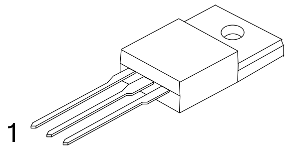
10A, 700V N-CHANNEL POWER MOSFET



TO-220F1

DESCRIPTION

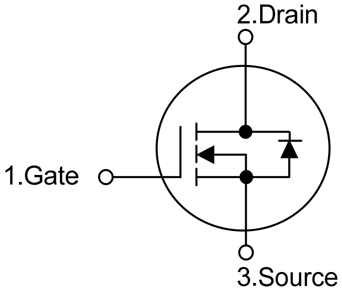
The UTC **10N70K** is an N-channel Power MOSFET using UTC's advanced technology to provide customers a minimum on-state resistance and superior switching performance, etc.

The UTC **10N70K** is generally applied in high efficient DC to DC converters, PWM motor controls and bridge circuits, etc.

FEATURES

* $R_{DS(ON)} \leq 1.2\ \Omega$ @ V_{GS}=10V, I_D=5.0A
* Low Gate Charge (Typical 44nC)
* Low C_{RSS} (typical 10 pF)
* High Switching Speed
* Improved dv/dt capability

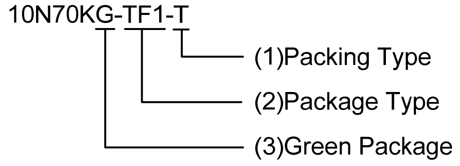
SYMBOL



ORDERING INFORMATION

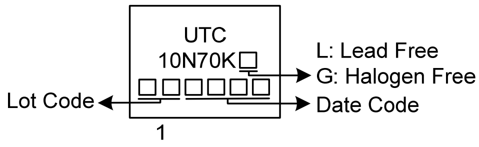
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10N70KL-TF1-T	10N70KG-TF1-T	TO-220F1	G	D	S	Tube

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



(1) T: Tube
(2) TF1: TO-220F1
(3) G: Halogen Free and Lead Free, L: Lead Free

MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	700	V
Gate-Source Voltage		V_{GSS}	±30	V
Avalanche Current (Note 2)		I_{AR}	10	A
Drain Current	Continuous	I_D	10	A
	Pulsed (Note 2)	I_{DM}	38	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	150	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation		P_D	50	W
Junction Temperature		T_J	+150	°C
Operating Temperature		T_{OPR}	-55 ~ +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 = 3mH, I_{AS} = 10A, V_{DD} = 50V, R_G = 25 Ω Starting T_J = 25°C
4. $I_{SD} \le 9.5$A, di/dt ≤200A/μs, $V_{DD} \le BV_{DSS}$, Starting T_J = 25°C

■ THERMAL DATA

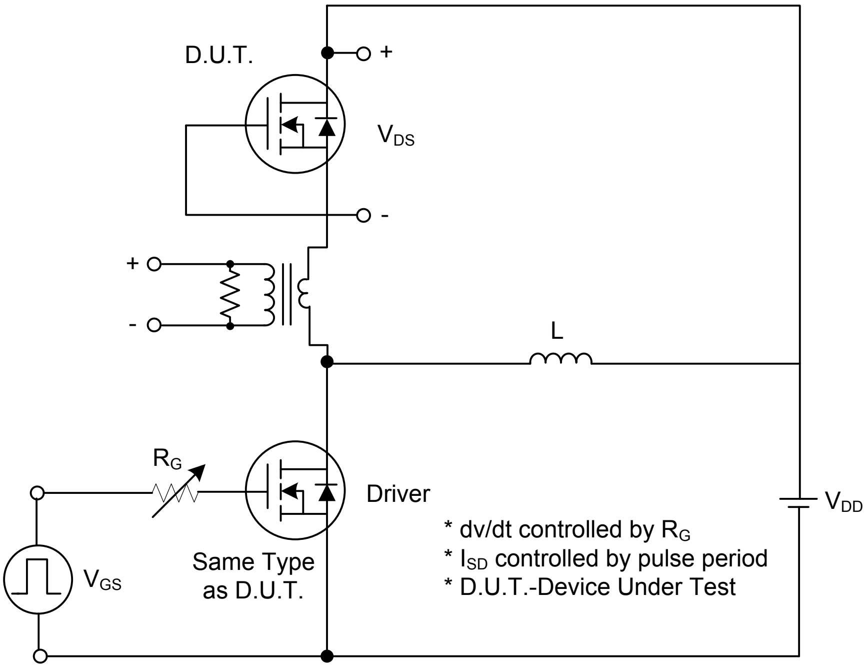
PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	62.5	°C/W
Junction to Case	θ_{JC}	2.5	°C/W

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

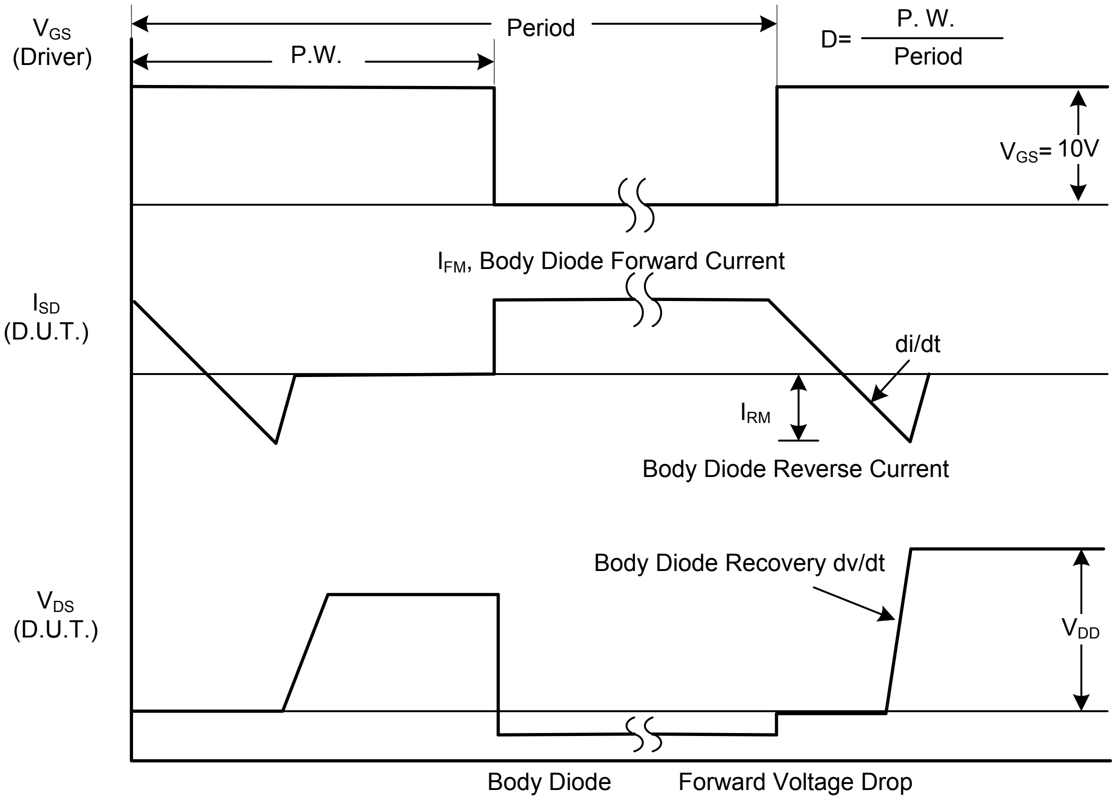
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	700			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 700V, V_{GS} = 0V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30 V, V_{DS} = 0 V			100	nA
	Reverse		V_{GS} = -30 V, V_{DS} = 0 V			-100	nA
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA, Referenced to 25°C		0.7		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-State Resistance		$R_{DS(ON)}$	V_{GS} = 10V, I_D = 5.0A		1.0	1.2	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1.0 MHz		1150	1712	pF
Output Capacitance		C_{OSS}			108	125	pF
Reverse Transfer Capacitance		C_{RSS}			10	13	pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q_G	V_{DS}=520V, I_D=10A, V_{GS}=10V (Note 1, 2)		95	110	nC
Gate-Source Charge		Q_{GS}			8		nC
Gate-Drain Charge		Q_{GD}			14		nC
Turn-On Delay Time		$t_{D(ON)}$	V_{DD}=325V, I_D =10A, R_G =25Ω (Note 1, 2)		90	100	ns
Turn-On Rise Time		t_R			30	90	ns
Turn-Off Delay Time		$t_{D(OFF)}$			210	300	ns
Turn-Off Fall Time		t_F			46	105	ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				10	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				38	A
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS} = 0 V, I_S =10A			1.4	V
Reverse Recovery Time		t_{rr}	V_{GS} = 0 V, I_S = 10A, dI_F / dt = 100 A/μs (Note 1)		420		ns
Reverse Recovery Charge		Q_{rr}			4.2		μC

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

■ TEST CIRCUITS AND WAVEFORMS

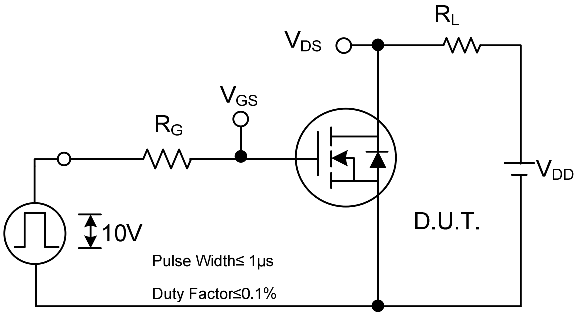


Peak Diode Recovery dv/dt Test Circuit

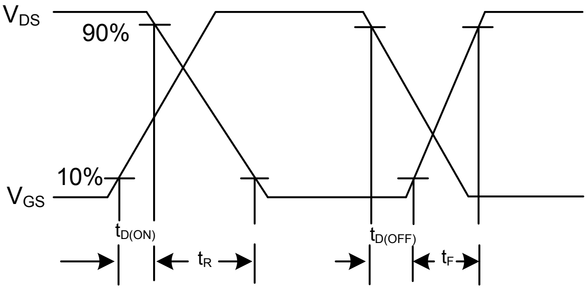


Peak Diode Recovery dv/dt Waveforms

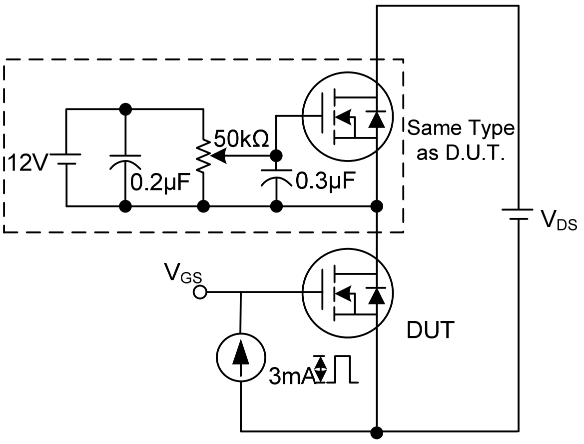
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



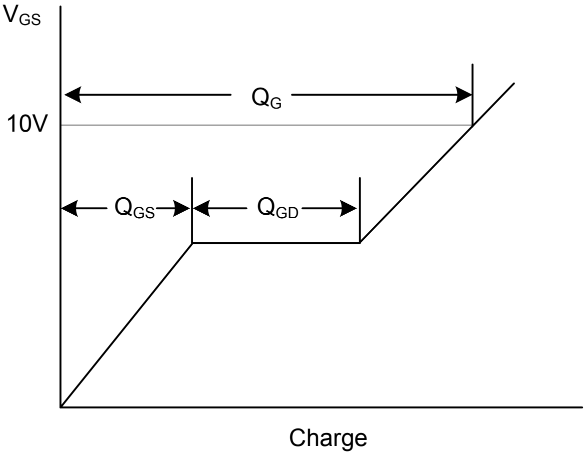
Switching Test Circuit



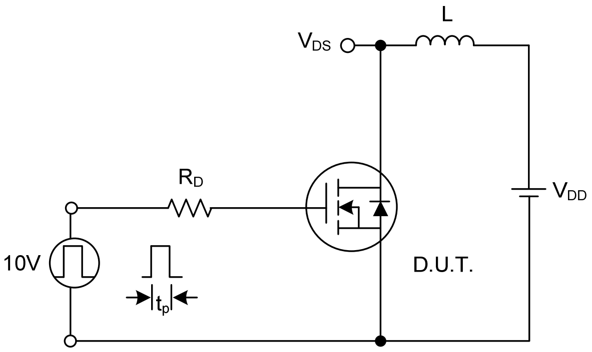
Switching Waveforms



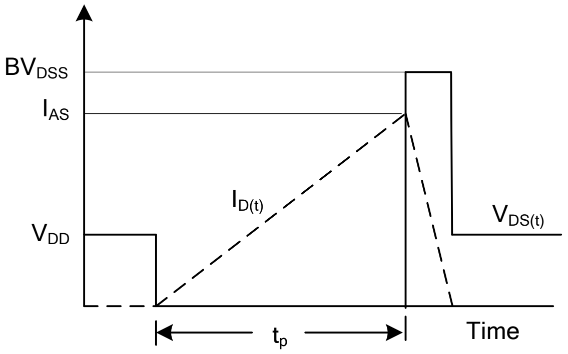
Gate Charge Test Circuit



Gate Charge Waveform



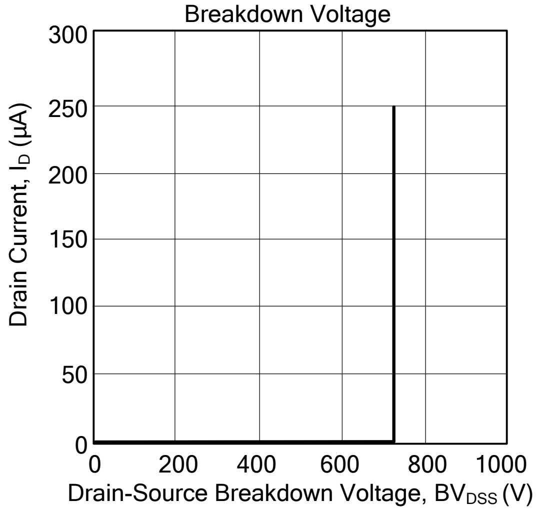
Unclamped Inductive Switching Test Circuit



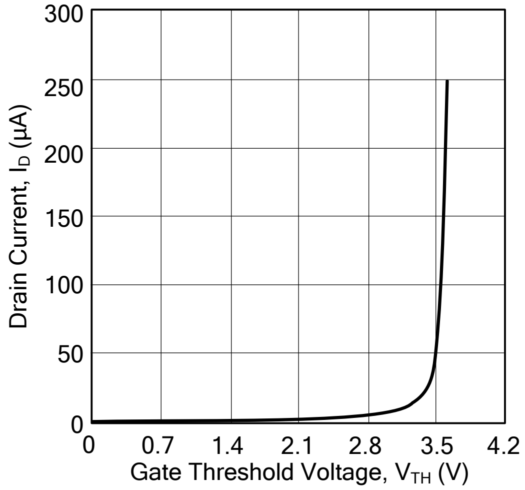
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

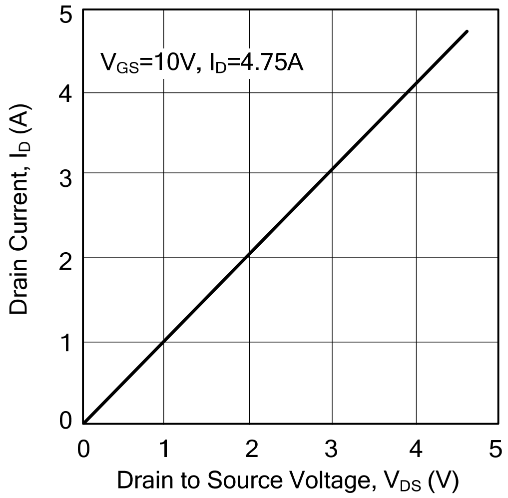
Drain Current vs. Drain-Source Breakdown Voltage



Drain Current vs. Gate Threshold Voltage



Drain-Source On-State Resistance Characteristics



Drain-Source Diode Forward Current vs. Source to Drain Voltage