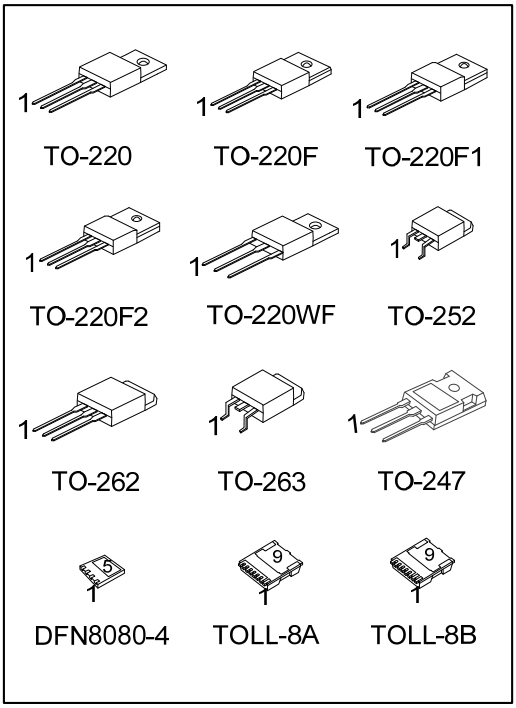
18A, 650V N-CHANNEL SUPER-JUNCTION MOSFET



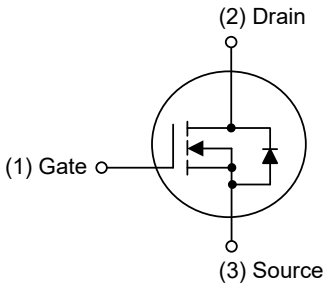
■ DESCRIPTION

The **UTC 18NM65-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.

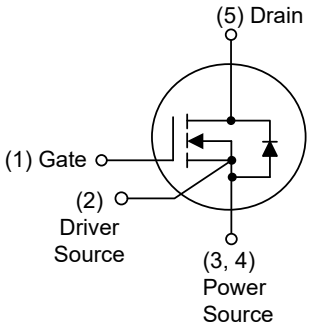
■ FEATURES

* $R_{DS(ON)} \leq 0.3\ \Omega$ @ V_{GS}=10V, I_D=6.5A
* Fast switching capability
* Avalanche energy tested
* Improved dv/dt capability, high ruggedness

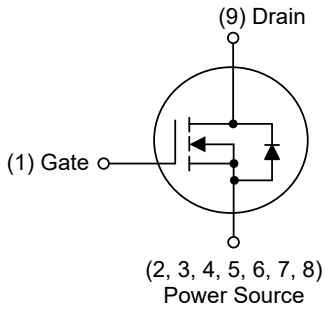
■ SYMBOL



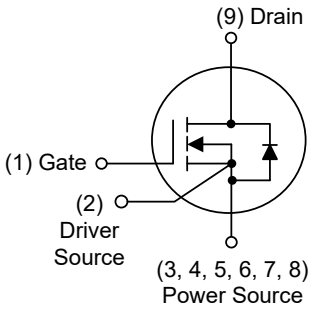
TO-220 / TO-220F / TO-220F1
TO-220F2 / TO-220WF / TO-252
TO-247 / TO-262 / TO-263



DFN8080-4



TOLL-8A

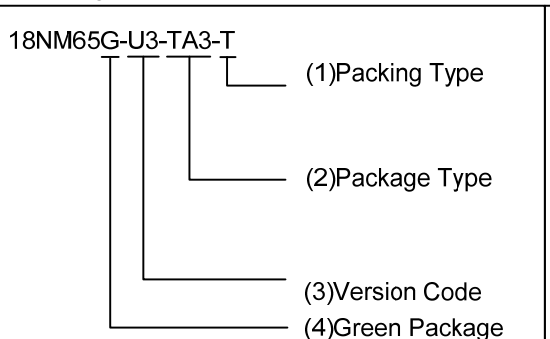


TOLL-8B

■ ORDERING INFORMATION

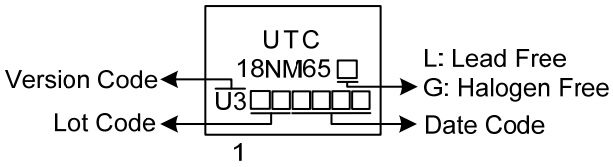
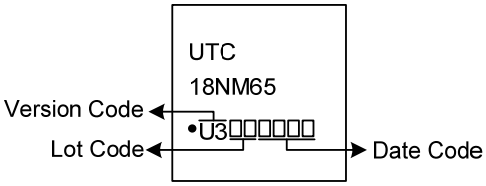
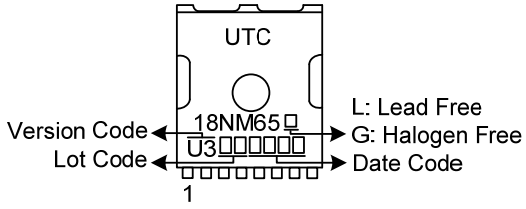
Ordering Number		Package	Pin Assignment									Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9	
18NM65L-U3-TA3-T	18NM65G-U3-TA3-T	TO-220	G	D	S	-	-	-	-	-	-	Tube
18NM65L-U3-TF1-T	18NM65G-U3-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube
18NM65L-U3-TF2-T	18NM65G-U3-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	-	Tube
18NM65L-U3-TF3-T	18NM65G-U3-TF3-T	TO-220F	G	D	S	-	-	-	-	-	-	Tube
18NM65L-U3-TW1-T	18NM65G-U3-TW1-T	TO-220WF	G	D	S	-	-	-	-	-	-	Tube
18NM65L-U3-TN3-R	18NM65G-U3-TN3-R	TO-252	G	D	S	-	-	-	-	-	-	Tape Reel
18NM65L-U3-T2Q-T	18NM65G-U3-T2Q-T	TO-262	G	D	S	-	-	-	-	-	-	Tube
18NM65L-U3-TQ2-T	18NM65G-U3-TQ2-T	TO-263	G	D	S	-	-	-	-	-	-	Tube
18NM65L-U3-TQ2-R	18NM65G-U3-TQ2-R	TO-263	G	D	S	-	-	-	-	-	-	Tape Reel
18NM65L-U3-T47-T	18NM65G-U3-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
18NM65L-U3-K04-8080-R	18NM65G-U3-K04-8080-R	DFN8080-4	G	S	S	S	D	-	-	-	-	Tape Reel
18NM65L-U3-T8A-R	18NM65G-U3-T8A-R	TOLL-8A	G	S	S	S	S	S	S	S	D	Tape Reel
18NM65L-U3-T8B-R	18NM65G-U3-T8B-R	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel

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



(1) T: Tube, R: Tape Reel
(2) 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) Version U3
(4) G: Halogen Free and Lead Free L: Lead Free

■ MARKING

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

■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V_{DSS}	650	V
Gate-Source Voltage			V_{GSS}	±30	V
Drain Current	Continuous	T_C=25°C	I_D	18	A
		T_C=100°C		11.7	A
	Pulsed (Note 2)		I_{DM}	54	A
Avalanche Energy	Single Pulsed (Note 3)		E_{AS}	420	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	1.6	V/ns
Power Dissipation	TO-220/TO-262/TO-263		P_D	92	W
	TO-220F/TO-220F1 TO-220F2/TO-220WF			30	W
	TO-247			100	W
	TO-252			60	W
	DFN8080-4			56	W
	TOLL-8A/TOLL-8A			175	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 = 100mH, I_{AS} = 2.9A, V_{DD} = 50V, R_G = 25Ω Starting T_J = 25°C
4. I_{SD} ≤ 18A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°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	°C/W
	TO-247		40	°C/W
	TO-252		110	°C/W
	DFN8080-4		35 (Note)	°C/W
	TOLL-8A/TOLL-8A		35 (Note)	°C/W
Junction to Case	TO-220/TO-262/TO-263	θ_{JC}	1.35	°C/W
	TO-220F/TO-220F1 TO-220F2/TO-220WF		4.16	°C/W
	TO-247		1.25	°C/W
	TO-252		2.08 (Note)	°C/W
	DFN8080-4		2.23 (Note)	°C/W
	TOLL-8A/TOLL-8A		0.71 (Note)	°C/W

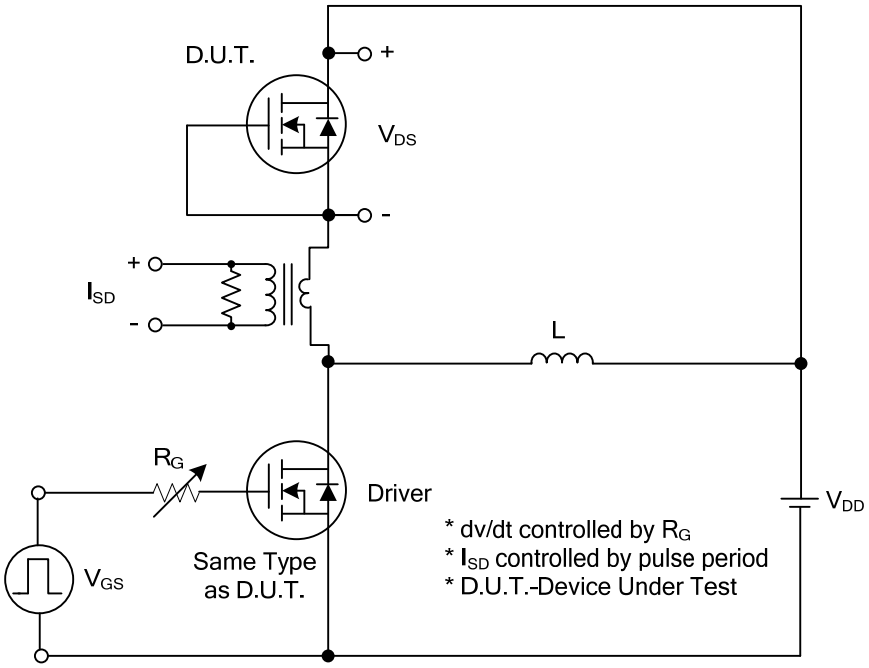
Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

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

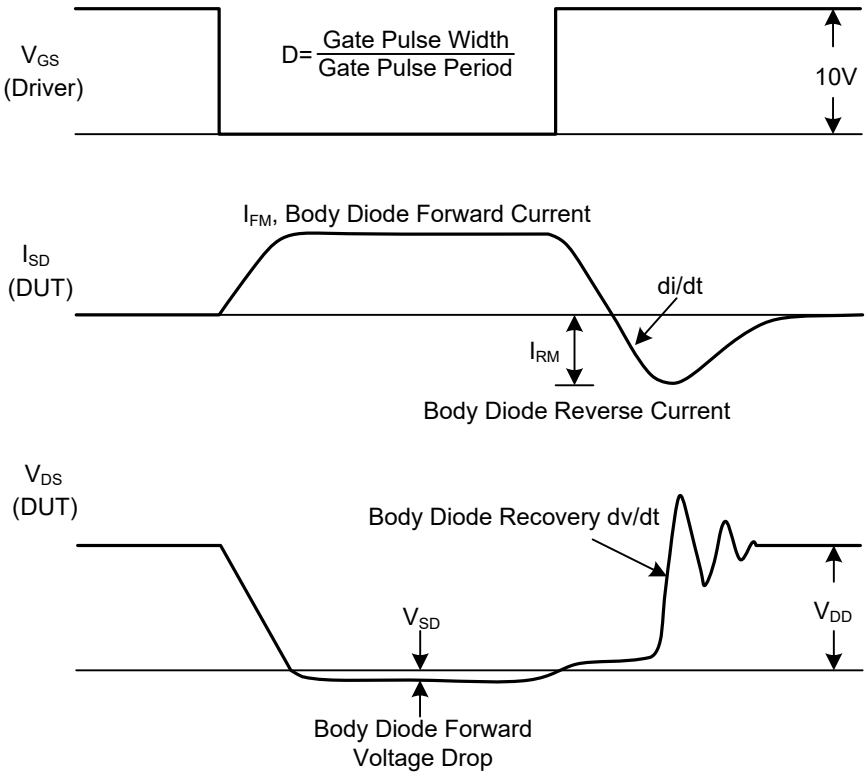
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	650			V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±30V, V_{DS}=0V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=6.5A		0.26	0.3	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	V_{GS}=0V, V_{DS}=50V, f=1MHz		809		pF
Output Capacitance	C_{OSS}			244		pF
Reverse Transfer Capacitance	C_{RSS}			11.8		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	V_{DS}=520V, V_{GS}=10V, I_D=18A (Note 1, 2)		42		nC
Gate-Source Charge	Q_{GS}			9.2		nC
Gate-Drain Charge	Q_{DD}			23		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D =9A, R_G =25Ω (Note 1, 2)		13		ns
Turn-On Rise Time	t_R			26		ns
Turn-Off Delay Time	$t_{D(OFF)}$			102		ns
Turn-Off Fall Time	t_F			50		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				18	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				54	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	I_S=18A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	I_S=18A, V_{GS}=0V, dI_F/dt=100A/μs		386		nS
Body Diode Reverse Recovery Charge	Q_{rr}			5818		nC

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

■ TEST CIRCUITS AND WAVEFORMS

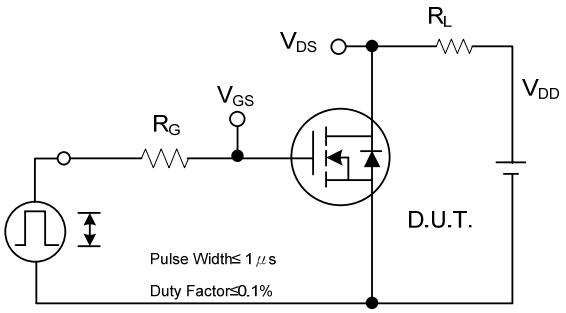


Peak Diode Recovery dv/dt Test Circuit

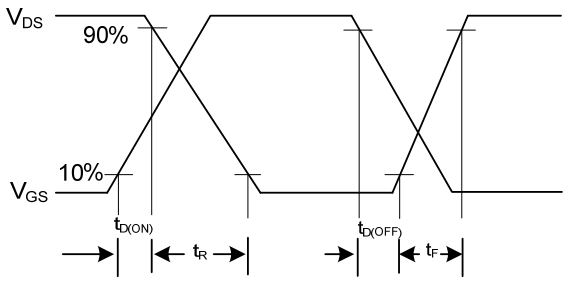


Peak Diode Recovery dv/dt Waveforms

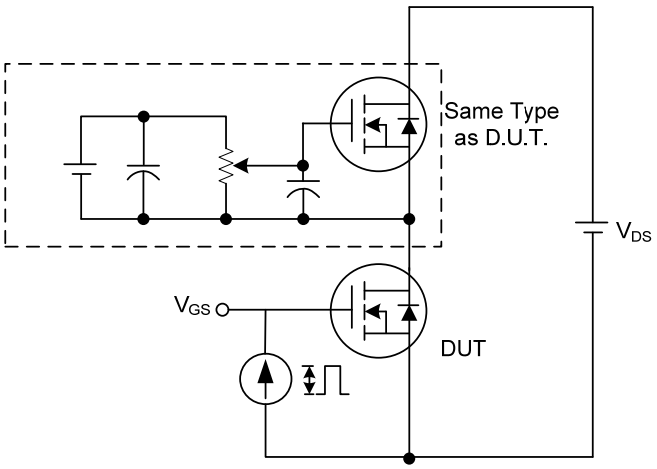
■ TEST CIRCUITS AND WAVEFORMS



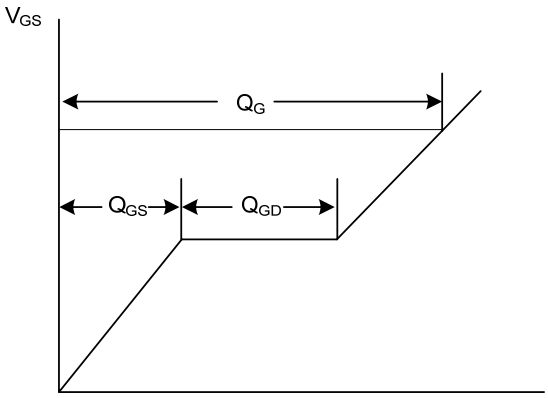
Switching Test Circuit



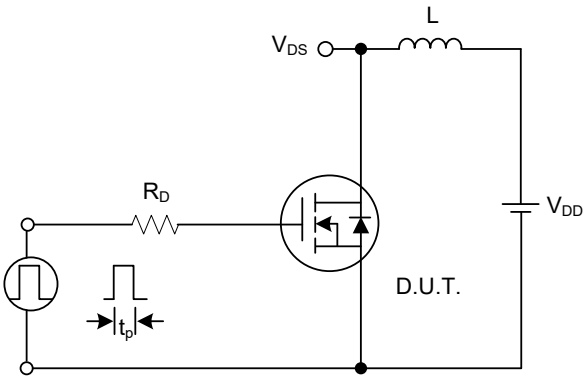
Switching Waveforms



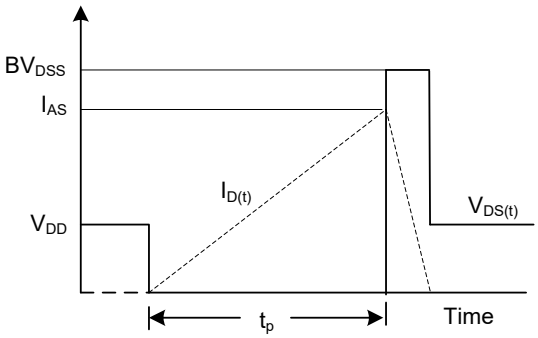
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms