



F30NM60

Power MOSFET

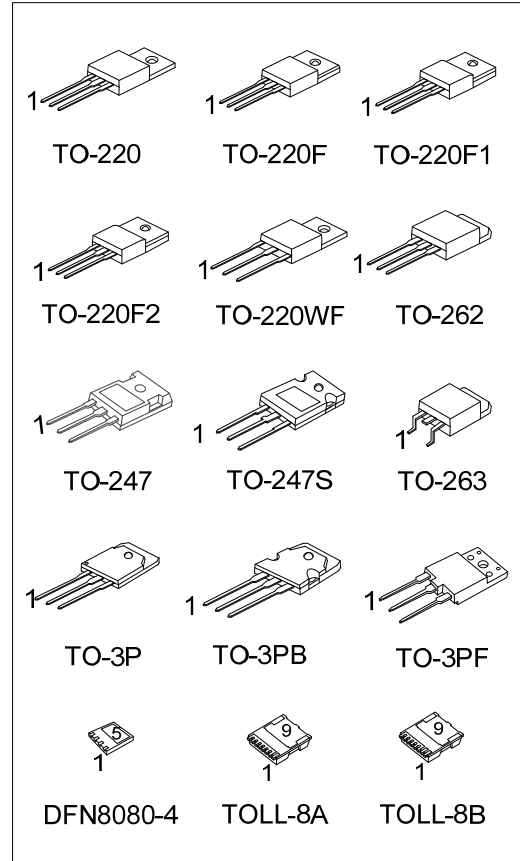
30A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

■ DESCRIPTION

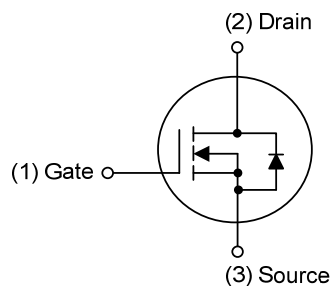
The **UTC F30NM60** is a N-Channel enhancement mode silicon gate super junction power MOSFET with fast body diode and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

■ FEATURES

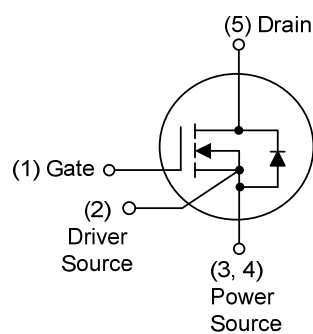
- * $R_{DS(ON)} \leq 0.13 \Omega$ @ $V_{GS}=10V$, $I_D=15A$
- * Fast body diode MOSFET technology
- * High Switching Speed
- * 100% Avalanche Tested



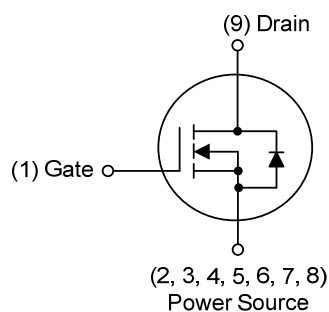
■ SYMBOL



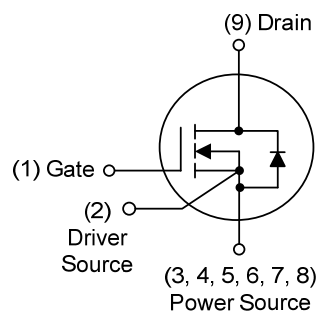
TO-220 / TO-220F / TO-220F1 / TO-220F2
TO-220WF / TO-3P / TO-3PB / TO-3PF
TO-247 / TO-247S / TO-262 / TO-263



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	
F30NM60L-TA3-T	F30NM60G-TA3-T	TO-220	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-TF1-T	F30NM60G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-TF2-T	F30NM60G-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-TF3-T	F30NM60G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-TW1-T	F30NM60G-TW1-T	TO-220WF	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-T2Q-T	F30NM60G-T2Q-T	TO-262	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-TQ2-T	F30NM60G-TQ2-T	TO-263	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-TQ2-R	F30NM60G-TQ2-R	TO-263	G	D	S	-	-	-	-	-	-	Tape Reel
F30NM60L-T3P-T	F30NM60G-T3P-T	TO-3P	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-T3B-T	F30NM60G-T3B-T	TO-3PB	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-T3F-T	F30NM60G-T3F-T	TO-3PF	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-T47-T	F30NM60G-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-T47S-T	F30NM60G-T47S-T	TO-247S	G	D	S	-	-	-	-	-	-	Tube
F30NM60L-K04-8080-R	F30NM60G-K04-8080-R	DFN8080-4	G	S	S	S	D	-	-	-	-	Tape Reel
F30NM60L-T8A-R	F30NM60G-T8A-R	TOLL-8A	G	S	S	S	S	S	S	S	D	Tape Reel
F30NM60L-T8B-R	F30NM60G-T8B-R	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel

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

F30NM60G-TA3-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TW1: TO-220WF, T2Q: TO-262, TQ2: TO-263, T3P: TO-3P, T3B: TO-3PB, T3F: TO-3PF, T47: TO-247, T47S: TO-247S, K04-8080: DFN8080-4, T8A: TOLL-8A, T8B: TOLL-8B (3) G: Halogen Free and Lead Free L: Lead Free
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MARKING

TO-220 / TO-220F / TO-220F1 / TO-220F2 TO-220WF / TO-3P / TO-3PB / TO-3PF TO-247 / TO-247S / TO-262 / TO-263	DFN8080-4
UTC F30NM60 Lot Code ← [] [] [] [] [] → Date Code 1 L: Lead Free G: Halogen Free	UTC F30NM60 Lot Code ← [] [] [] [] [] → Date Code
TOLL-8A / TOLL-8B	-
UTC F30NM65 Lot Code ← [] [] [] [] [] → Date Code 1 L: Lead Free G: Halogen Free	-

■ **ABSOLUTE MAXIMUM RATINGS** ($T_c=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	600	V
Gate-Source Voltage		V_{GS}	± 30	V
Continuous Drain Current		I_D	30	A
Pulsed Drain Current (Note 2)		I_{DM}	60	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	264	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	11	V/ns
Power Dissipation	TO-220/TO-262 TO-263	P_D	128	W
	TO-220F/TO-220F1 TO-220F2/TO-220WF		40	W
	TO-3P/TO-3PB		158	W
	TO-3PF		65	W
	TO-247/TO-247S		145	W
	DFN8080-4		70	W
	TOLL-8A/TOLL-8B		215	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. $L = 100\text{mH}$, $I_{AS} = 2.3\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220WF/TO-262 TO-263	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-3P/TO-3PB TO-3PF		30	$^\circ\text{C}/\text{W}$
	TO-247/TO-247S		40	$^\circ\text{C}/\text{W}$
	DFN8080-4/TOLL-8A TOLL-8B		35 (Note)	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262 TO-263	θ_{JC}	0.97	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2/TO-220WF		3.125	$^\circ\text{C}/\text{W}$
	TO-3P/TO-3PB		0.79	$^\circ\text{C}/\text{W}$
	TO-3PF		1.92	$^\circ\text{C}/\text{W}$
	TO-247/TO-247S		0.86	$^\circ\text{C}/\text{W}$
	DFN8080-4		1.78 (Note)	$^\circ\text{C}/\text{W}$
	TOLL-8A/TOLL-8B		0.58 (Note)	$^\circ\text{C}/\text{W}$

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

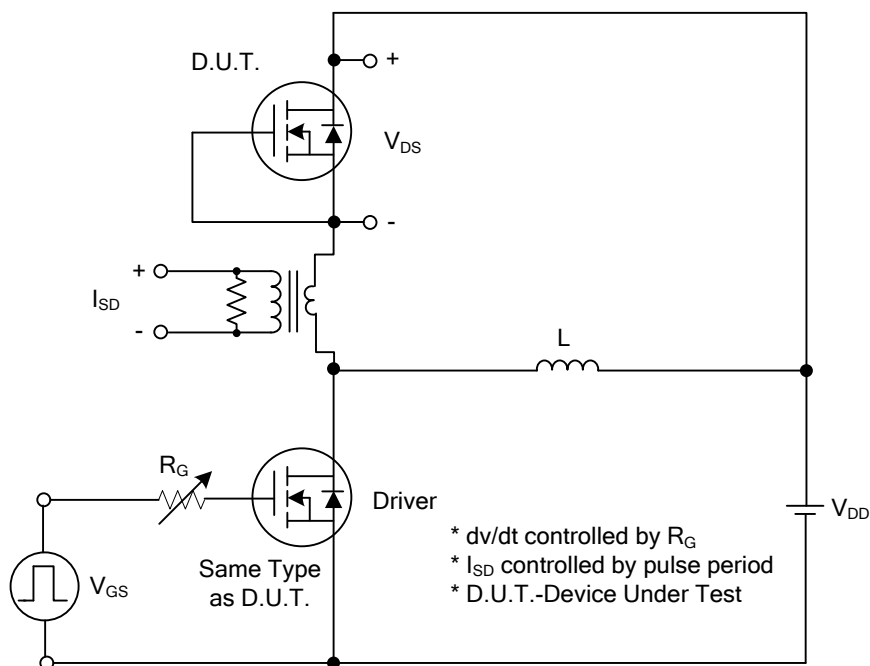
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V, 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 =15A			0.13	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =50V, V _{GS} =0V, f=1.0MHz		2450		pF
Output Capacitance		C _{OSS}			300		pF
Reverse Transfer Capacitance		C _{RSS}			15		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =480V, V _{GS} =10V, I _D =30A (Note 1, 2)		92.4		nC
Gate-Source Charge		Q _{GS}			21.2		nC
Gate-Drain Charge		Q _{GD}			38		nC
Turn-On Delay Time (Note 1)		t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =30A, R _G =25Ω (Note 1, 2)		40		ns
Turn-On Rise Time		t _R			53		ns
Turn-Off Delay Time		t _{D(OFF)}			300		ns
Turn-Off Fall Time		t _F			140		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				30	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				60	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =30A , V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	I _S =30A , V _{GS} =0V		190		ns
Reverse Recovery Charge		Q _{rr}	di/dt=100A/μs		2.8		μC

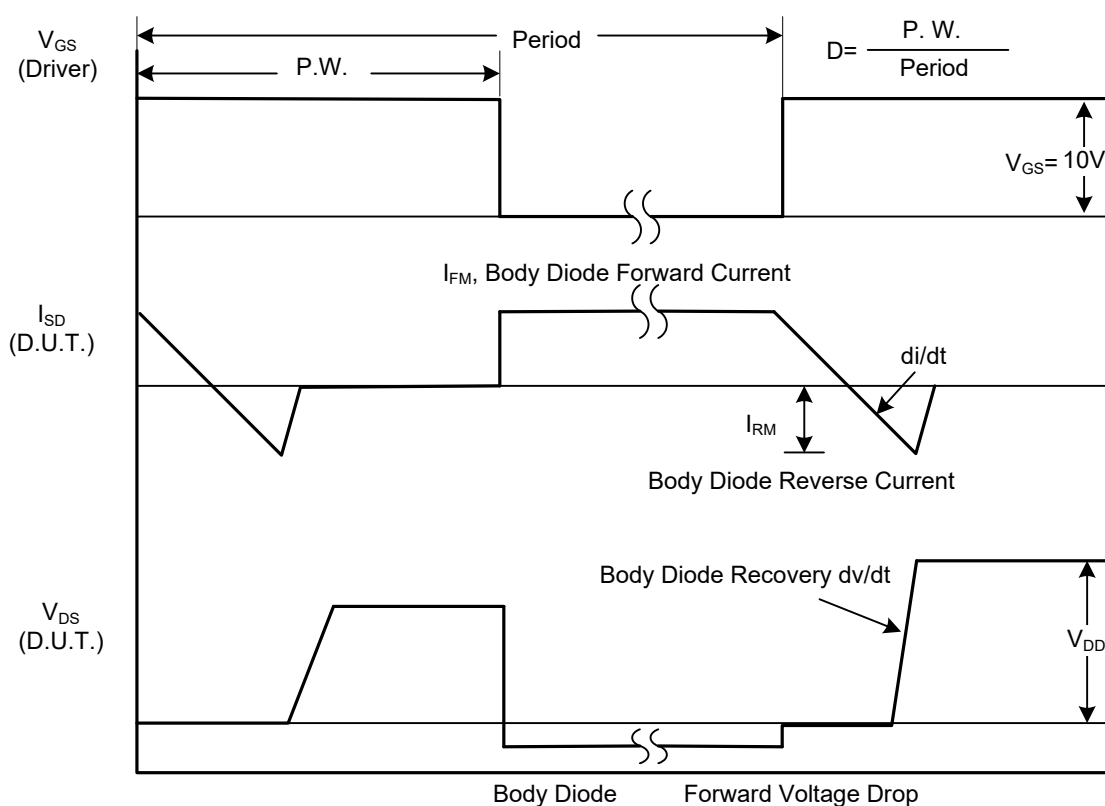
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

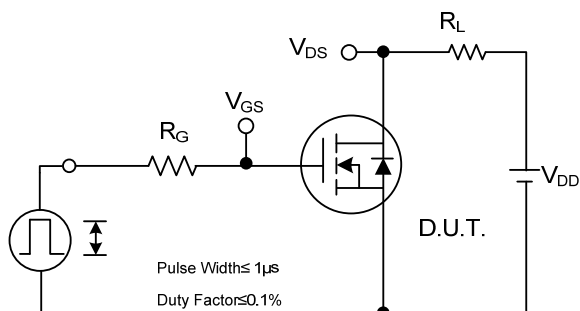


Peak Diode Recovery dv/dt Test Circuit

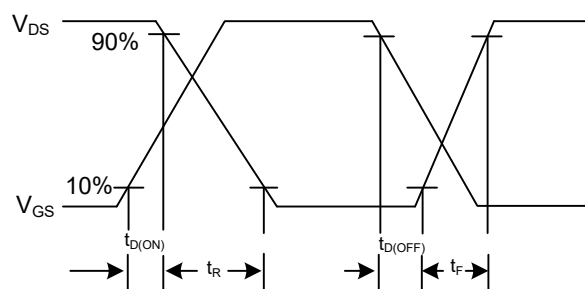


Peak Diode Recovery dv/dt Waveforms

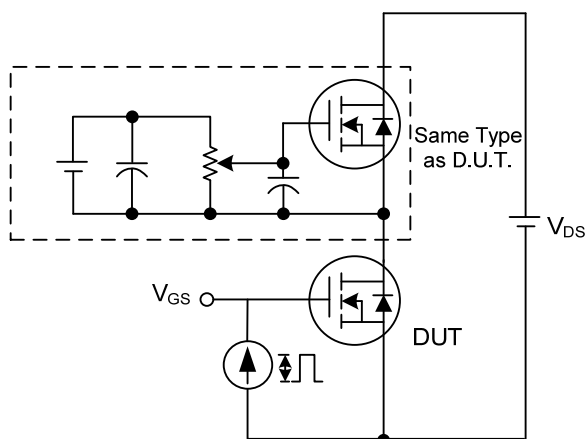
■ TEST CIRCUITS AND WAVEFORMS



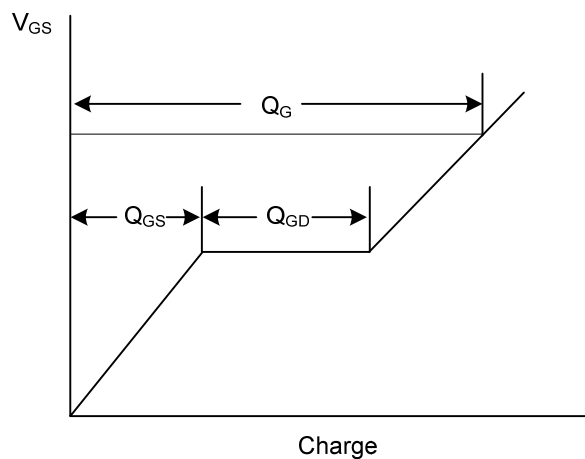
Switching Test Circuit



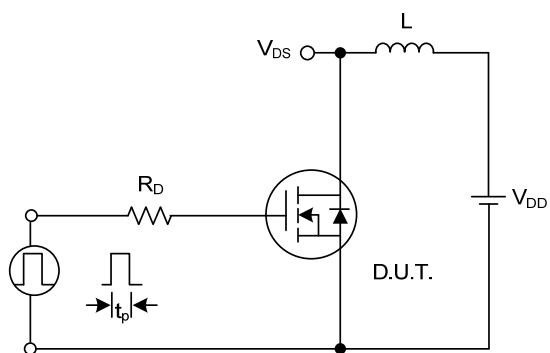
Switching Waveforms



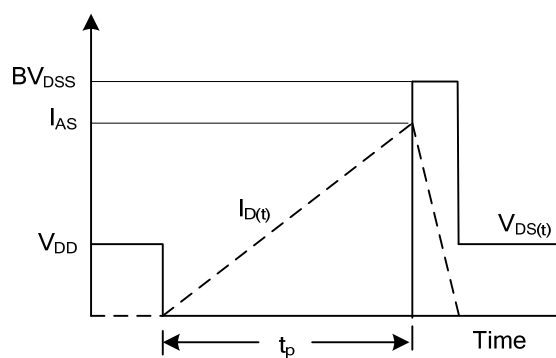
Gate Charge Test Circuit



Gate Charge Waveform

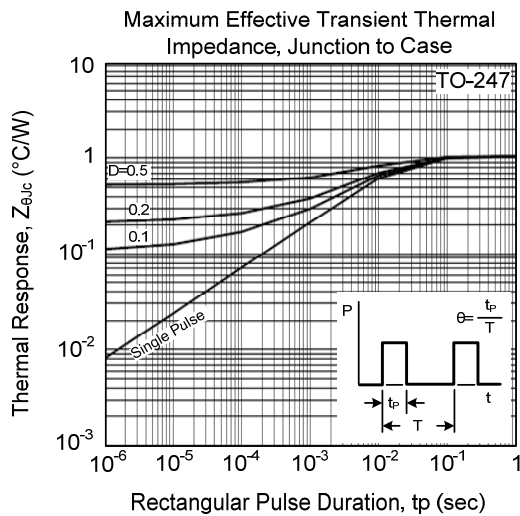


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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