dt capability, high ruggedness

■ SYMBOL



■ ORDERING INFORMATION

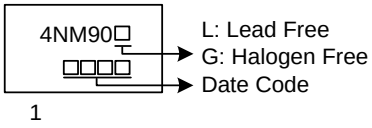
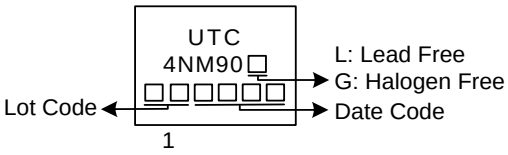
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4NM90L-AA2-R	4NM90G-AA2-R	SOT-223-2	G	D	S	Tape Reel
4NM90L-AA3-R	4NM90G-AA3-R	SOT-223	G	D	S	Tape Reel
4NM90L-TA3-T	4NM90G-TA3-T	TO-220	G	D	S	Tube
4NM90L-TF1-T	4NM90G-TF1-T	TO-220F1	G	D	S	Tube
4NM90L-TF2-T	4NM90G-TF2-T	TO-220F2	G	D	S	Tube
4NM90L-TM3-T	4NM90G-TM3-T	TO-251	G	D	S	Tube
4NM90L-TMS2-T	4NM90G-TMS2-T	TO-251S2	G	D	S	Tube
4NM90L-TN3-R	4NM90G-TN3-R	TO-252	G	D	S	Tape Reel

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

4NM90G-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

■ MARKING

SOT-223-2 / SOT-223	TO-220 / TO-220F1 / TO-220F2 TO-251 / TO-251S2 / TO-252
	

■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°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}	1.2	A
Single Pulsed Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	114	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.34	V/ns
Power Dissipation	SOT-223-2/SOT-223	P_D	8	W
	TO-220		40	W
	TO-220F1/TO-220F2		22	W
	TO-251/TO-251S2 TO-252		23	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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 = 159mH, I_{AS} = 1.2A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C.
4. I_{SD} ≤ 4.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C.

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-223-2/SOT-223	$θ_{JA}$	150	°C/W
	TO-220/TO-220F1 TO-220F2		62.5	°C/W
	TO-251/TO-251S2 TO-252		110	°C/W
Junction to Case	SOT-223-2/SOT-223	$θ_{JC}$	44.6 (Note)	°C/W
	TO-220		3.13	°C/W
	TO-220F1/TO-220F2		5.68	°C/W
	TO-251/TO-251S2 TO-252		5.43 (Note)	°C/W

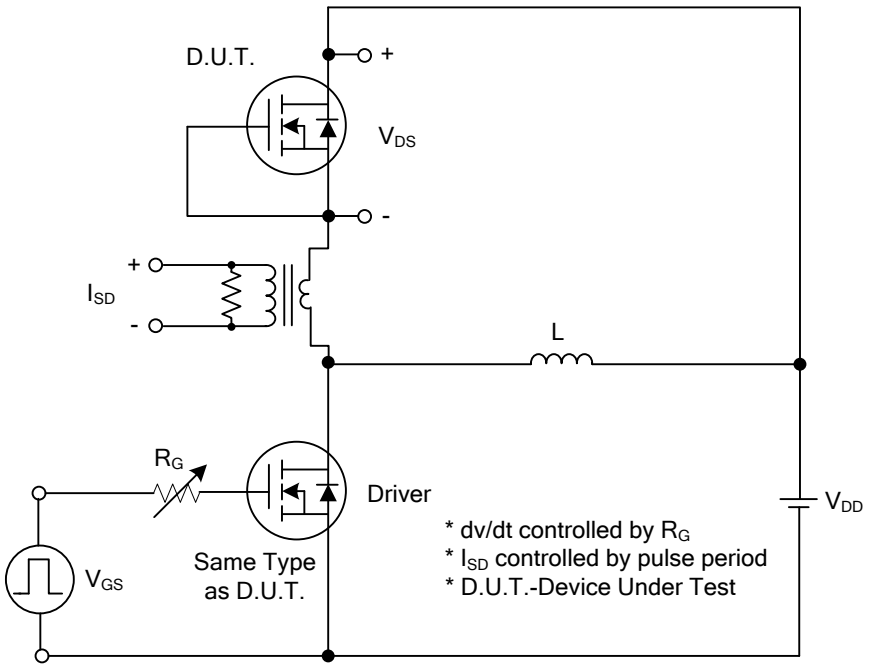
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

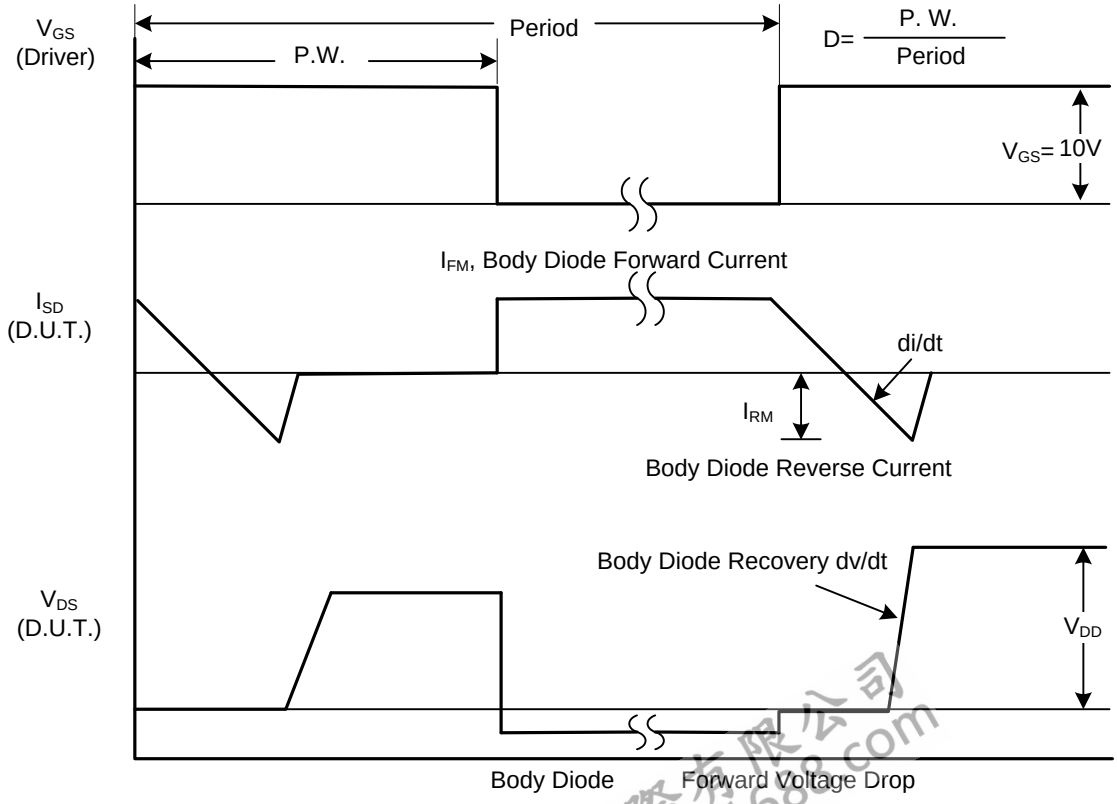
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	900			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 900V, V_{GS} = 0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V			100	nA
	Reverse		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			4.1	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		280		pF
Output Capacitance		C_{OSS}			125		pF
Reverse Transfer Capacitance		C_{RSS}			7		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)		45		nC
Gate to Source Charge		Q_{GS}			4		nC
Gate to Drain Charge		Q_{GD}			8		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			55		nS
Turn-OFF Delay Time		$t_{D(OFF)}$			130		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, dI_F/dt=100A/μs		530		nS
Body Diode Reverse Recovery Charge		Q_{rr}			3.75		μC

Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

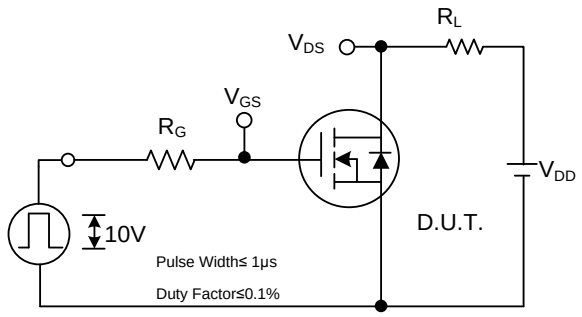


Peak Diode Recovery dv/dt Test Circuit

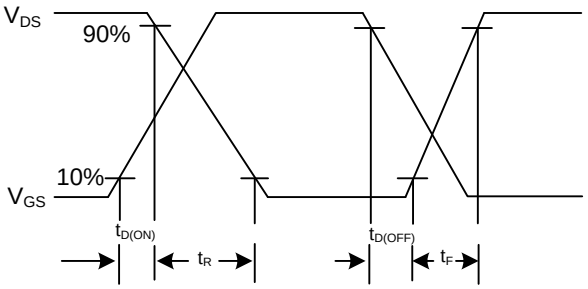


Peak Diode Recovery dv/dt Waveforms

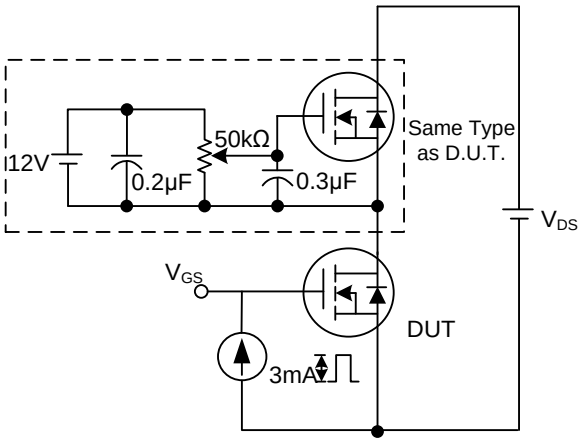
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



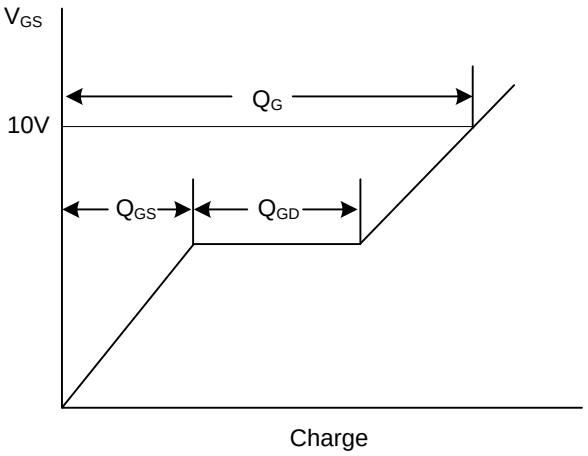
Switching Test Circuit



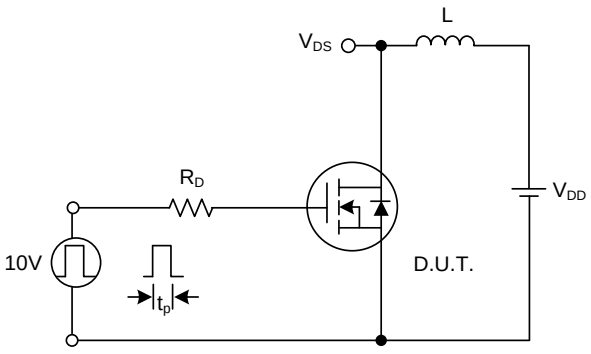
Switching Waveforms



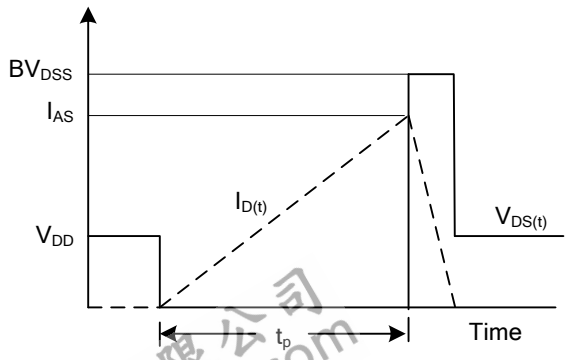
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms