UNISONIC TECHNOLOGIES CO., LTD

12N65-C

12A, 650V N-CHANNEL POWER MOSFET

■ DESCRIPTION

The UTC **12N65-C** is a high voltage power MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.

■ FEATURES

* $R_{DS(ON)}$ < 0.75 Ω @ V_{GS} = 10 V, I_D = 6.0 A
* Fast switching capability
* Avalanche energy tested
* Improved dv/dt capability, high ruggedness

TO-220

TO-220F1

TO-263

■ SYMBOL


2.Drain

1.Gate

3.Source
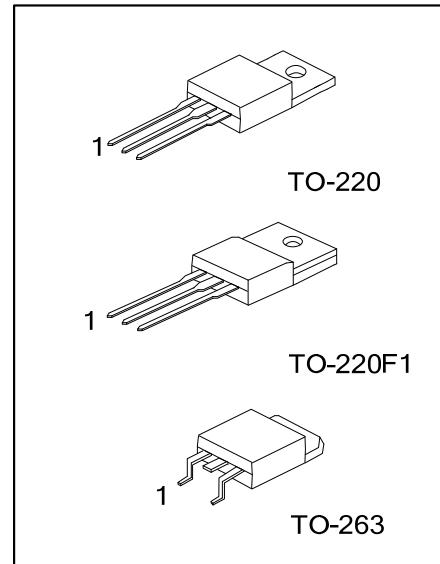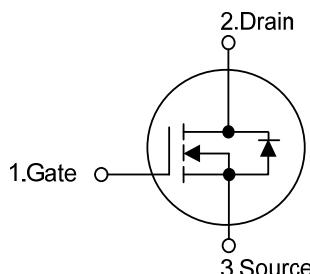
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
12N65L-TF1-T	12N65G-TF1-T	TO-220F1	G	D	S	Tube
12N65L-TF3-T	12N65G-TF3-T	TO-220F	G	D	S	Tube
12N65L-TQ2-T	12N65G-TQ2-T	TO-263	G	D	S	Tube
12N65L-TQ2-R	12N65G-TQ2-R	TO-263	G	D	S	Tape Reel

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

12N65G-TF1-T

(1)Packing Type   (1) T: Tube, R: Tape Reel

(2)Package Type   (2) TF1: TO-220F1, TF3: TO-220F, TQ2: TO-263

(3)Green Package   (3) G: Halogen Free and Lead Free, L: Lead Free

QW-R502-B51 a

■ **MARKING**


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        UTC
       12N65☐        L: Lead Free
       ☐☐☐☐☐☐    →  G: Halogen Free
Lot Code ◄      →    Data Code
        1
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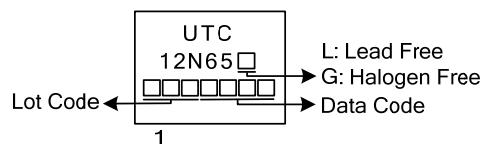
■ **ABSOLUTE MAXIMUM RATINGS** (T_C = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage		V_{GSS}	±30	V
Continuous Drain Current		I_D	12	A
Pulsed Drain Current (Note 2)		I_{DM}	48	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	123	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2	ns
Power Dissipation	TO-220/TO-263	P_D	225	W
	TO-220F1		51	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 = 10mH, I_{AS} = 4.95A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C

4. I_{SD} ≤ 12A, di/dt ≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient		$θ_{JA}$	62.5	°C/W
Junction to Case	TO-220/TO-263	$θ_{JC}$	0.56	°C/W
	TO-220F1		2.45	°C/W

■ **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			1	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	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=6.0A			0.75	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}			1440		pF
Output Capacitance		C_{OSS}	V_{GS}=0V, V_{DS}=25V, f =1.0 MHz		240		pF
Reverse Transfer Capacitance		C_{RSS}			45		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=50V, I_D=1.3A, I_G=100μA		143.7		nC
Gate-Source Charge		Q_{GS}	V_{GS}=10V (Note 1,2)		10.7		nC
Gate-Drain Charge		Q_{GD}			26.1		nC
Turn-On Delay Time (Note 1)		$t_{D(ON)}$			80		ns
Turn-On Rise Time		t_R	V_{DD} =30V, I_D =0.5A,		150		ns
Turn-Off Delay Time		$t_{D(OFF)}$	R_G =25Ω, V_{GS}=10V (Note 1,2)		442		ns
Turn-Off Fall Time		t_F			215		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				12	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				48	A
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0 V, I_S=6.0 A			1.4	V
Reverse Recovery Time		t_{rr}	V_{GS}=0 V, I_S=6.0 A,		375		ns
Reverse Recovery Charge		Q_{rr}	dI_F/dt=100 A/μs (Note 1)		2.46		μC

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

■ **TEST CIRCUITS AND WAVEFORMS**
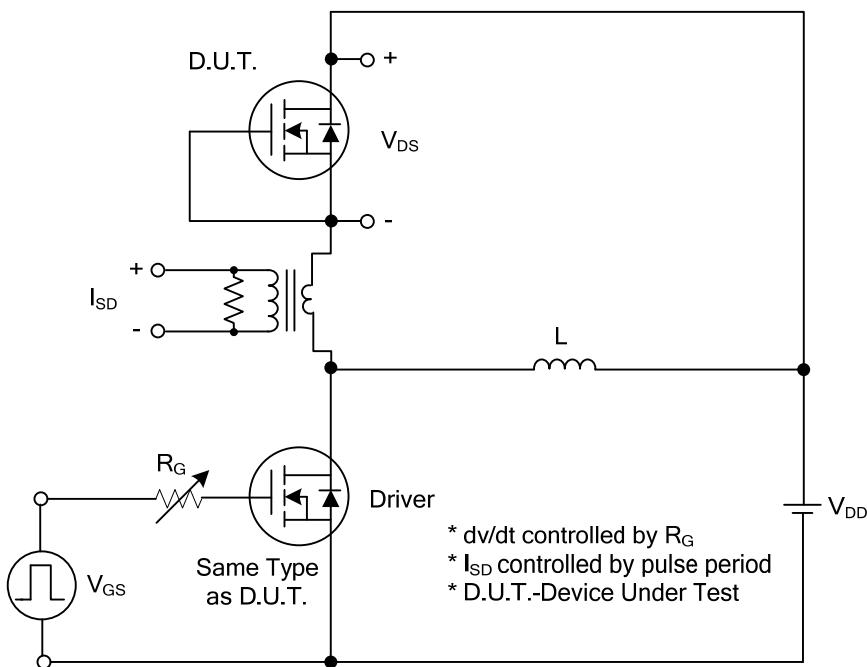

Peak Diode Recovery dv/dt Test Circuit

* dv/dt controlled by R_G
* I_{SD} controlled by pulse period
* D.U.T.-Device Under Test

$D = \dfrac{P.\ W.}{Period}$

$V_{GS} = 10V$

I_{FM}, Body Diode Forward Current

Body Diode Reverse Current

Body Diode Recovery dv/dt

Body Diode Forward Voltage Drop
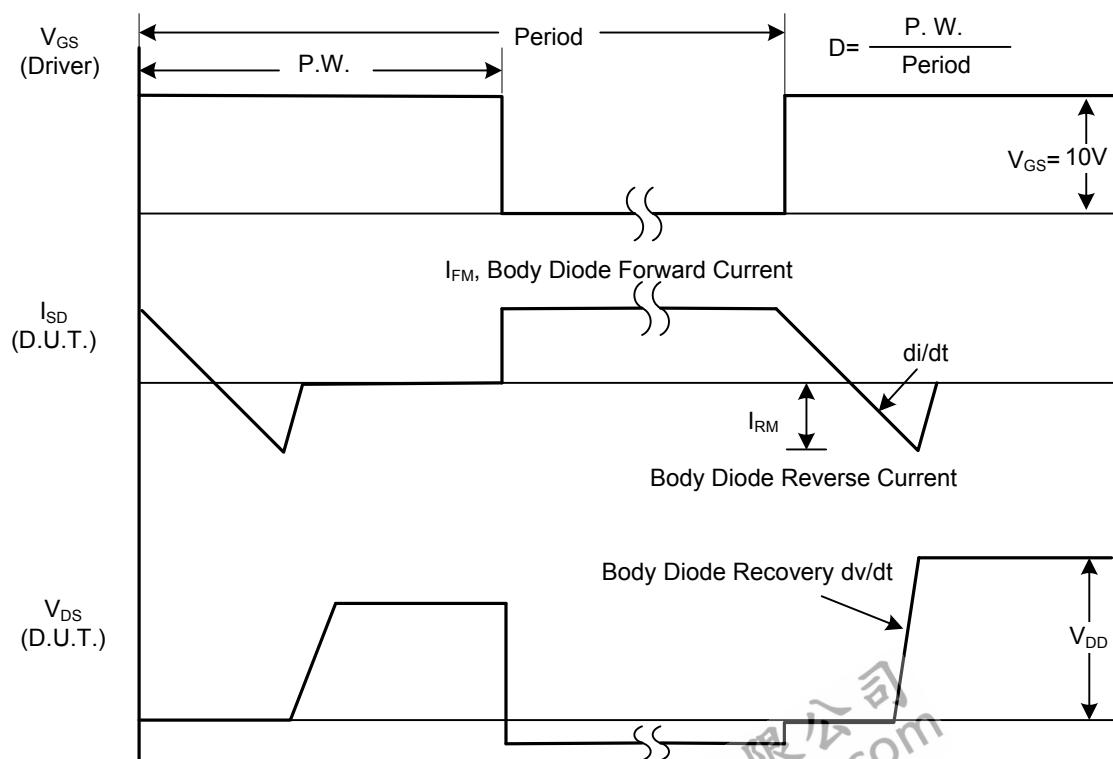
Peak Diode Recovery dv/dt Waveforms

■ **TEST CIRCUITS AND WAVEFORMS (Cont.)**
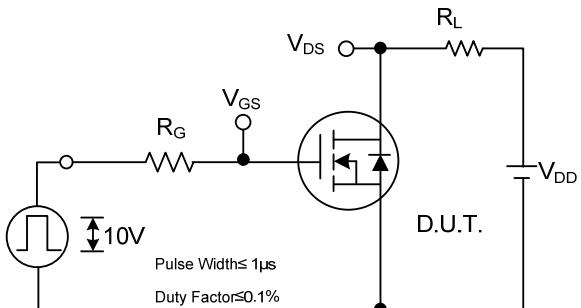
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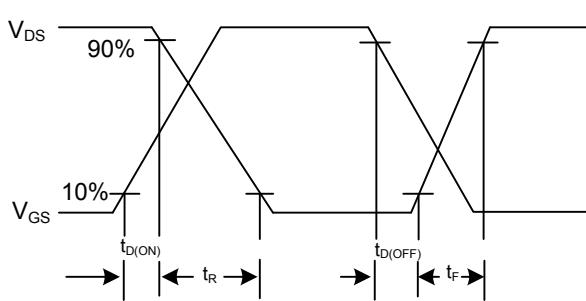
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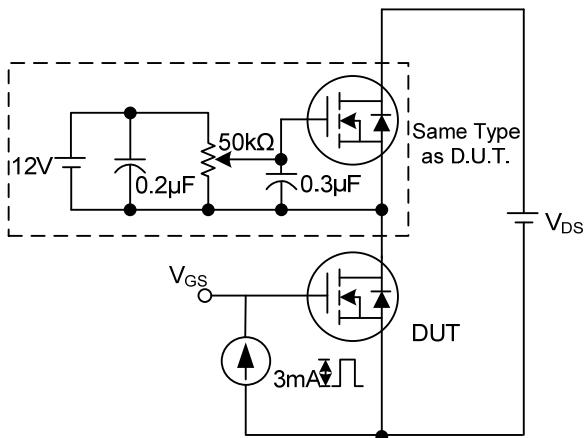
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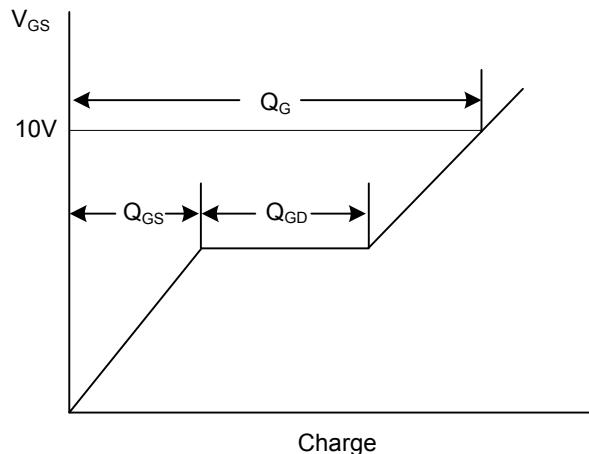
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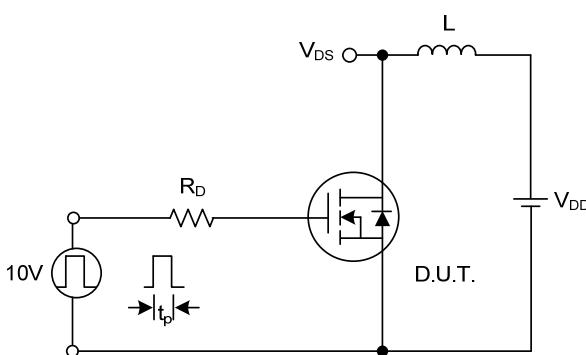
Unclamped Inductive Switching Test Circuit
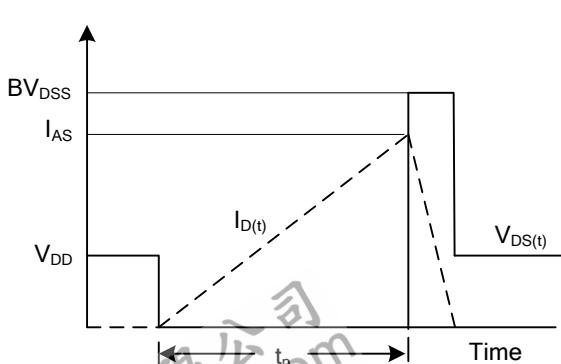
Unclamped Inductive Switching Waveforms

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