



9NM60-U3

Preliminary

Power MOSFET

9.0A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

The **UTC 9NM60-U3** 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

* For SOT-223-2/SOT-223

$R_{DS(ON)} \leq 0.6 \Omega$ @ $V_{GS}=10V$, $I_D=2.5A$

* For TO-220/TO-220F/TO-220F1/TO-220F2/TO-220WF
TO-247/TO-252/TO-262/TO-263/ DFN8080-4/TOLL-8A
TOLL-8B

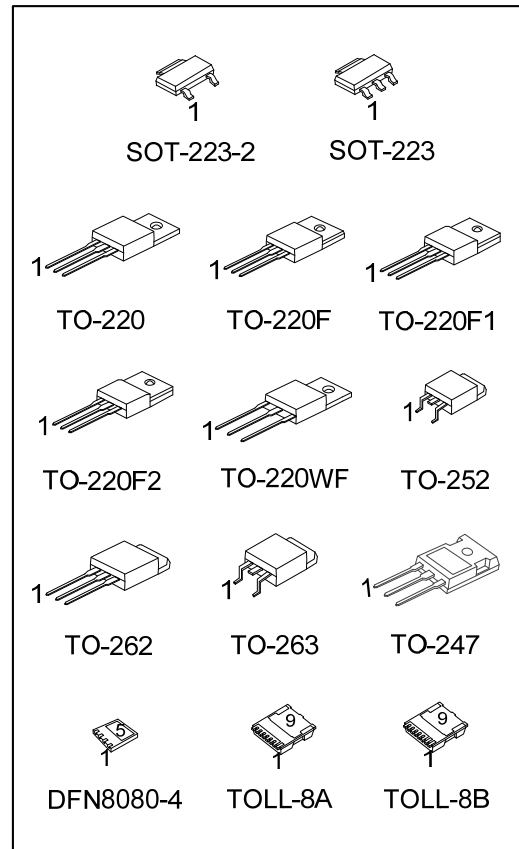
$R_{DS(ON)} \leq 0.58 \Omega$ @ $V_{GS}=10V$, $I_D=2.5A$

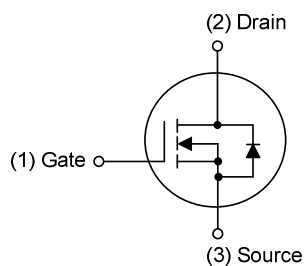
* Fast switching capability

* Avalanche energy tested

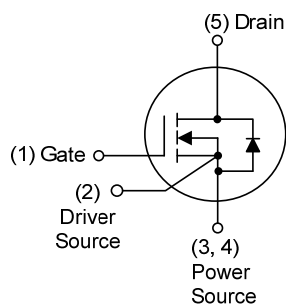
* Improved dv/dt capability, high ruggedness

SYMBOL

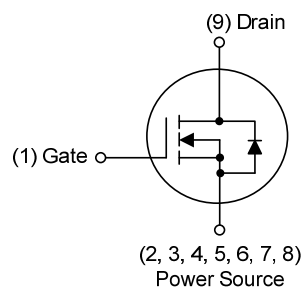




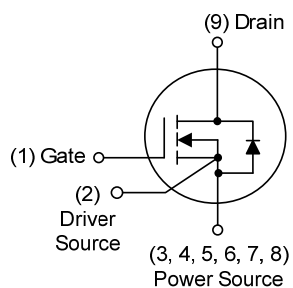
SOT-223-2 / SOT-223
TO-220 / TO-220F / TO-220F1
TO-220F2 / TO-220WF / TO-252
TO-247 / TO-262 / TO-263



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	
9NM60L-AA2-R	9NM60G-AA2-R	SOT-223-2	G	D	S	-	-	-	-	-	-	Tape Reel
9NM60L-AA3-R	9NM60G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	-	Tape Reel
9NM60L-TA3-T	9NM60G-TA3-T	TO-220	G	D	S	-	-	-	-	-	-	Tube
9NM60L-TF1-T	9NM60G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube
9NM60L-TF2-T	9NM60G-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	-	Tube
9NM60L-TF3-T	9NM60G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	-	Tube
9NM60L-TW1-T	9NM60G-TW1-T	TO-220WF	G	D	S	-	-	-	-	-	-	Tube
9NM60L-TN3-R	9NM60G-TN3-R	TO-252	G	D	S	-	-	-	-	-	-	Tape Reel
9NM60L-T2Q-T	9NM60G-T2Q-T	TO-262	G	D	S	-	-	-	-	-	-	Tube
9NM60L-TQ2-T	9NM60G-TQ2-T	TO-263	G	D	S	-	-	-	-	-	-	Tube
9NM60L-TQ2-R	9NM60G-TQ2-R	TO-263	G	D	S	-	-	-	-	-	-	Tape Reel
9NM60L-T47-T	9NM60G-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
9NM60L-K04-8080-R	9NM60G-K04-8080-R	DFN8080-4	G	S	S	S	D	-	-	-	-	Tape Reel
9NM60L-T8A-R	9NM60G-T8A-R	TOLL-8A	G	S	S	S	S	S	S	S	D	Tape Reel
9NM60L-T8B-R	9NM60G-T8B-R	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel

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

9NM60G-AA2-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, TF3: TO-220F, TW1: TO-220WF, TN3: TO-252, TN3: TO-252, T2Q: TO-262, TQ2: TO-263, T47: TO-247, T474: TO-247-4, K04-8080: DFN8080-4, T8A: TOLL-8A, T8B: TOLL-8B (3) G: Halogen Free and Lead Free L: Lead Free
--	--

MARKING

SOT-223-2 / SOT-223	TO-220 / TO-220F / TO-220F1 TO-220F2 / TO-220WF / TO-252 TO-252 / TO-247 / TO-262 / TO-263
Lot Code ← 1 → L: Lead Free G: Halogen Free Date Code	UTC 9NM60 Lot Code ← 1 → L: Lead Free G: Halogen Free Date Code
DFN8080-4	TOLL-8A / TOLL-8B
UTC 9NM60 Lot Code ← 1 → Date Code	UTC 9NM60 Lot Code ← 1 → 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}	600	V
Gate-Source Voltage			V _{GSS}	±30	V
Drain Current	Continuous	T _C =25°C	I _D	9	A
		T _C =100°C		5.9	A
	Pulsed (Note 2)		I _{DM}	27	A
Avalanche Energy	Single Pulsed (Note 3)		E _{AS}	144	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	1.5	V/ns
Power Dissipation	SOT-223-2/SOT-223		P _D	4.5	W
	TO-220/TO-262/TO-263			70	W
	TO-220F/TO-220F1			28	W
	TO-220F2/TO-220WF				
	TO-247			80	W
	TO-252			54	W
	DFN8080-4			46	W
	TOLL-8A /TOLL-8A			130	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. $L = 100\text{mH}$, $I_{AS} = 1.7\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$ Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 9\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DS}$, Starting $T_J = 25^\circ\text{C}$

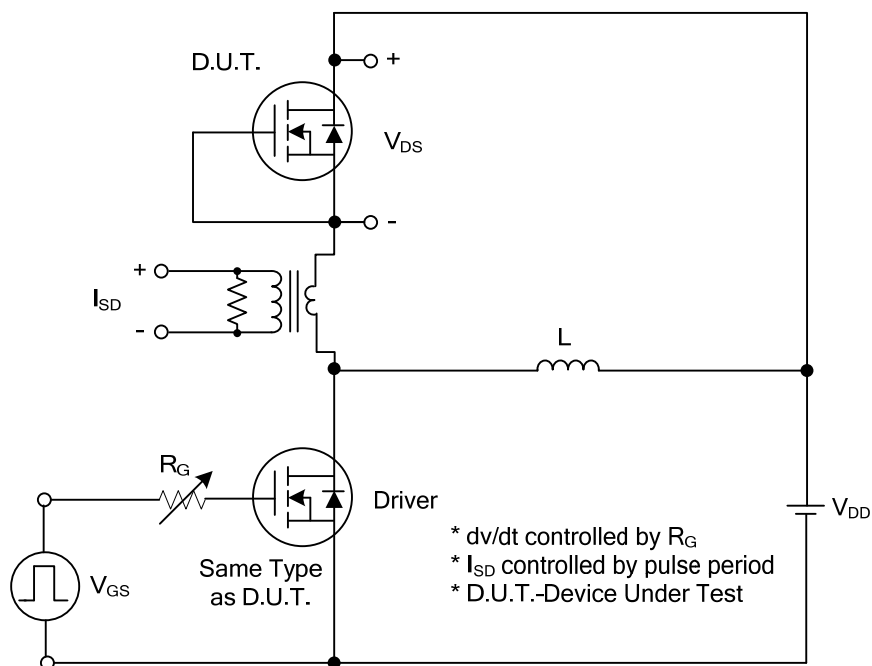
■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220WF/TO-262/TO-263	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-247		40	$^\circ\text{C}/\text{W}$
	TO-252		110	$^\circ\text{C}/\text{W}$
	DFN8080-4		35 (Note)	$^\circ\text{C}/\text{W}$
	TOLL-8A /TOLL-8A		35 (Note)	$^\circ\text{C}/\text{W}$
	SOT-223-2/SOT-223		150 (Note)	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262/TO-263	θ_{JC}	1.8	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2/TO-220WF		4.46	$^\circ\text{C}/\text{W}$
	TO-247		1.56	$^\circ\text{C}/\text{W}$
	TO-252		2.31 (Note)	$^\circ\text{C}/\text{W}$
	DFN8080-4		2.72 (Note)	$^\circ\text{C}/\text{W}$
	TOLL-8A /TOLL-8A		0.96 (Note)	$^\circ\text{C}/\text{W}$
	SOT-223-2/SOT-223		27.8 (Note)	$^\circ\text{C}/\text{W}$

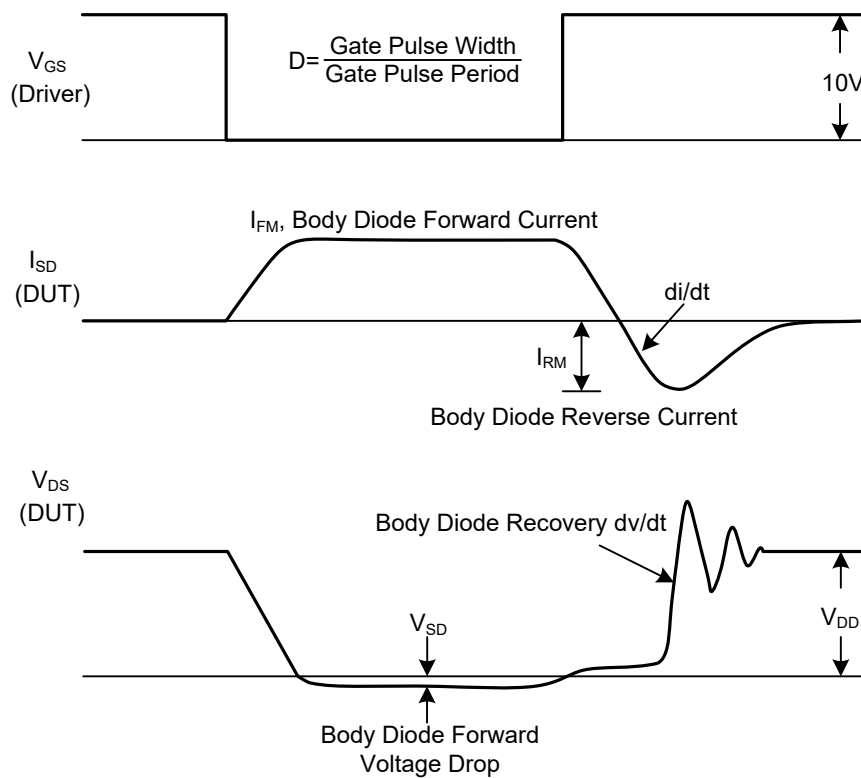
Note: Device mounted on FR-4 substrate P_c board, 2oz copper, with 1inch square copper plate.

Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

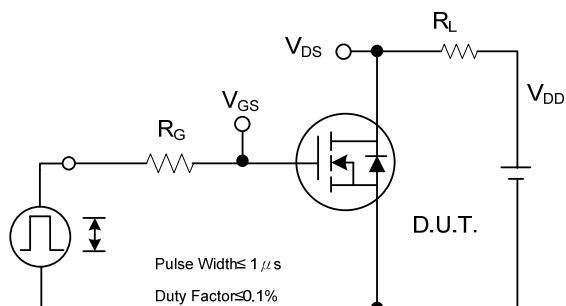


Peak Diode Recovery dv/dt Test Circuit

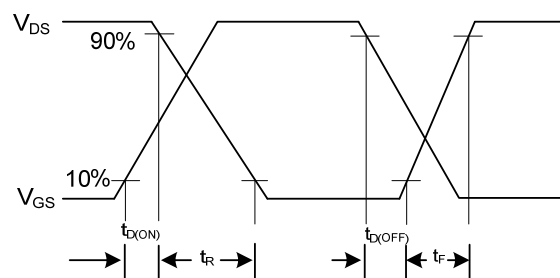


Peak Diode Recovery dv/dt Waveforms

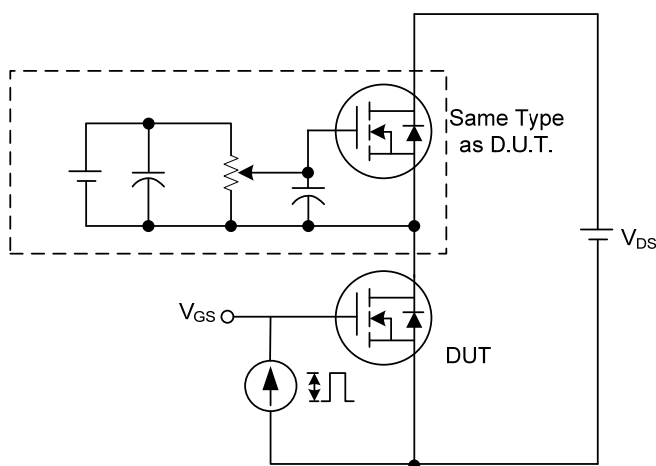
■ TEST CIRCUITS AND WAVEFORMS



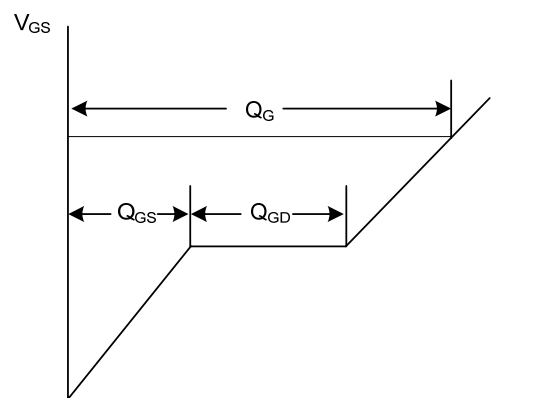
Switching Test Circuit



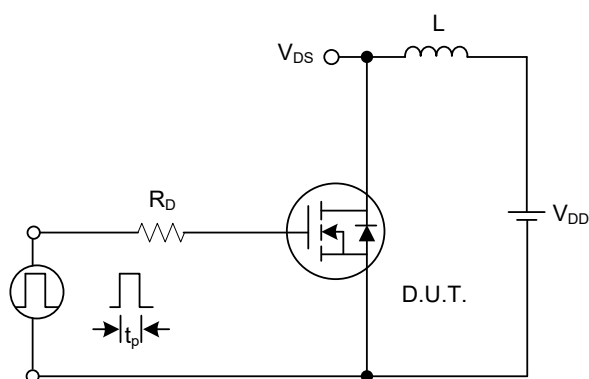
Switching Waveforms



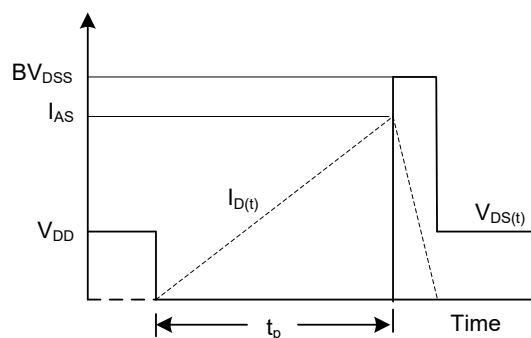
Gate Charge Test Circuit



Charge
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.