



13NM90

Preliminary

Power MOSFET

13A, 900V N-CHANNEL SUPER-JUNCTION MOSFET

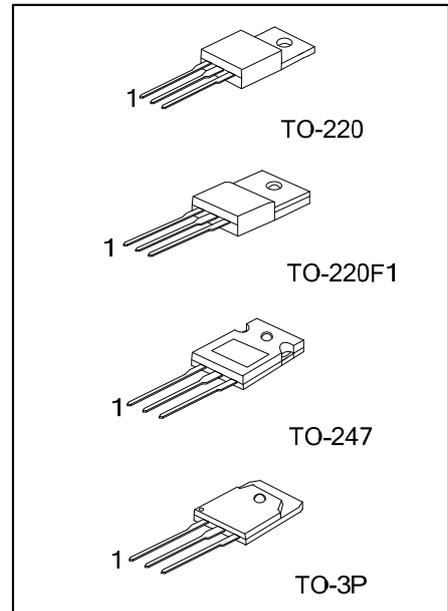
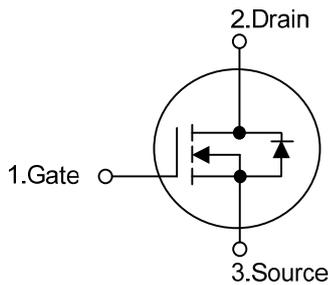
■ DESCRIPTION

The **UTC 13NM90** 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 DC-DC, AC-DC converters for power applications.

■ FEATURES

- * $R_{DS(ON)} < 0.5\Omega @ V_{GS} = 10V, I_D = 6.5A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

■ SYMBOL



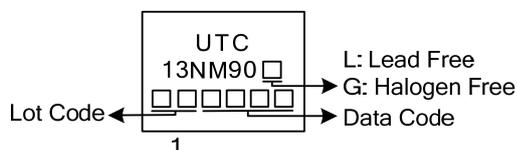
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
13NM90L-TA3-T	13NM90G-TA3-T	TO-220	G	D	S	Tube
13NM90L-TF1-R	13NM90G-TF1-R	TO-220F1	G	D	S	Tape Reel
13NM90L-T3P-T	13NM90G-T3P-T	TO-3P	G	D	S	Tube
13NM90L-T47-T	13NM90G-T47-T	TO-247	G	D	S	Tube

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

<p>13NM90L-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) TA3: TO-220, TF1: TO-220F1, T3P: TO-3P T47: TO-247 (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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■ MARKING



■ 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	13	A
Pulsed Drain Current	Pulsed (Note 2)	I_{DM}	52	A
Avalanche Current (Note 2)		I_{AR}	3.0	A
Single Pulsed Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	716	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.68	V/ns
Power Dissipation	TO-220	P_D	200	W
	TO-220F1		53	W
	TO-3P		405	W
	TO-247		370	W
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. $L = 159\text{mH}$, $I_{AS} = 3.0\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$.

4. $I_{SD} \leq 13\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F1	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-3P		30	$^\circ\text{C}/\text{W}$
	TO-247		40	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	0.63	$^\circ\text{C}/\text{W}$
	TO-220F1		2.36	$^\circ\text{C}/\text{W}$
	TO-3P		0.31	$^\circ\text{C}/\text{W}$
	TO-247		0.34	$^\circ\text{C}/\text{W}$

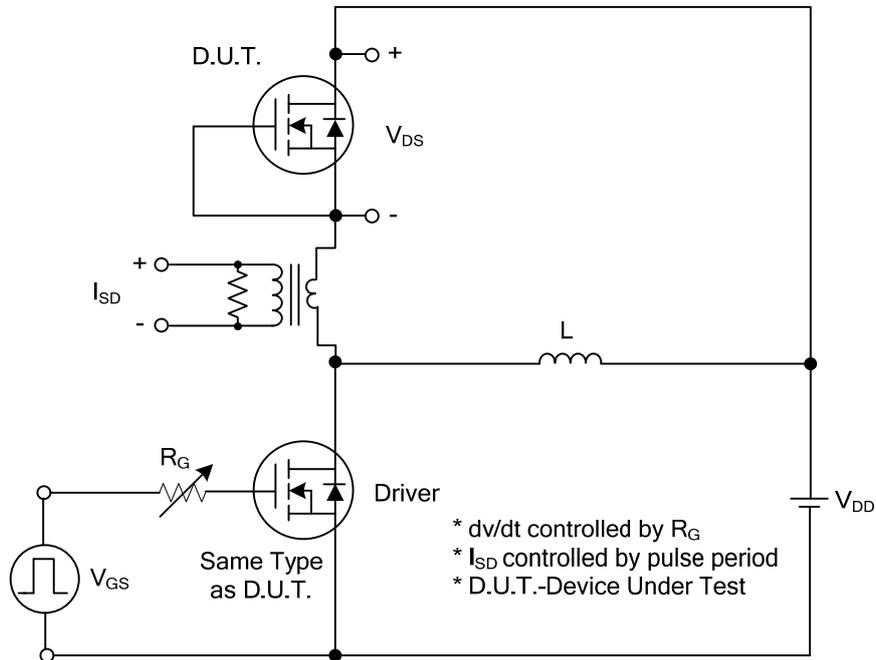
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

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}			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 = 6.5A			0.5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		1800		pF
Output Capacitance	C _{OSS}			475		pF
Reverse Transfer Capacitance	C _{RSS}			6		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)		85		nC
Gate to Source Charge	Q _{GS}			8		nC
Gate to Drain Charge	Q _{GD}			26.5		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)		68		nS
Rise Time	t _R			155		nS
Turn-OFF Delay Time	t _{D(OFF)}			655		nS
Fall-Time	t _F			190		nS
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				13	A
Maximum Body-Diode Pulsed Current	I _{SM}				52	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =13A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =13A, V _{GS} =0V, dI _F /dt=100A/μs		600		nS
Body Diode Reverse Recovery Charge	Q _{rr}				11.8	

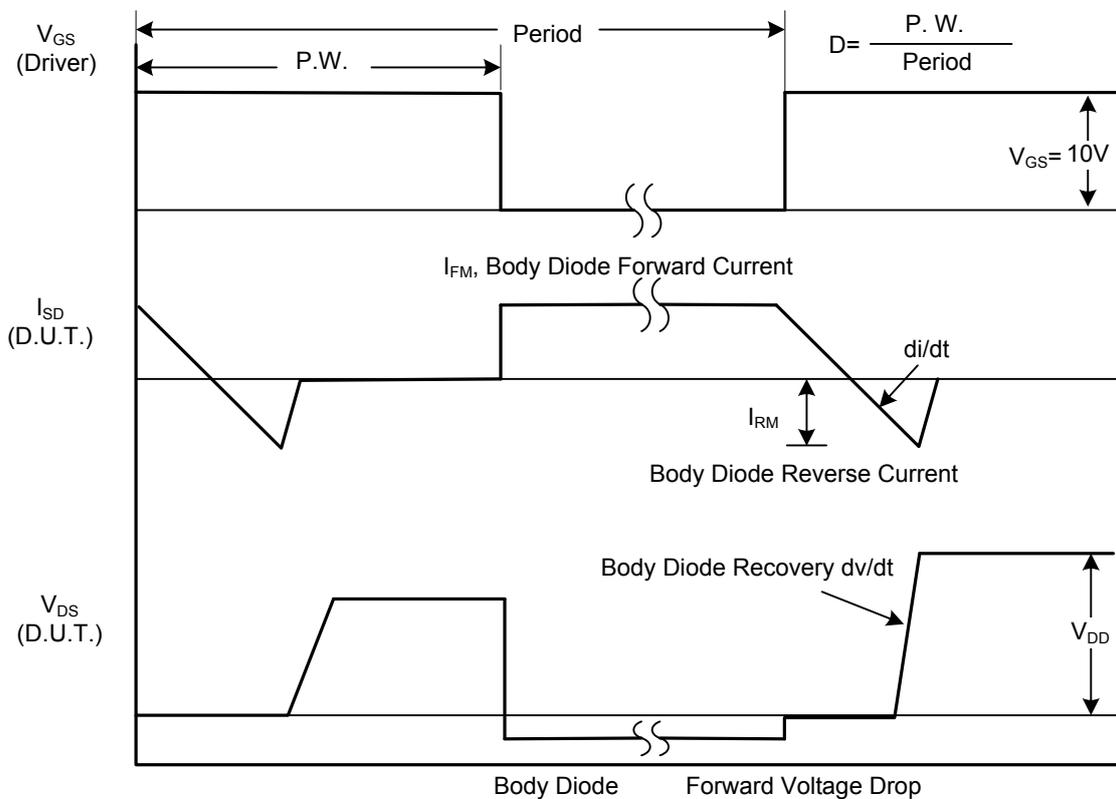
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

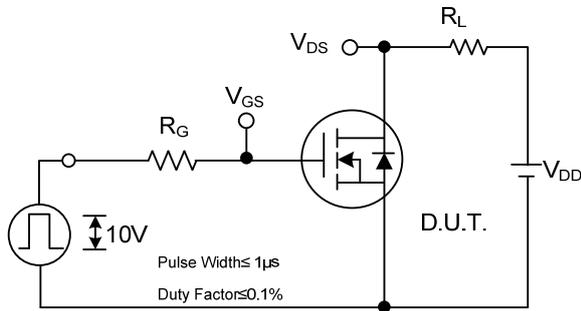


Peak Diode Recovery dv/dt Test Circuit

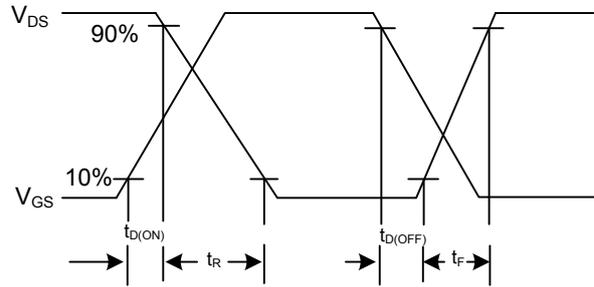


Peak Diode Recovery dv/dt Waveforms

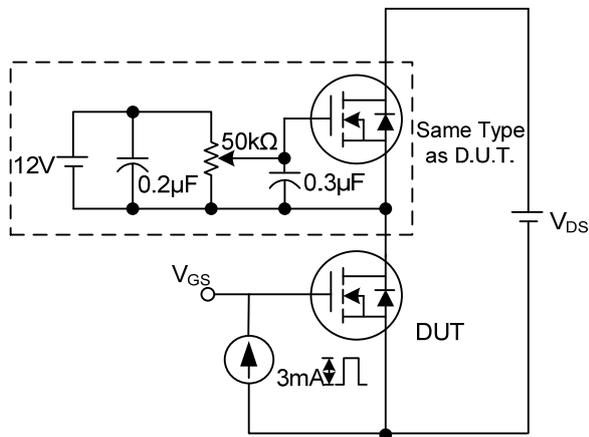
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



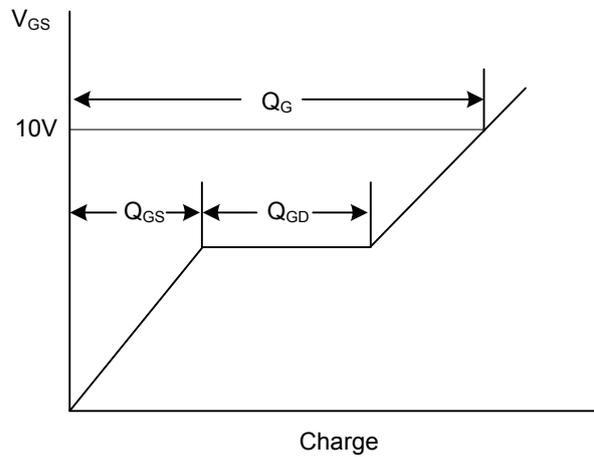
Switching Test Circuit



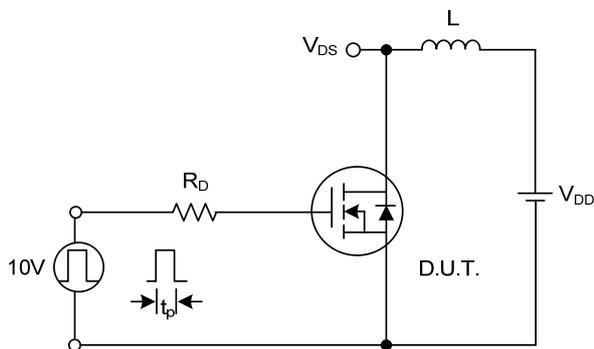
Switching Waveforms



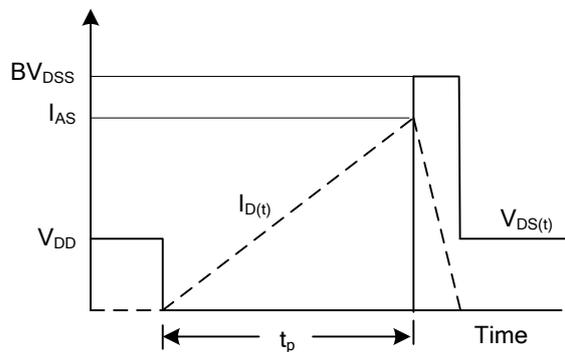
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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