



5N70Z

Power MOSFET

5A, 700V LOGIC N-CHANNEL MOSFET

DESCRIPTION

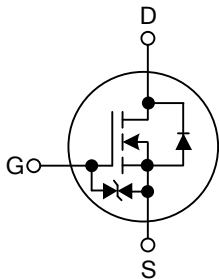
The UTC **5N70Z** is an N-Channel enhancement MOSFET, it uses UTC's advanced technology to provide customers with a minimum on-state resistance, high switching speed and low gate charge. It can also withstand high energy pulse in the avalanche and commutation modes.

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

FEATURES

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

SYMBOL

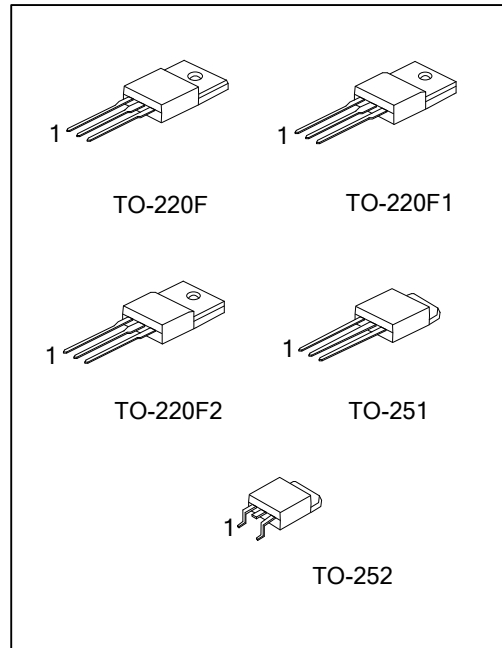


ORDERING INFORMATION

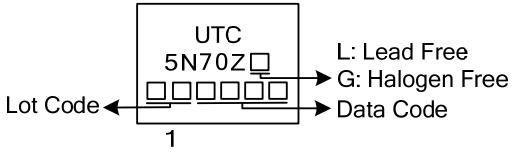
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N70ZL-TF3-T 5N70Z	G-TF3-T	TO-220F	G D		S	Tube
5N70ZL-TF1-T 5N70Z	G-TF1-T	TO-220F1	G D		S	Tube
5N70ZL-TF2-T 5N70Z	G-TF2-T	TO-220F2	G D		S	Tube
5N70ZL-TM3-T 5N70Z	G-TM3-T	TO-251	G	D	S	Tube
5N70ZL-TN3-R 5N70Z	G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>5N70ZL-TF3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Lead Free</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2</p> <p>TM3: TO-251, TN3: TO-252</p> <p>(3) L: Lead Free, G: Halogen Free</p>
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■ MARKING INFORMATION

PACKAGE	MARKING
TO-220F TO-220F1 TO-220F2 TO-251 TO-252	 <p>The diagram shows a rectangular marking area on a MOSFET. At the top, it says 'UTC'. Below that is '5N70Z' followed by a small square. Underneath are five small squares. Below these squares is the number '1'. An arrow labeled 'Lot Code' points to the first square. An arrow labeled 'Data Code' points to the last square. To the right of the squares, there are two lines: 'L: Lead Free' and 'G: Halogen Free'.</p>

■ ABSOLUTE MAXIMUM RATINGS ($T_c=25^\circ\text{C}$, 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	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	P_D	36 W	W	
	TO-220F2				
	TO-251/TO-252		28		
Junction Temperature		T_J	+	150	$^\circ\text{C}$
Operation Temperature		T_{OPR}	-55~	+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. $L=6.2\text{mH}$, $I_{AS}=5\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.

4. $I_{SD}\leq 4.5\text{A}$, $di/dt\leq 300\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$

■ THERMAL CHARACTERISTICS

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

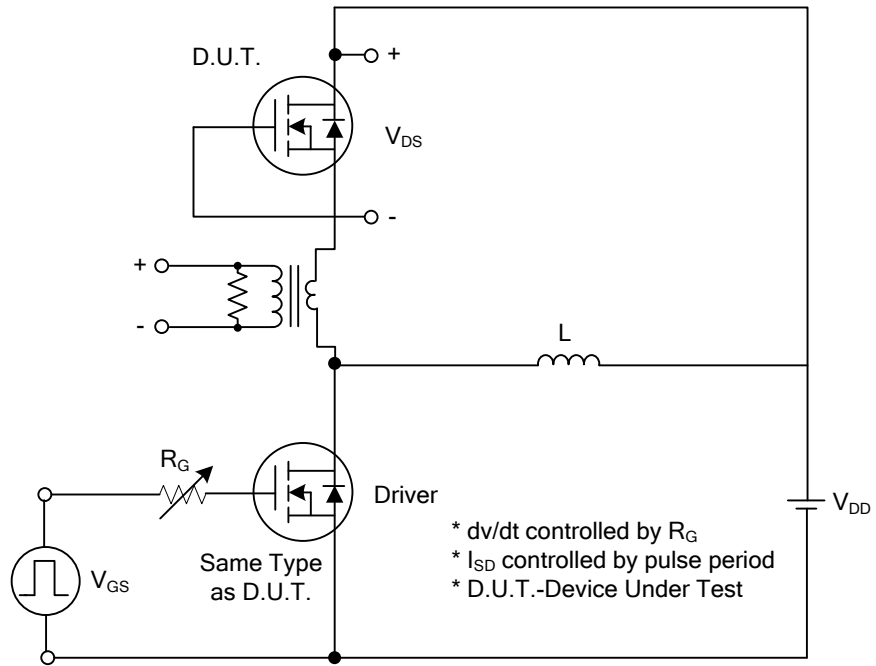
■ ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$ 700				V
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C , $I_D=250\mu\text{A}$		0.18		$^\circ\text{V}/^\circ\text{C}$
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=700\text{V}$, $V_{GS}=0\text{V}$			1	μA
		$V_{DS}=560\text{V}$, $V_{GS}=0\text{V}$, $T_C=125^\circ\text{C}$			10	μA
Gate-Source Leakage Current	Forward	$V_{GS}=+20\text{V}$, $V_{DS}=0\text{V}$			+10	μA
	Reverse	$V_{GS}=-20\text{V}$, $V_{DS}=0\text{V}$			-10	μA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2		4	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=2.5\text{A}$		2.15	2.5	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$	420		625	pF
Output Capacitance	C_{OSS}		55		65	pF
Reverse Transfer Capacitance	C_{RSS}		9		12	pF
SWITCHING PARAMETERS						
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=30\text{V}$, $I_D=0.5\text{A}$, $R_G=25\Omega$ (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	$V_{GS}=5\text{V}$, $V_{DS}=160\text{V}$, $I_D=4.5\text{A}$ (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}	$I_S=5\text{A}$, $V_{GS}=0\text{V}$			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_S=4.5\text{A}$, $V_{GS}=0\text{V}$, $di_F/dt=100\text{A}/\mu\text{s}$	95			ns
Body Diode Reverse Recovery Charge	Q_{RR}	(Note 1)		0.3		μC

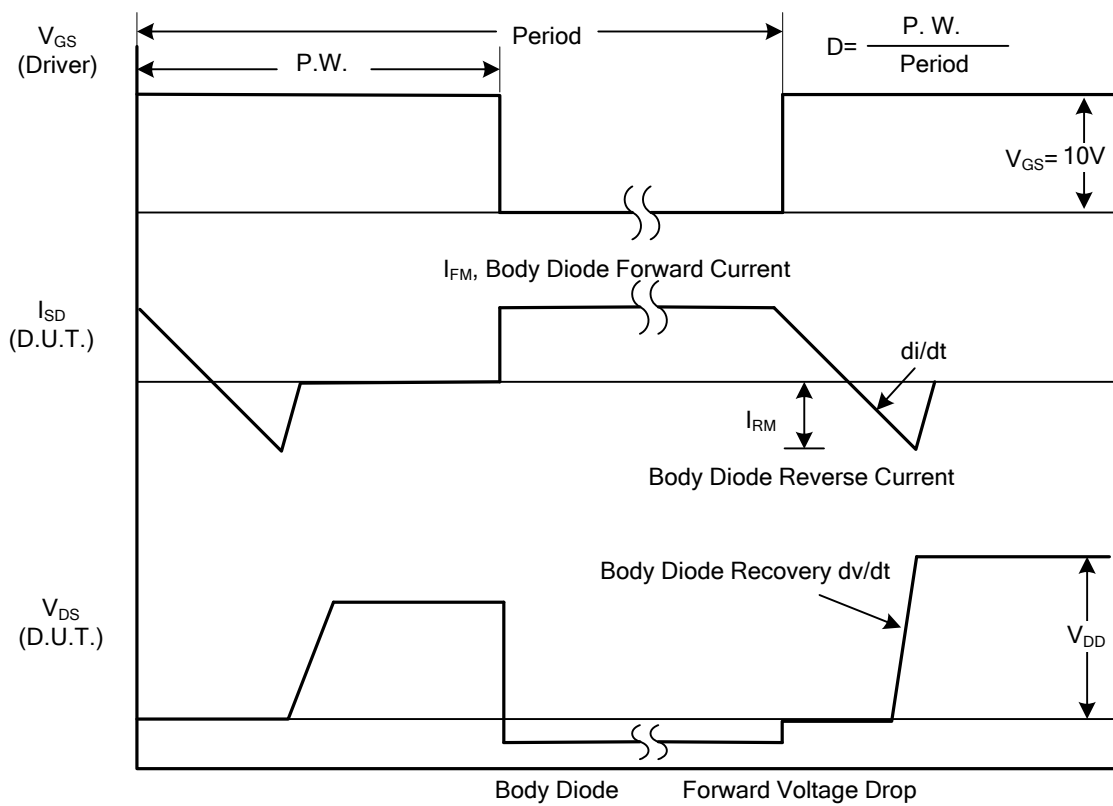
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

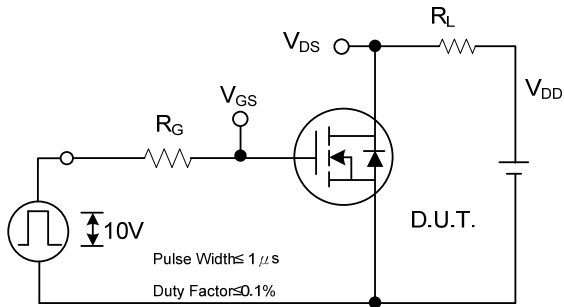
■ TEST CIRCUITS AND WAVEFORMS



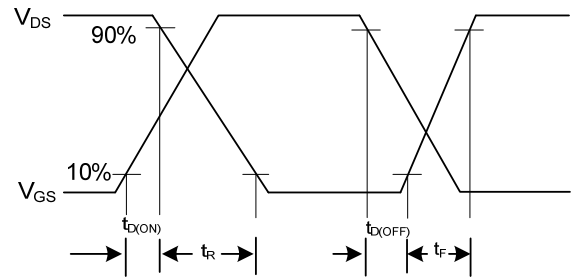
Peak Diode Recovery dv/dt Test Circuit



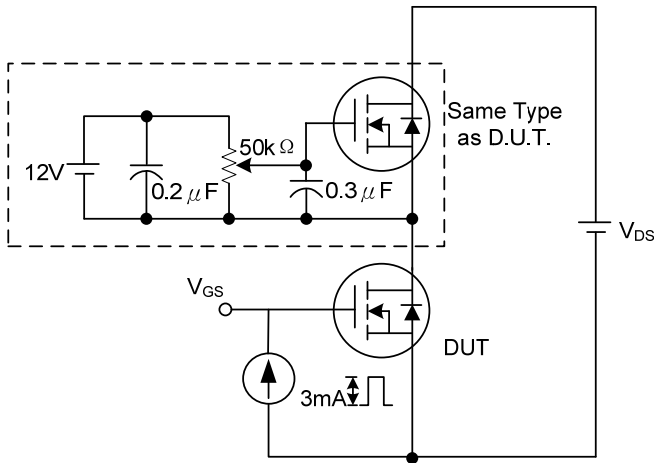
TEST CIRCUITS AND WAVEFORMS(Cont.)



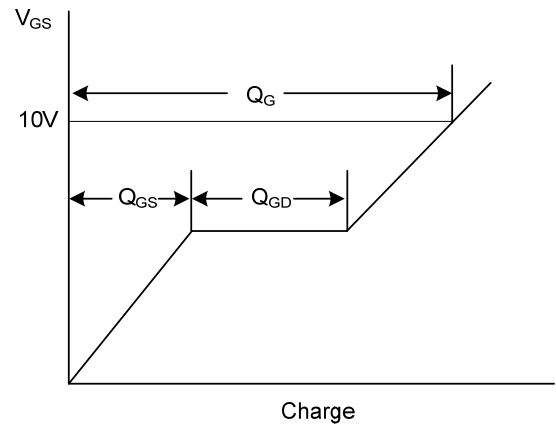
Switching Test Circuit



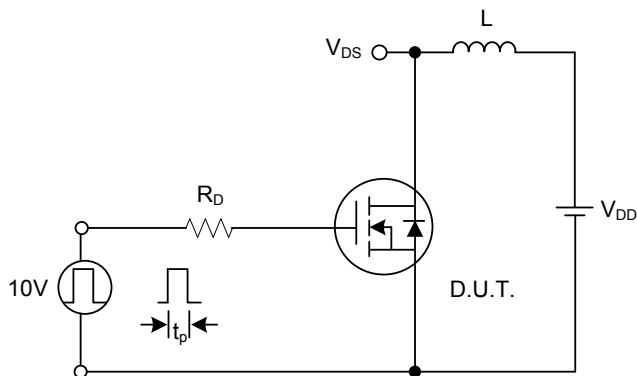
Switching Waveforms



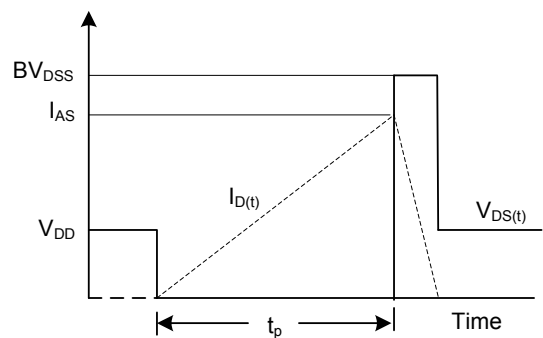
Gate Charge Test Circuit



Gate Charge Waveform

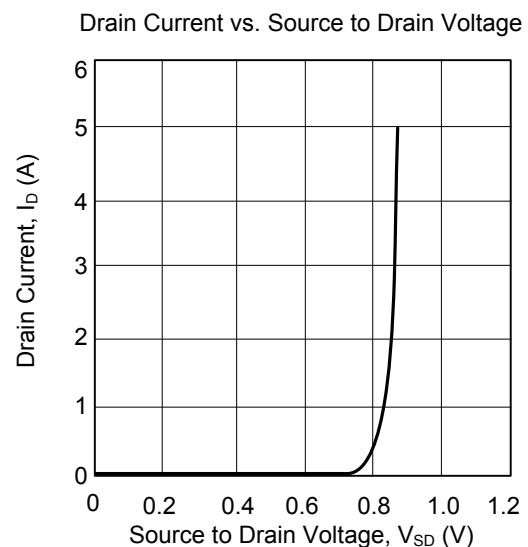
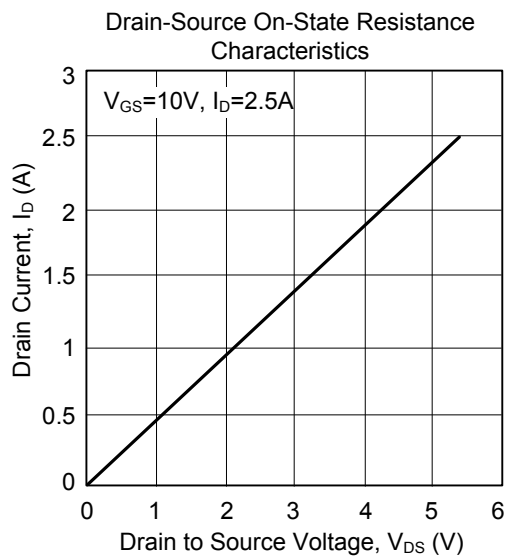
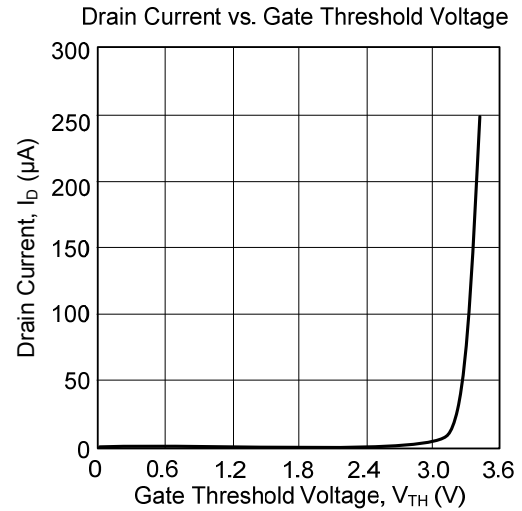
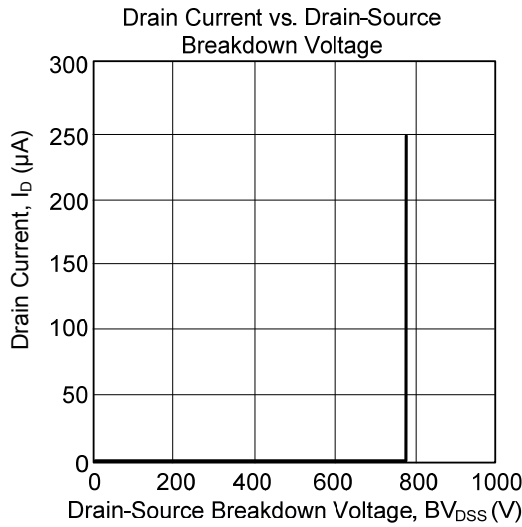


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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