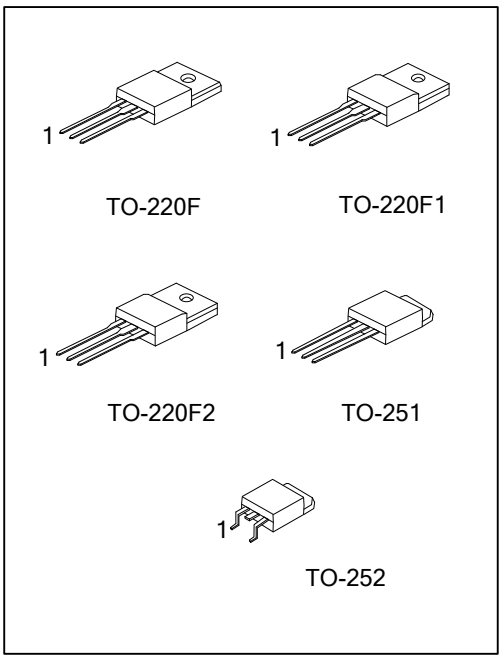
5N70Z

Power MOSFET

5A, 700V LOGIC N-CHANNEL MOSFET



■ DESCRIPTION

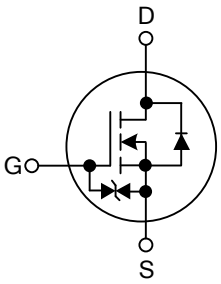
The UTC **5N70Z** is an N-Channel enhancement MOSFET, it uses UTC's advanced technology to provide customers with a minimum on-state resistance, high switching speed and low gate charge. It can also withstand high energy pulse in the avalanche and commutation modes.

The UTC **5N70Z** is suitable for high efficiency switching DC/DC converter, motor control and switch mode power supply.

■ FEATURES

* $R_{DS(ON)}$<2.5Ω @ V_{GS}=10V
* Low gate charge (Typ=4.8nC)
* Low C_{RSS} (Typ=6.0pF)
* High switching speed
* ESD Capability

■ SYMBOL



■ ORDERING INFORMATION

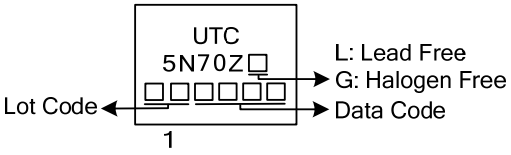
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N70ZL-TF3-T	5N70ZG-TF3-T	TO-220F	G	D	S	Tube
5N70ZL-TF1-T	5N70ZG-TF1-T	TO-220F1	G	D	S	Tube
5N70ZL-TF2-T	5N70ZG-TF2-T	TO-220F2	G	D	S	Tube
5N70ZL-TM3-T	5N70ZG-TM3-T	TO-251	G	D	S	Tube
5N70ZL-TN3-R	5N70ZG-TN3-R	TO-252	G	D	S	Tape Reel

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

5N70ZL-TF3-T
- (1)Packing Type
- (2)Package Type
- (3)Lead Free

(1) T: Tube, R: Tape Reel
(2) TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2
TM3: TO-251, TN3: TO-252
(3) L: Lead Free, G: Halogen Free

■ MARKING INFORMATION

PACKAGE	MARKING
TO-220F TO-220F1 TO-220F2 TO-251 TO-252	

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

PARAMETER SYMBOL			RATINGS	UNIT
Drain-Source Voltage		V_{DSS} 700		V
Gate-Source Voltage		V_{GSS} ±20		V
Avalanche Current (Note 2)		I_{AR} 5		A
Drain Current	Continuous I	$_D$ 5		A
	Pulsed (Note 2)	I_{DM} 20		A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS} 100		mJ
	Repetitive (Note 2)	E_{AR} 10		mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220F/TO-220F1 TO-220F2	P_D	36 W	
	TO-251/TO-252		28	W
Junction Temperature		T_J +	150	°C
Operation Temperature		T_{OPR} -55~	+150	°C
Storage Temperature		T_{STG} -55~	+150	°C

Notes: 1. Absolute ma ximum ratings are those val ues b eyond which the dev ice cou ld be perm anently d amaged. 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=6.2mH, I_{AS}=5A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C.
4. I_{SD}≤4.5A, di/dt≤300A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25°C

■ THERMAL CHARACTERISTICS

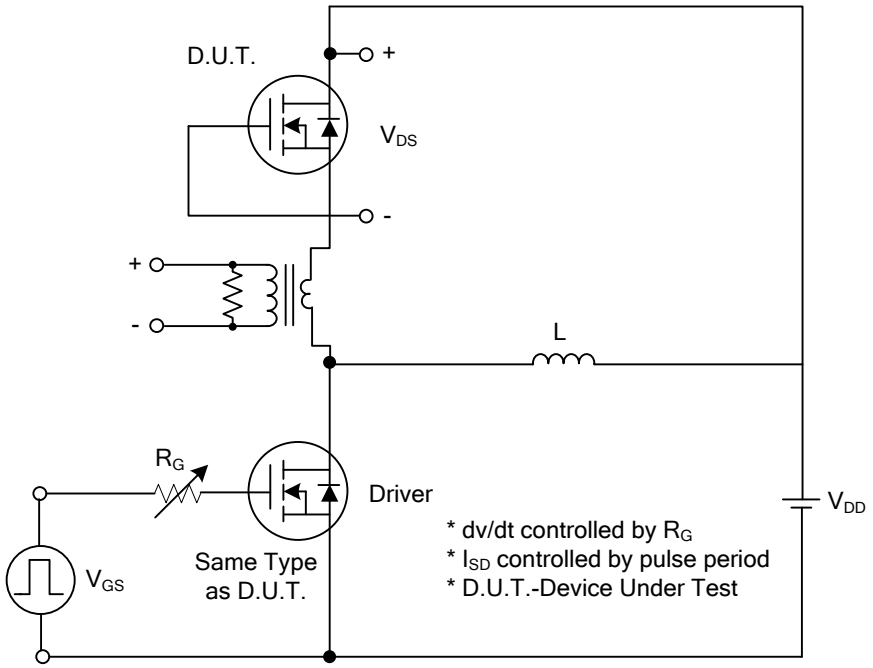
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F/TO-220F1 TO-220F2	θ_{JA}	62.5 °C/W	
	TO-251/TO-252		110	°C/W
Junction to Case	TO-220F/TO-220F1 TO-220F2	θ_{JC}	3.47 °C/W	
	TO-251/TO-252		4.53	°C/W

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

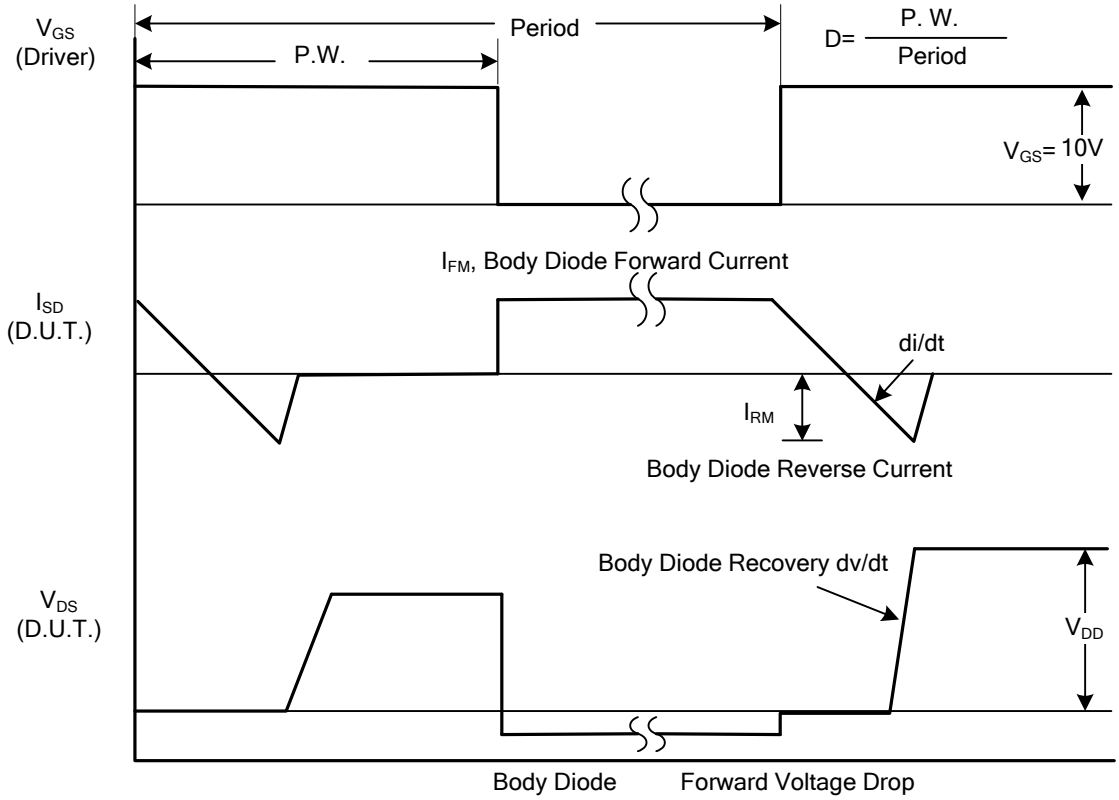
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V 700				V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C, I_D=250μA		0.18		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=700V, V_{GS}=0V			1	μA
			V_{DS}=560V, V_{GS}=0V, T_C=125°C			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+10	μA
	Reverse V		$_{GS}$=-20V, V_{DS}=0V			-10	μA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2		4	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=2.5A		2.15	2.5	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz	420		625	pF
Output Capacitance		C_{OSS}			55	65	pF
Reverse Transfer Capacitance		C_{RSS}			9	12	pF
SWITCHING PARAMETERS							
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=30V, I_D=0.5A, R_G=25Ω (Note 1, 2)	40		60	ns
Rise Time		t_R			42	60	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			135	155	ns
Fall-Time		t_F			48	60	ns
Total Gate Charge		Q_G	V_{GS}=5V, V_{DS}=160V, I_D=4.5A (Note 1, 2)	70		90	nC
Gate to Source Charge		Q_{GS}			20		nC
Gate to Drain Charge		Q_{GD}			15		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				5	A
Maximum Body-Diode Pulsed Current		I_{SM}				20	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=5A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	I_S=4.5A, V_{GS}=0V, dI_F/dt=100A/μs (Note 1)	95			ns
Body Diode Reverse Recovery Charge		Q_{RR}			0.3		μC

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

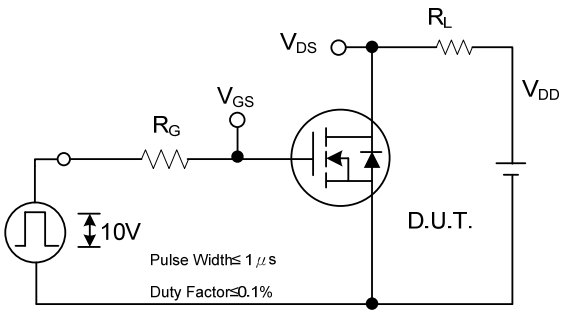
■ TEST CIRCUITS AND WAVEFORMS



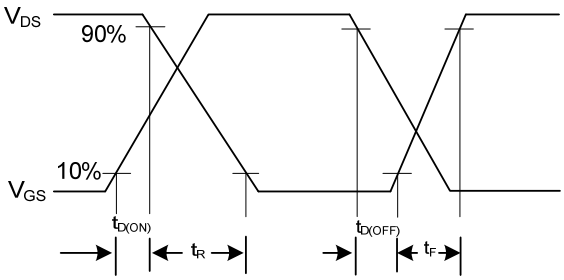
Peak Diode Recovery dv/dt Test Circuit



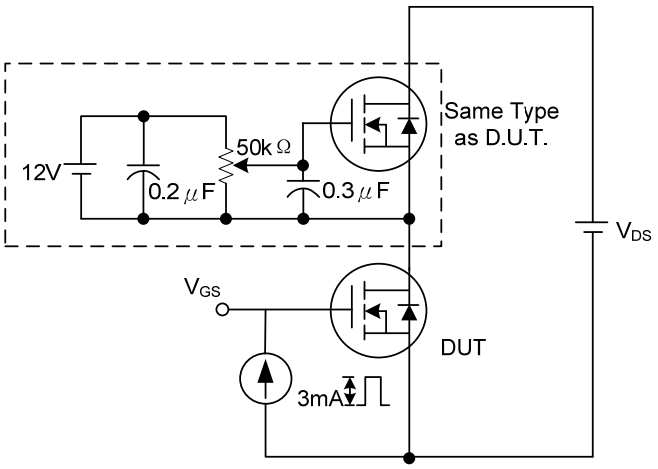
■ TEST CIRCUITS AND WAVEFORMS(Cont.)



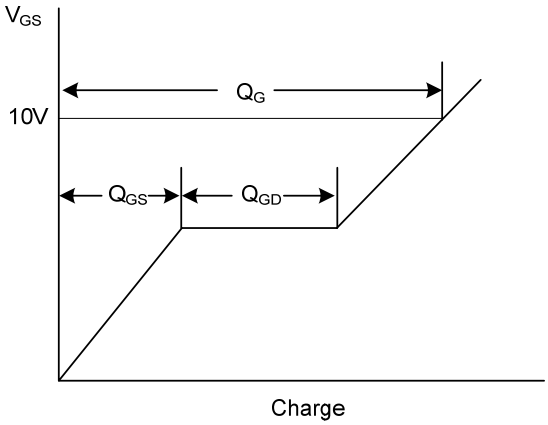
S witching Test Circuit



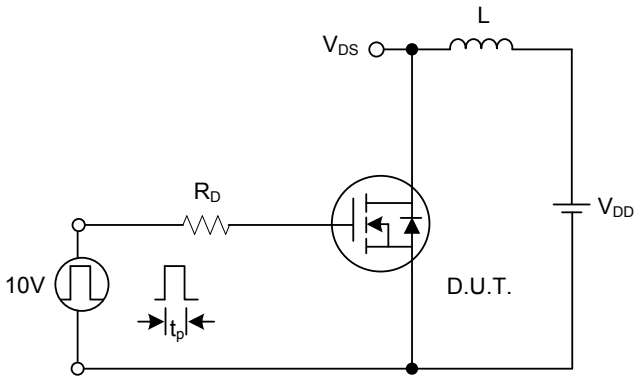
Switching Waveforms



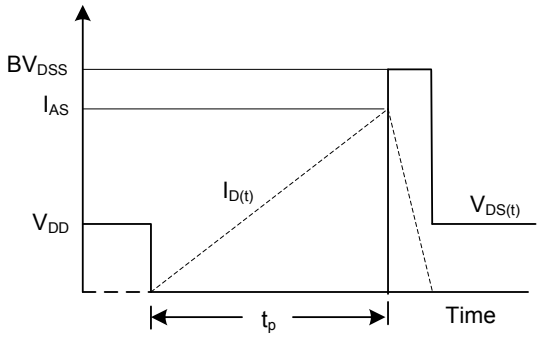
Gate Charge Test Circuit



Gate Charge Waveform



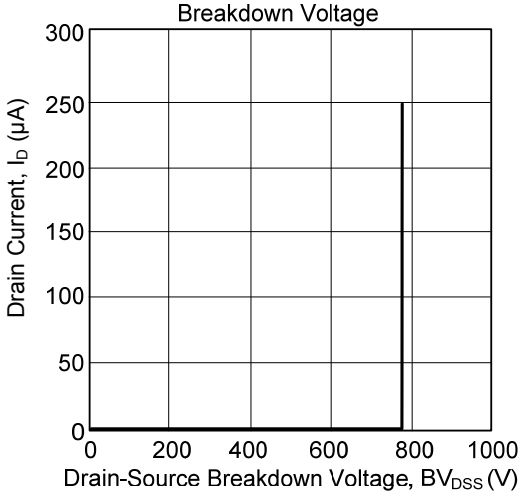
Unclamped Inductive Switching Test Circuit



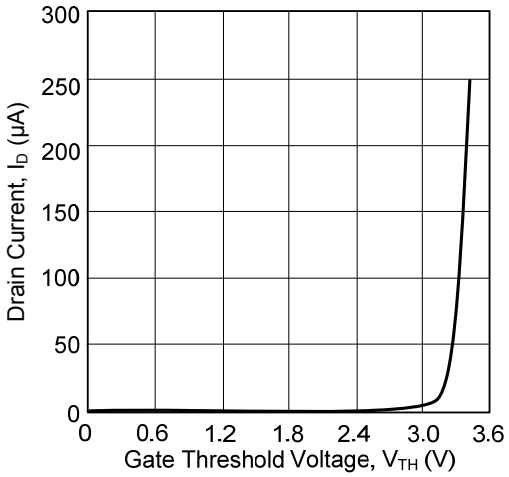
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

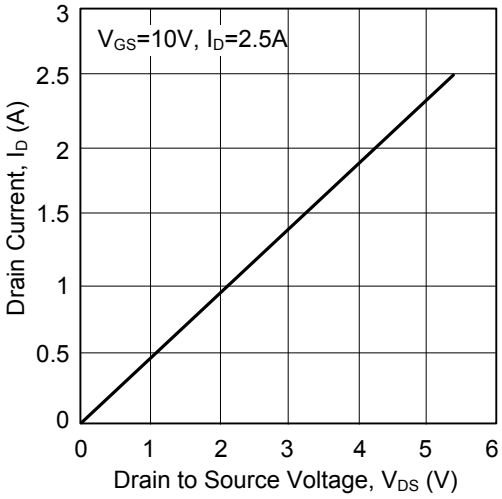
Drain Current vs. Drain-Source Breakdown Voltage



Drain Current vs. Gate Threshold Voltage



Drain-Source On-State Resistance Characteristics



Drain Current vs. Source to Drain Voltage