



30NM65-U3

Preliminary

Power MOSFET

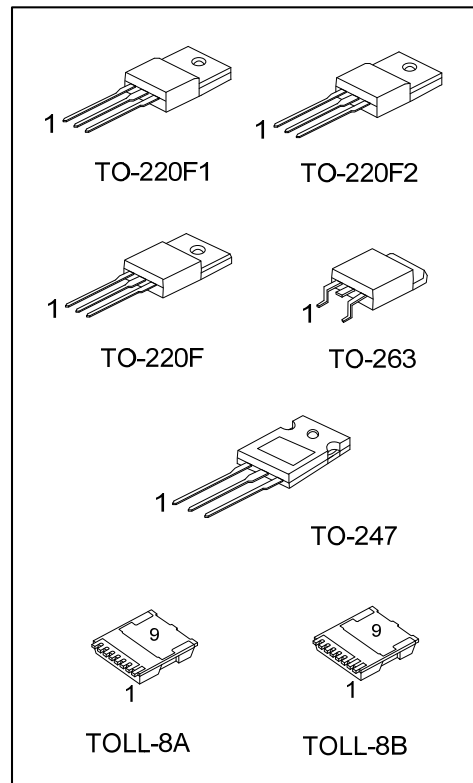
30A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

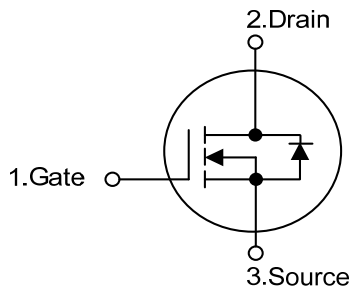
The UTC 30NM65-U3 is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

FEATURES

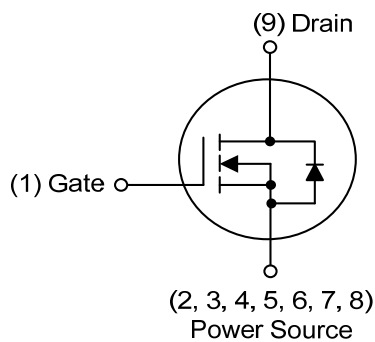
- * $R_{DS(ON)} \leq 110 \text{ m}\Omega @ V_{GS}=10V, I_D=15A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness



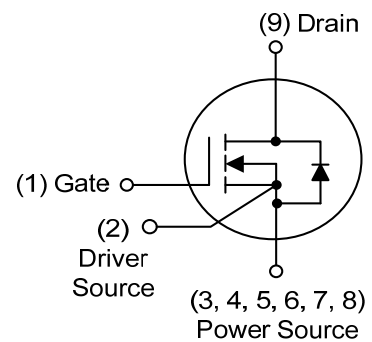
SYMBOL



TO-220F / TO-220F1 / TO-220F2
TO-247 / TO-263



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	
30NM65L-U3-TF1-T	30NM65G-U3-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U3-TF2-T	30NM65G-U3-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U3-TF3-T	30NM65G-U3-TF3-T	TO-220F	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U3-T47-T	30NM65G-U3-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U3-TQ2-T	30NM65G-U3-TQ2-T	TO-263	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U3-TQ2-R	30NM65G-U3-TQ2-R	TO-263	G	D	S	-	-	-	-	-	-	Tape Reel
30NM65L-U3-T8A-T	30NM65G-U3-T8A-T	TOLL-8A	G	S	S	S	S	S	S	S	S	Tape Reel
30NM65L-U3-T8B-T	30NM65G-U3-T8B-T	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel

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

<p>30NM65G-U3-TF1-T</p> <p>(1) Packing Type (2) Package Type (3) Version Code (4) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, T47: TO-247, TQ2: TO-263, T8A: TOLL-8A, T8B: TOLL-8B (3) Version U3 (4) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

TO-220F / TO-220F1 TO-220F2 / TO-263 / TO-247	TOLL-8A / TOLL-8A
<p>Version Code ← UTC 30NM60 U3 → L: Lead Free → G: Halogen Free → Date Code ← Lot Code 1</p>	<p>Version Code ← UTC 30NM65 U3 → L: Lead Free → G: Halogen Free → Date Code ← Lot Code 1</p>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous $T_C=25^\circ\text{C}$	I_D	30	A
	Pulsed (Note 2)	I_{DM}	90	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	900	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	8.8	V/ns
Power Dissipation	TO-220F/TO-220F1 TO-220F2	P_D	35	W
	TO-247		150	W
	TO-263		127	W
	TOLL-8A/TOLL-8B		225	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. $L = 100\text{mH}$, $I_{AS} = 4.2\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, 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	RATINGS	UNIT
Junction to Ambient	TO-220F/TO-220F1 TO-220F2/TO-263	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-247/TOLL-8A TOLL-8B		35	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1 TO-220F2	θ_{JC}	3.57	$^\circ\text{C}/\text{W}$
	TO-247		0.83	$^\circ\text{C}/\text{W}$
	TO-263		1.2 (Note)	$^\circ\text{C}/\text{W}$
	TOLL-8A/TOLL-8B		0.55 (Note)	$^\circ\text{C}/\text{W}$

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

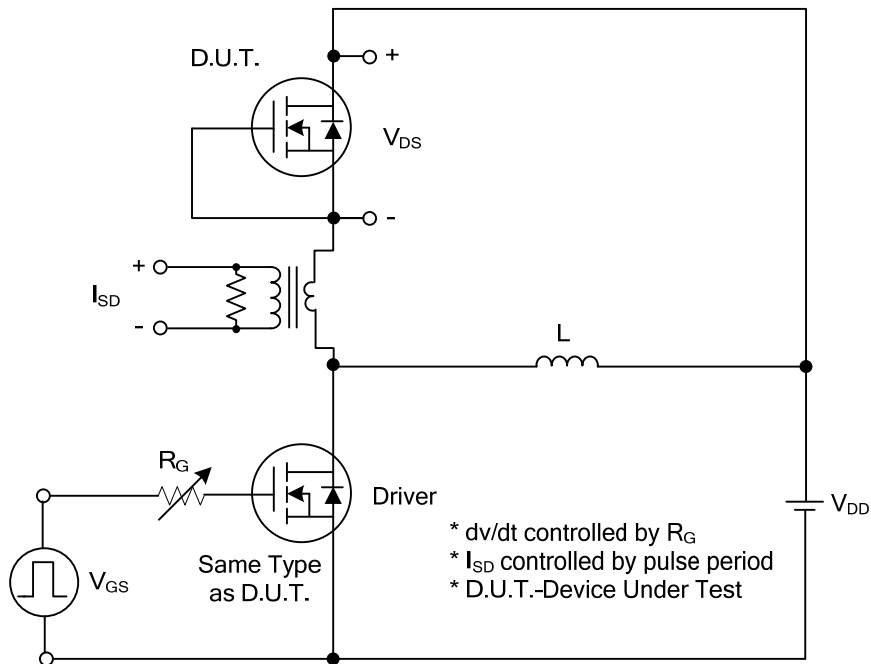
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

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 =15A			110	mΩ
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1MHz		1843		pF
Output Capacitance	C _{OSS}			793		pF
Reverse Transfer Capacitance	C _{RSS}			70		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q _G	V _{DS} =520V, V _{GS} =10V, I _D =30A (Note 1, 2)		87		nC
Gate-Source Charge	Q _{GS}			13		nC
Gate-Drain Charge	Q _{DD}			56		nC
Turn-On Delay Time	t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =30A, R _G =25Ω (Note 1, 2)		30		ns
Turn-On Rise Time	t _R			67		ns
Turn-Off Delay Time	t _{D(OFF)}			224		ns
Turn-Off Fall Time	t _F			102		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				30	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				90	A
Drain-Source Diode Forward Voltage	V _{SD}	I _S =30A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time	t _{rr}	I _S =30A, V _{GS} =0V, dI _F /dt=100A/μs		536		ns
Body Diode Reverse Recovery Charge	Q _{rr}				10.6	

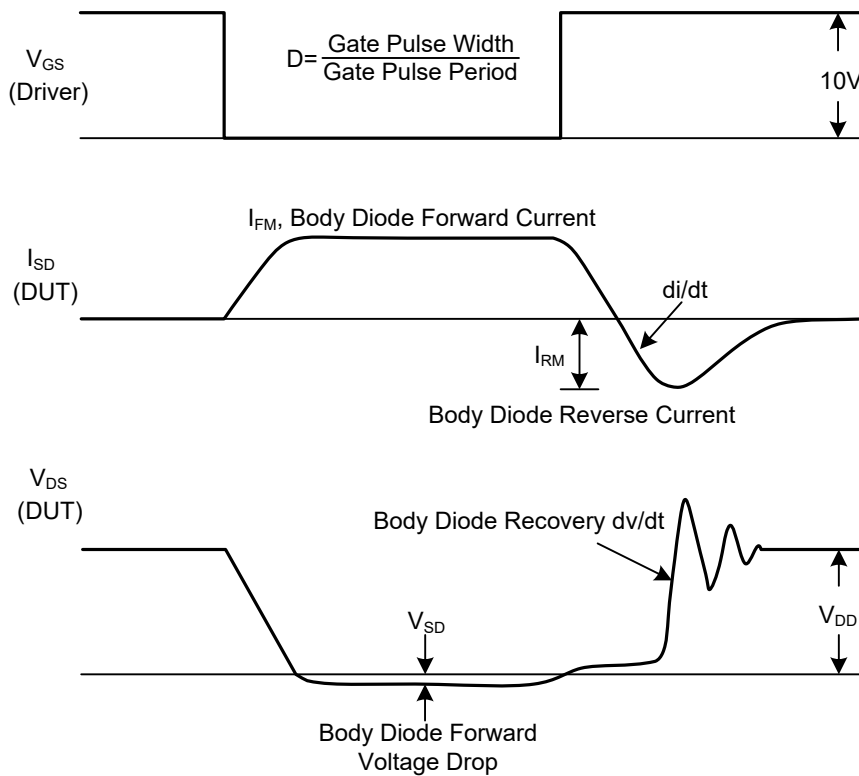
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

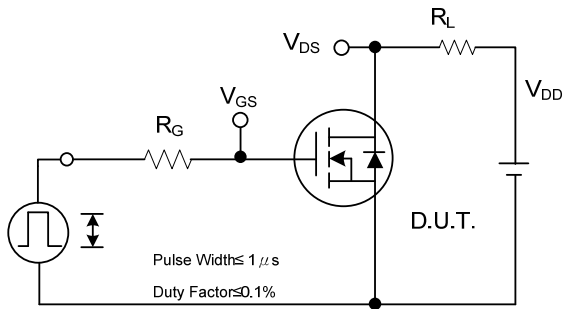


Peak Diode Recovery dv/dt Test Circuit

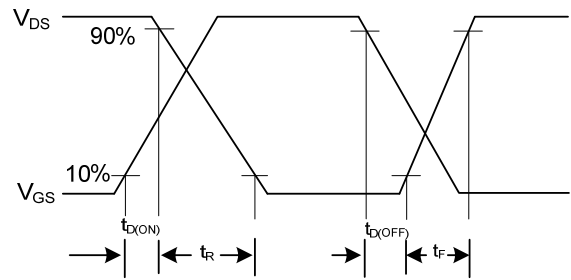


Peak Diode Recovery dv/dt Waveforms

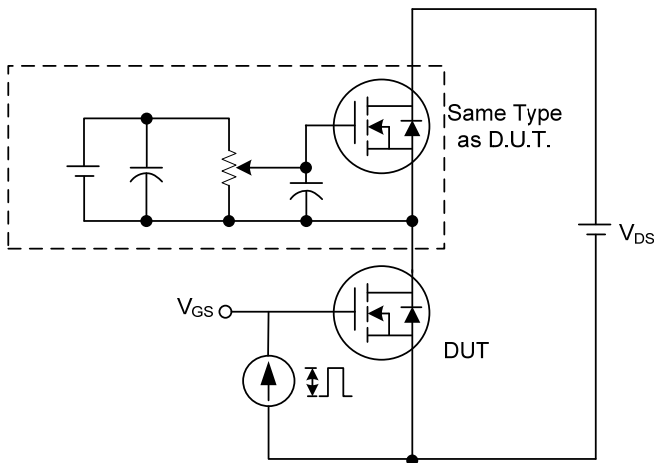
■ TEST CIRCUITS AND WAVEFORMS



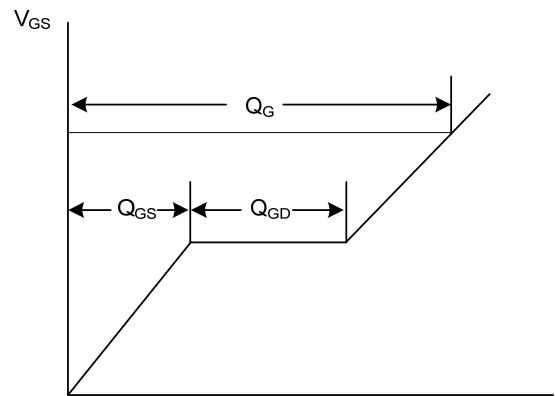
Switching Test Circuit



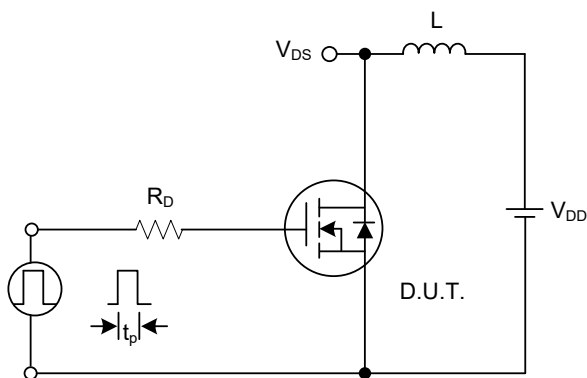
Switching Waveforms



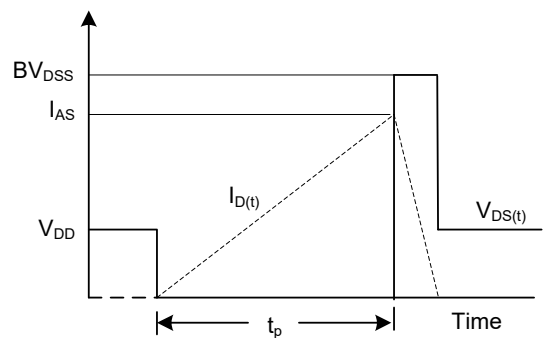
Gate Charge Test Circuit



Charge
Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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