

**45NM60-U3**

Preliminary

Power MOSFET**45A, 600V N-CHANNEL
SUPER-JUNCTION MOSFET****DESCRIPTION**

The **UTC 45NM60-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**TO-247/TOLL-8B**

* $R_{DS(ON)} \leq 0.066 \Omega$ @ $V_{GS}=10V$, $I_D=22.5A$

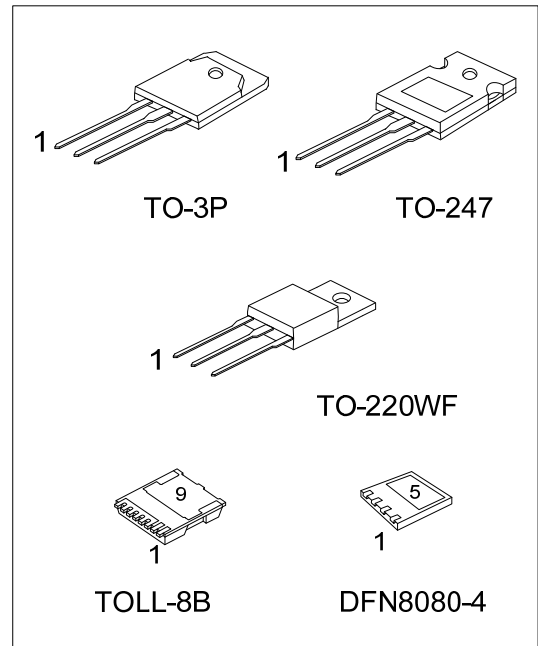
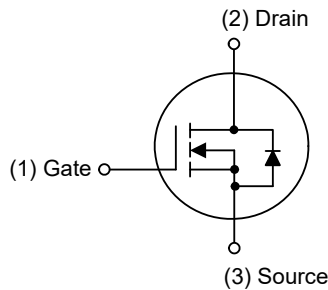
DFN8080-4

* $R_{DS(ON)} \leq 0.085 \Omega$ @ $V_{GS}=10V$, $I_D=22.5A$

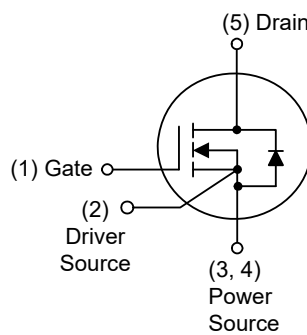
* Fast switching capability

* Avalanche energy tested

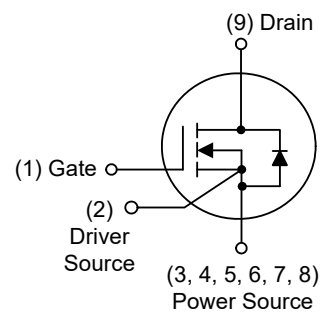
* Improved dv/dt capability, high ruggedness

**SYMBOL**

TO-220WF / TO-3P / TO-247



DFN8080-4



TOLL-8B

ORDERING INFORMATION

Ordering Number		Package	Pin Assignment									Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9	
45NM60L-U3-TW1-T	45NM60G-U3-TW1-T	TO-220WF	G	D	S	-	-	-	-	-	-	Tube
45NM60L-U3-T3P-T	45NM60G-U3-T3P-T	TO-3P	G	D	S	-	-	-	-	-	-	Tube
45NM60L-U3-T47-T	45NM60G-U3-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
45NM60L-U3-T8B-R	45NM60G-U3-T8B-R	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel
45NM60L-K04-8080-R	45NM60G-K04-8080-R	DFN8080-4	G	S	S	S	D	-	-	-	-	Tape Reel

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

45NM60G-U3-TW1-T (1) Packing Type (2) Package Type (3) Version Code (4) Green Package	(1) T: Tube, R: Tape Reel (2) TW1: TO-220WF, T3P: TO-3P, T47: TO-247 T8B: TOLL-8B, K04-8080: DFN8080-4 (3) Version U3 (4) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

PACKAGE	MARKING
TO-220WF TO-3P TO-247	UTC 45NM60 U3 Version Code ← Lot Code ← → Date Code 1 L: Lead Free G: Halogen Free
DFN8080-4	UTC 45NM60 •U3 Version Code ← Lot Code ← → Date Code 1
TOLL-8B	UTC 45NM60 U3 Version Code ← 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 _{DSS}	600	V
Gate-Source Voltage			V _{GSS}	±30	V
Drain Current	Continuous	T _C =25°C	I _D	45	A
		T _C =100°C		29.2	A
	Pulsed (Note 2)		I _{DM}	135	A
Avalanche Energy	Single Pulsed (Note 3)		E _{AS}	288	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	5.3	V/ns
Power Dissipation	TO-220WF		P _D	42	W
	TO-3P			220	W
	TO-247			200	W
	DFN8080-4			100	W
	TOLL-8B			280	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. $L = 100\text{mH}$, $I_{AS} = 2.4\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, 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	RATING	UNIT
Junction to Ambient	TO-220WF	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-3P		30	$^{\circ}\text{C}/\text{W}$
	TO-247		40	$^{\circ}\text{C}/\text{W}$
	DFN8080-4/TOLL-8B		35 (Note)	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220WF	θ_{JC}	2.98	$^{\circ}\text{C}/\text{W}$
	TO-3P		0.56	$^{\circ}\text{C}/\text{W}$
	TO-247		0.625	$^{\circ}\text{C}/\text{W}$
	DFN8080-4		1.25	$^{\circ}\text{C}/\text{W}$
	TOLL-8B		0.44 (Note)	$^{\circ}\text{C}/\text{W}$

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

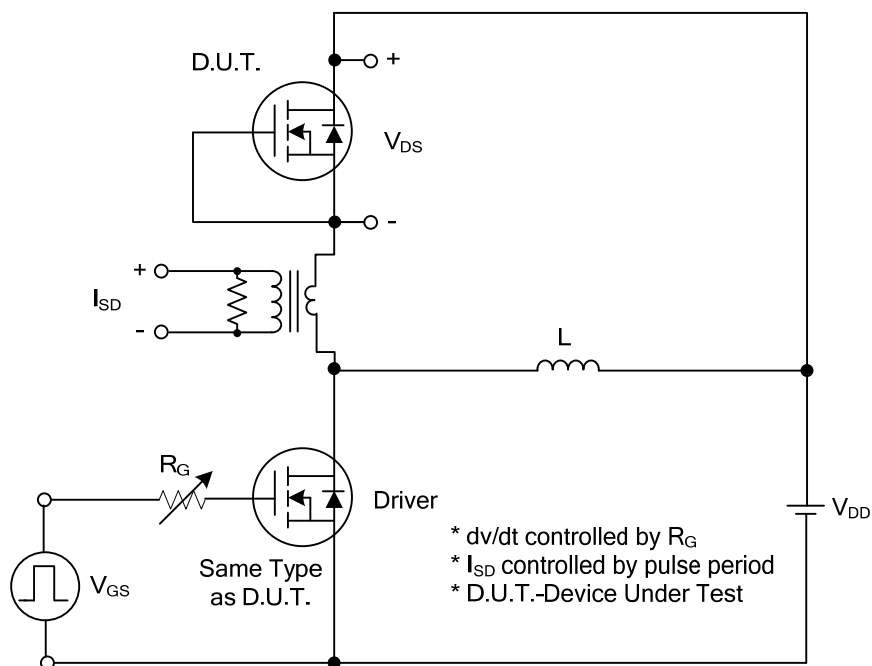
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

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		I _{GSS}	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	TO-247	R _{DS(ON)}	V _{GS} =10V, I _D =22.5A		0.055	0.066	Ω
	TOLL-8B						
	DFN8080-4				0.068	0.085	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1MHz		3330		pF
Output Capacitance		C _{OSS}			980		pF
Reverse Transfer Capacitance		C _{RSS}			33		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q _G	V _{DS} =480V, V _{GS} =10V, I _D =45A (Note 1, 2)		180		nC
Gate-Source Charge		Q _{GS}			30		nC
Gate-Drain Charge		Q _{DD}			88		nC
Turn-On Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =45A, R _G =25Ω (Note 1, 2)		45		ns
Turn-On Rise Time		t _R			90		ns
Turn-Off Delay Time		t _{D(OFF)}			475		ns
Turn-Off Fall Time		t _F			140		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				45	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				135	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =45A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =30A, V _{GS} =0V,		588		nS
Body Diode Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs		11.8		μC

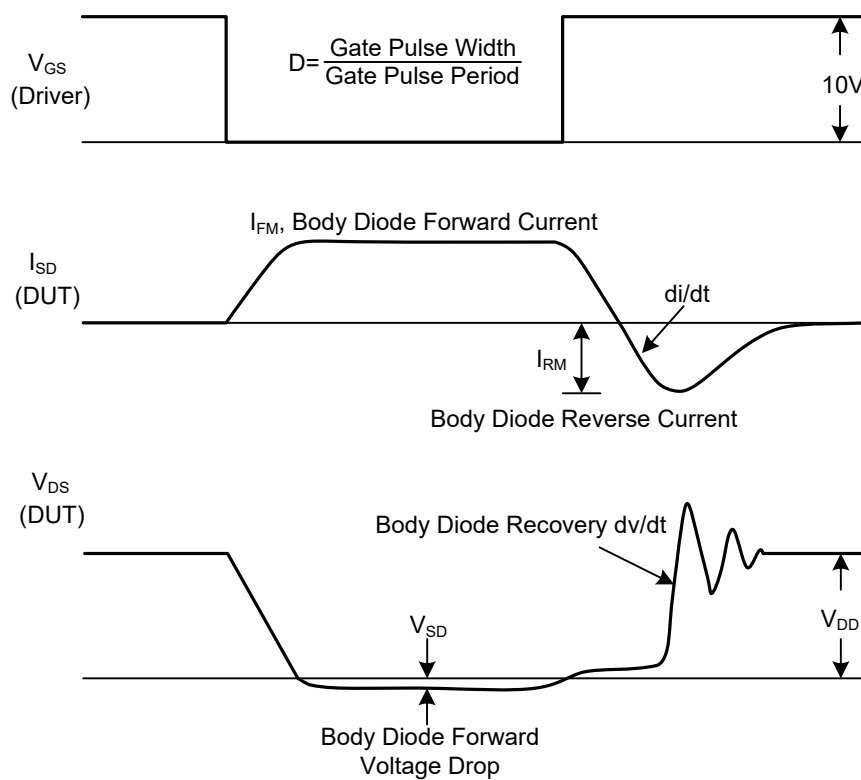
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

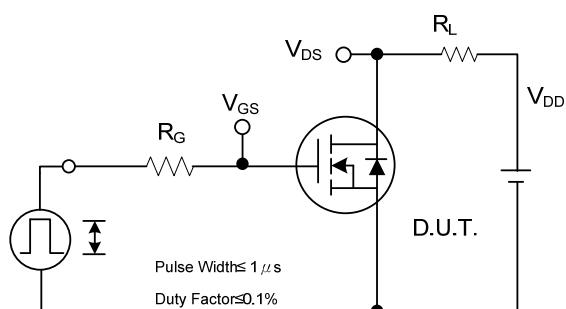


Peak Diode Recovery dv/dt Test Circuit

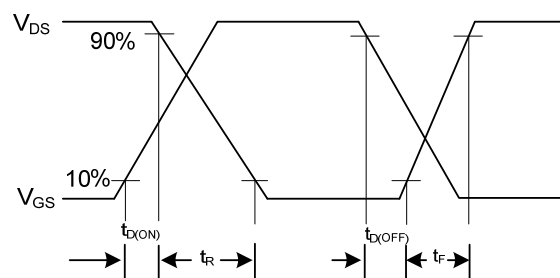


Peak Diode Recovery dv/dt Waveforms

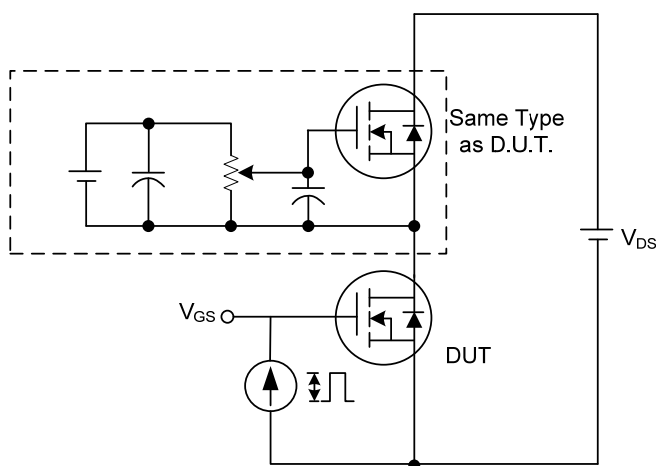
■ TEST CIRCUITS AND WAVEFORMS



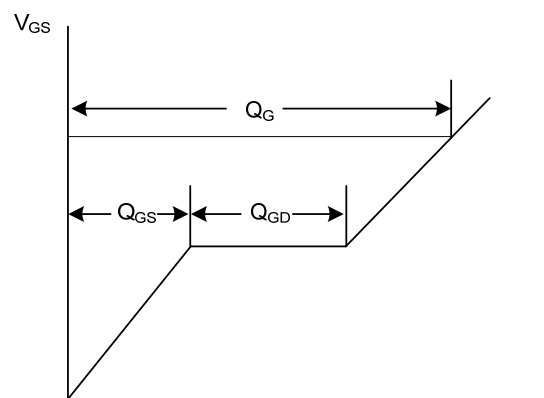
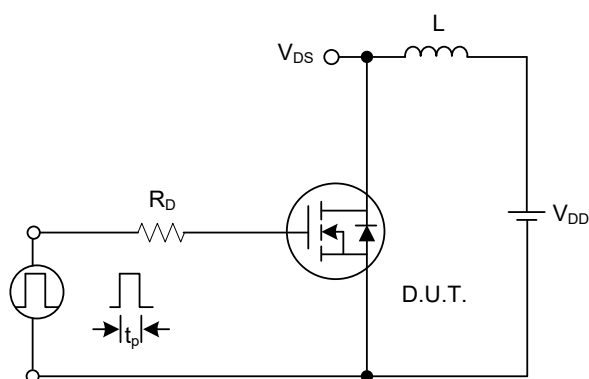
Switching Test Circuit



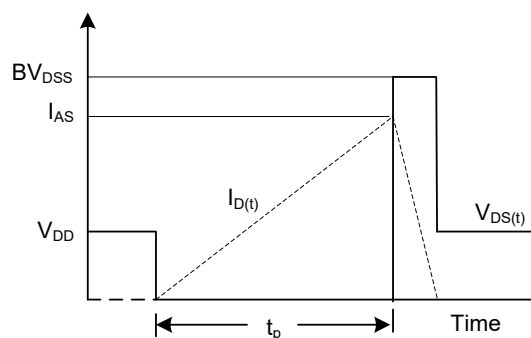
Switching Waveforms



Gate Charge Test Circuit

Charge
Gate Charge Waveform

Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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