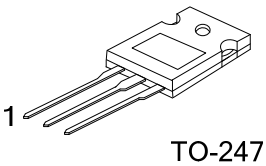
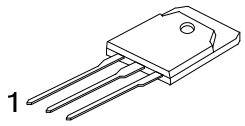
22N65

Power MOSFET

22A, 650V N-CHANNEL POWER MOSFET



TO-247



TO-3P

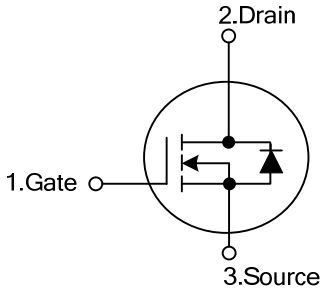
■ DESCRIPTION

As the SMPS MOSFET, the UTC **22N65** uses UTC's advanced technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

■ FEATURES

* $R_{DS(ON)}$ < 0.35Ω
* Ultra low gate charge (Typical 150 nC)
* Low reverse transfer capacitance (C_{RSS} = typical 36 pF)
* Fast switching capability
* Avalanche energy specified
* Improved dv/dt capability, high ruggedness

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
22N65L-T47-T	22N65G-T47-T	TO-247	G	D	S	Tube
22N65L-T3P-T	22N65G-T3P-T	TO-3P	G	D	S	Tube

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

22N65L-T47-T

(1)Packing Type — (1) T: Tube

(2)Package Type — (2) T47: TO-247, T3P: TO-3P

(3)Lead Free — (3) L: Lead Free, G: Halogen Free

■ 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
Avalanche Current		I_{AR}	22	A
Continuous Drain Current		I_D	22	A
Pulsed Drain Current (Note 1)		I_{DM}	88	A
Avalanche Energy	Single Pulsed	E_{AS}	380	mJ
	Repetitive	E_{AR}	37	mJ
Peak Diode Recovery dv/dt (Note 2)		dv/dt	18	V/ns
Power Dissipation	TO-247	P_D	420	W
	TO-3P		450	W
Junction Temperature		T_J	150	°C
Operating Temperature		T_{OPR}	-55 ~ +150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Note: 1. Repetitive rating; pulse width limited by max. junction temperature.
2. I_{SD} ≤ 22A, di/dt ≤540 A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤150°C.
3. 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.

■ THERMAL DATA

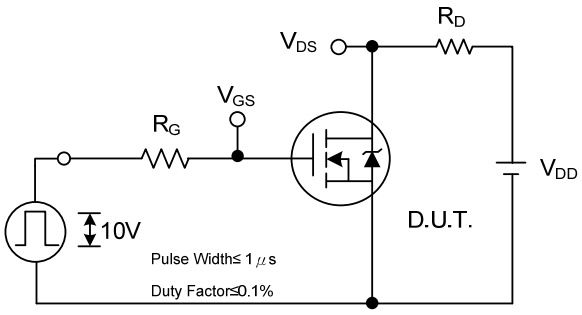
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-247	θ_{JA}	40	°C /W
	TO-3P		30	°C /W
Junction to Case	TO-247	θ_{JC}	0.30	°C /W
	TO-3P		0.27	°C /W

■ ELECTRICAL CHARACTERISTICS(T_J=25°C, L=1.5mH,R_G=25Ω,I_{AS} =22A,Unless otherwise specified)

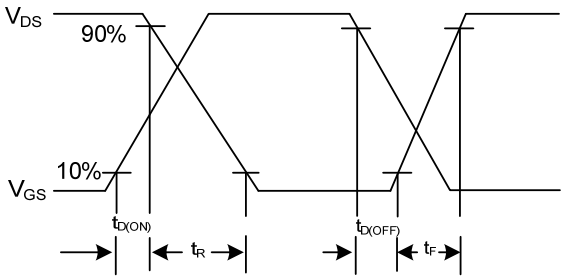
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	650			V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V			50	μA
Gate- Source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±30V			±100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	I_D=1mA, Referenced to 25°C		0.30		V/°C
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.0		4.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=13A (Note 2)		0.3	0.35	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1.0MHz		3200		pF
Output Capacitance	C_{OSS}			350		pF
Reverse Transfer Capacitance	C_{RSS}			36		pF
SWITCHING PARAMETERS						
Turn-ON Delay Time	$t_{D(ON)}$	V_{DD}=300V, I_D=22A, R_G=6.2Ω, V_{GS}=10V (Note 2)		100		ns
Turn-ON Rise Time	t_R			250		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			650		ns
Turn-OFF Fall-Time	t_F			550		ns
Total Gate Charge	Q_G	V_{DS}=480V, V_{GS}=10V, I_D=22A (Note 2)			150	nC
Gate Source Charge	Q_{GS}				45	nC
Gate Drain Charge	Q_{GD}				76	nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=22A			1.5	V
Continuous Source Current (Body Diode)	I_S	(Note 1)			22	A
Pulsed Source Current (Body Diode)	I_{SM}				88	A
Reverse Recovery Time	t_{RR}	I_S=22A, di/dt=100A/μs (Note 2)		590	890	ns
Reverse Recovery Charge	Q_{RR}			7.2	11	μC

Note: 1. Repetitive rating; pulse width limited by max. junction temperature.
2. Pulse Width ≤ 300 s, Duty Cycle ≤ 2%.

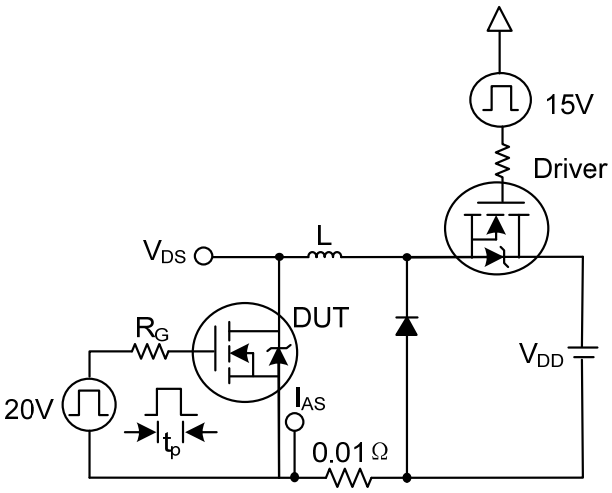
■ TEST CIRCUITS



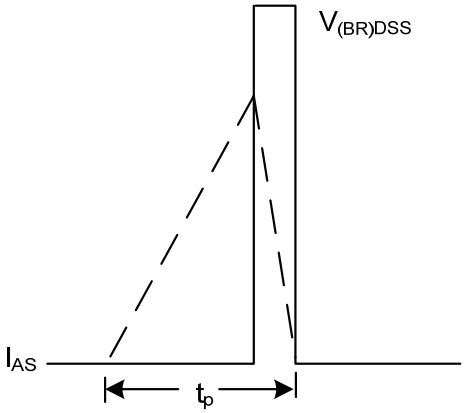
Switching Test Circuit



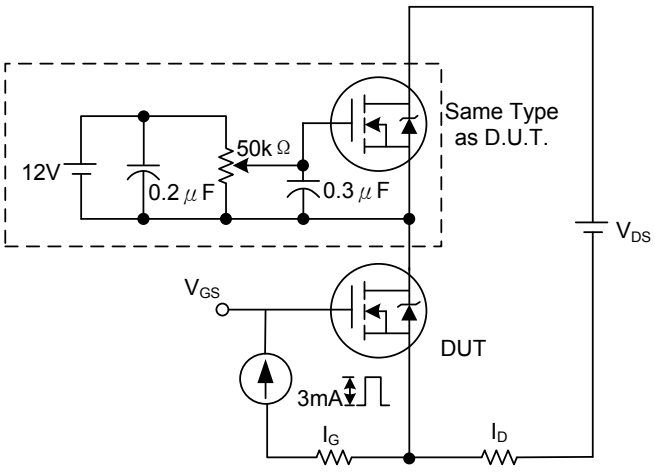
Switching Waveforms



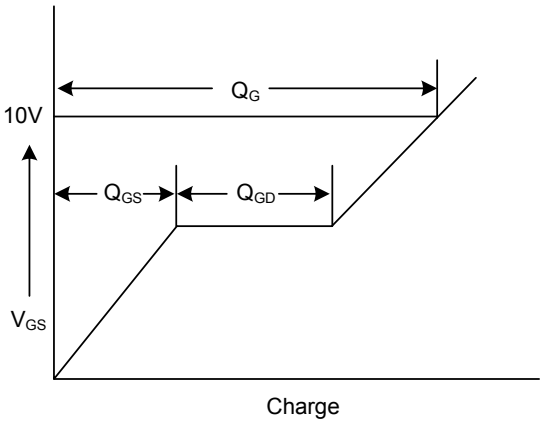
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



Gate Charge Test Circuit



Gate Charge Waveform

■ TEST CIRCUITS(Cont.)

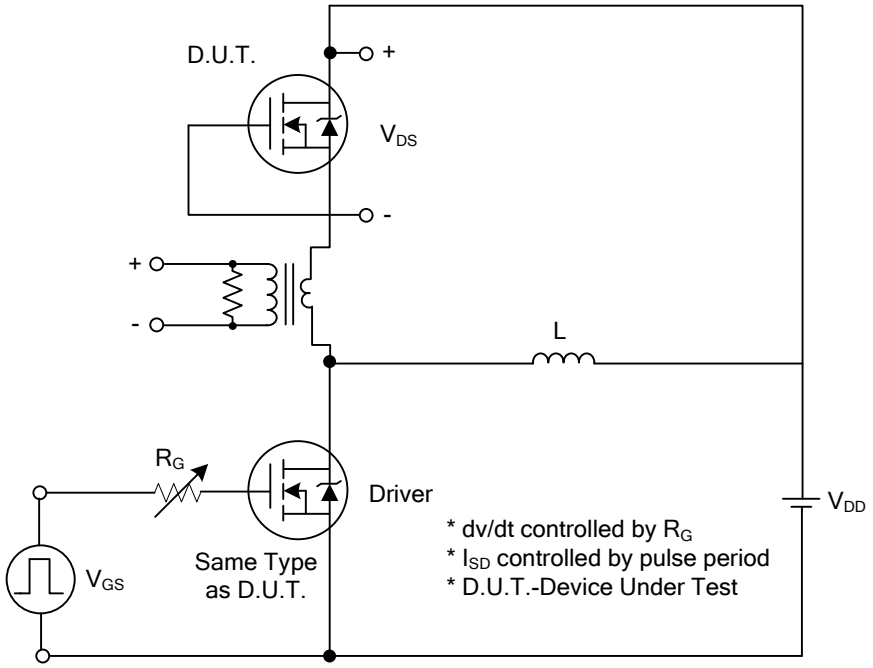
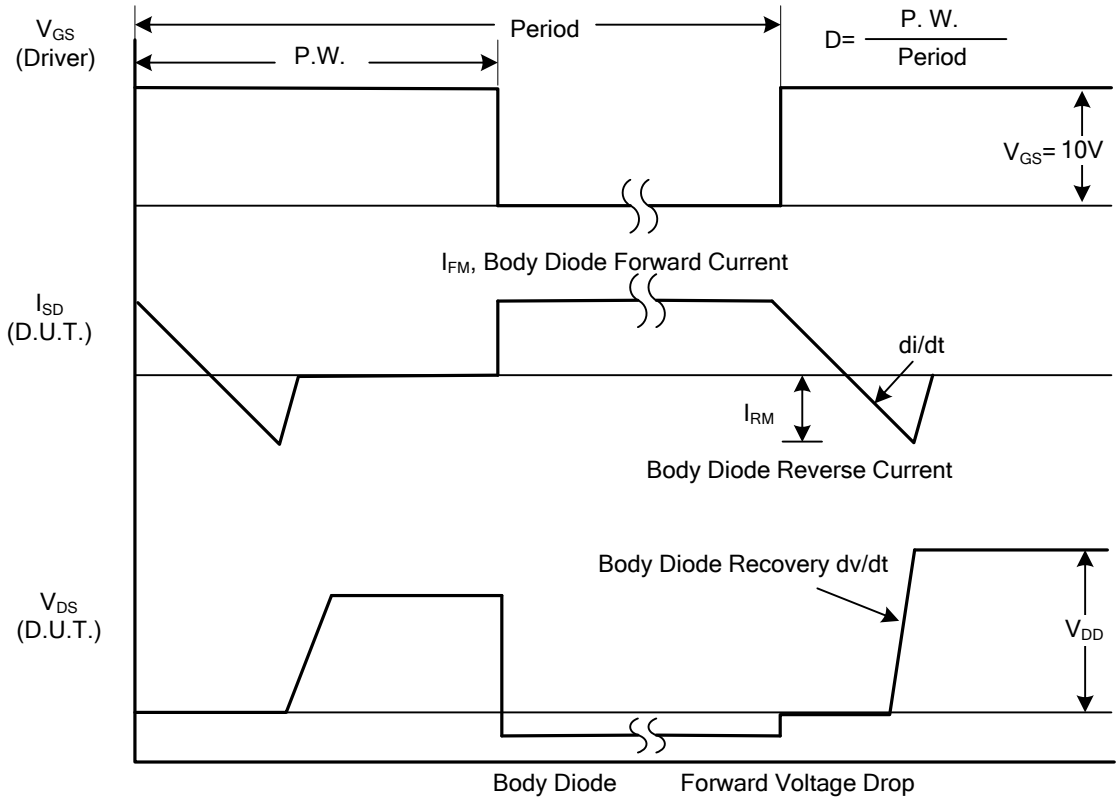
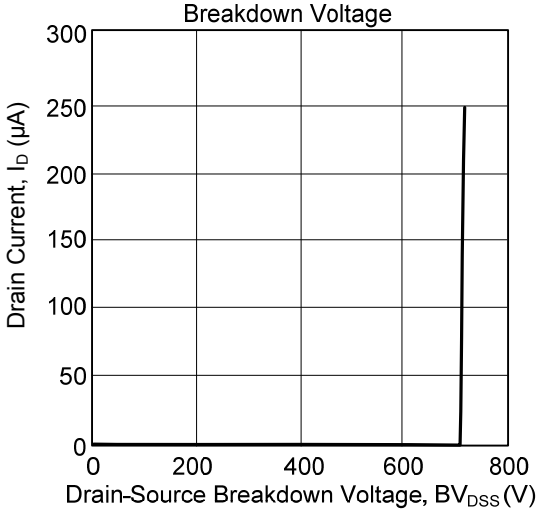


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

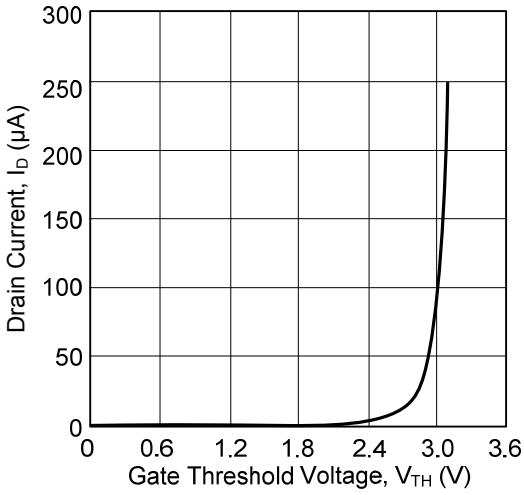


■ TYPICAL CHARACTERISTICS

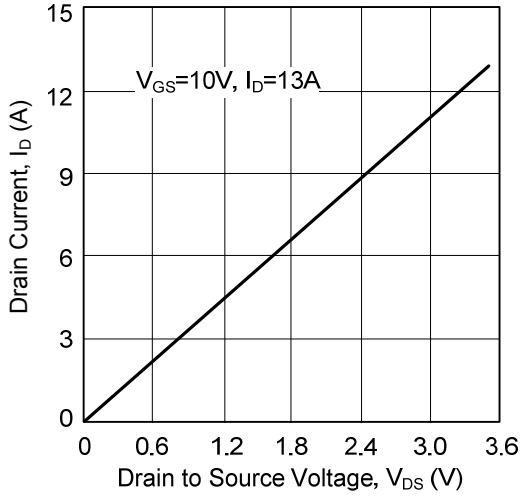
Drain Current vs. Drain-Source Breakdown Voltage



Drain Current vs. Gate Threshold Voltage



Drain-Source On-State Resistance Characteristics



Drain Current vs. Source to Drain Voltage