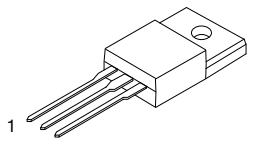
5A, 500V N-CHANNEL POWER MOSFET



TO-220F

■ DESCRIPTION

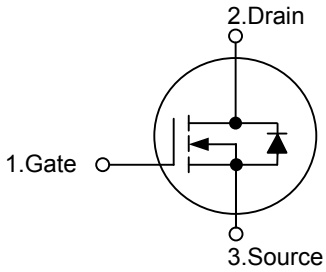
The UTC **5N50K** is a n N- channel p ower MOSF ET a dopting UTC's advanc ed techn ology to provide customers with DMOS, planar stripe techn ology. T his technolo gy i s design ed to meet the requirements of the minim um on- state resistance an d perfec t switching perf ormance. It also can withstand hig h ener gy pulse in the avalanche and communication mode.

The UTC **5N50K** can b e us ed in a pplications, such as active power factor correction, h igh efficienc y s witched m ode po wer supplies, electronic lamp ballasts based on half bridge topology.

■ FEATURES

* $R_{DS(ON)}$ = 1.4Ω @V_{GS} = 10 V
* 100% avalanche tested
* High switching speed

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N50KL-TF3-T	5N50KG-TF3-T	TO-220F	G	D	S	Tube

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

5N50KL-TF3-R (1)Packing Type (2)Package Type (3) Lead Free	(1) T: Tube (2) TF3: TO-220F (3) G: Halogen Free, L: Lead Free

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

PARAMETER SYMBOL			RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous I	$_D$	5	A
	Pulsed (Note 2)	I_{DM}	20	A
Avalanche Current (Note 2)		I_{AR}	5	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	270	mJ
	Repetitive (Note 2)	E_{AR}	7.3	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation		P_D	38	W
Junction Temperature		T_J	+ 150	°C
Storage Temperature		T_{STG}	-55~ +150	°C

Note: 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 = 21.5mH, I_{AS} = 5.2A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
4. I_{SD} ≤5A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

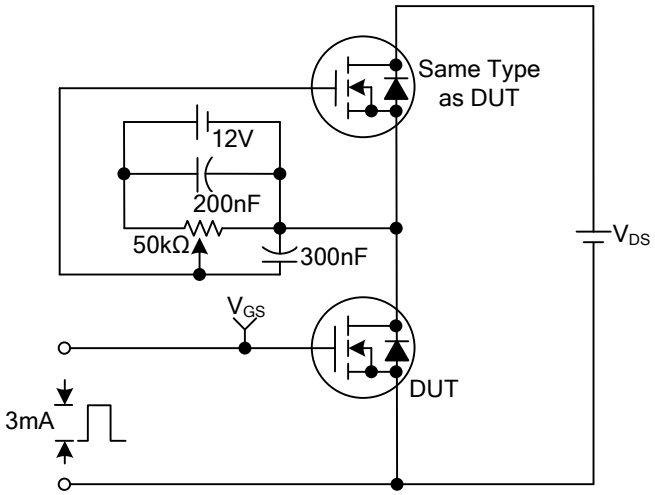
PARAMETER SYMBOL		RATINGS	UNIT
Junction to Ambient	$θ_{JA}$	62.5	°C/W
Junction to Case	$θ_{JC}$	3.25	°C/W

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

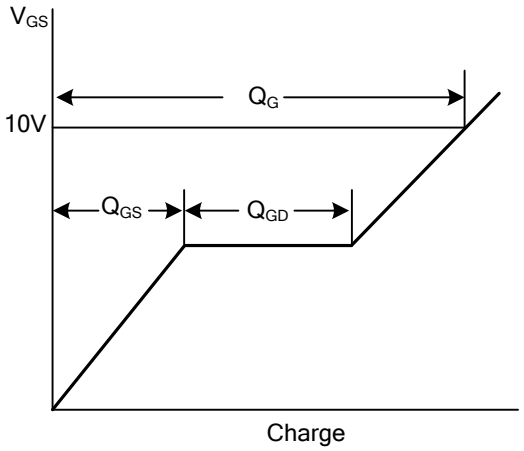
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V 500				V
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	Reference to 25°C, I_D=250μA		0.5		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=500V, V_{GS}=0V			1	μA
			V_{DS}=400V, T_C=125°C			10	
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=2.5A		1.2	1.4	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		480	625	pF
Output Capacitance		C_{OSS}			80	105	pF
Reverse Transfer Capacitance		C_{RSS}			15	20	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{GS}=10V, V_{DS}=400V, I_D=5A (Note 1, 2)	18		24	nC
Gate to Source Charge		Q_{GS}			2.2		nC
Gate to Drain Charge		Q_{GD}			9.7		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=250V, I_D=5A, R_G=25Ω (Note 1, 2)		12	35	ns
Rise Time		t_R			46	100	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			50	110	ns
Fall-Time t		$_F$			48	105	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				5	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				20	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=5A, V_{GS}=0V			1.4	V
Reverse Recovery Time		t_{rr}	I_S=5A, V_{GS}=0V, dI_F/dt=100A/μs (Note 1)		263		ns
Reverse Recovery Charge		Q_{RR}			1.9		μC

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

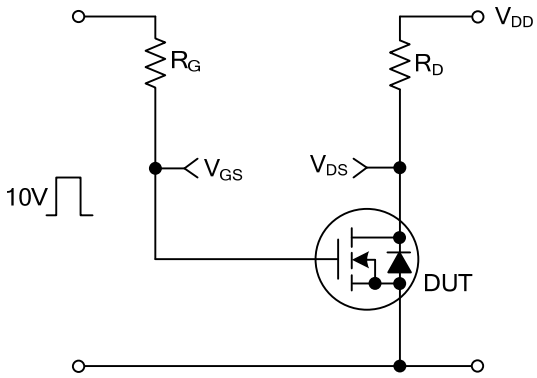
■ TEST CIRCUITS AND WAVEFORMS



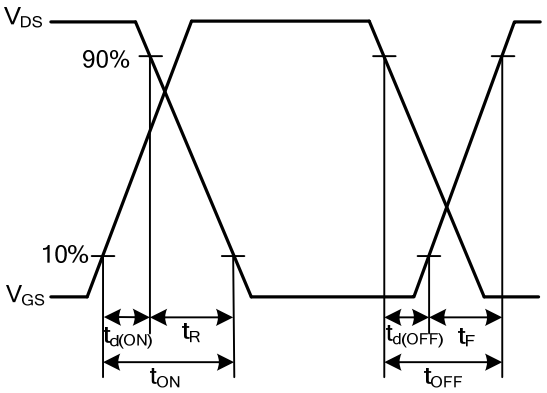
Gate Charge Test Circuit



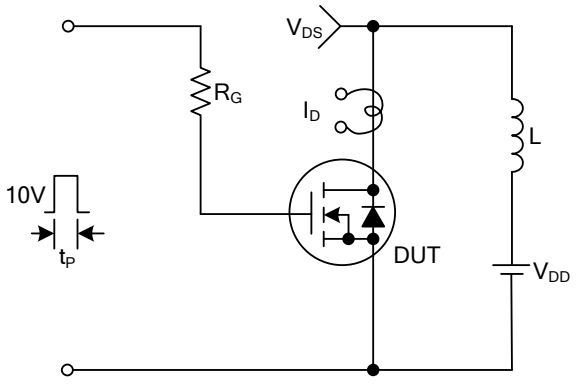
Gate Charge Waveforms



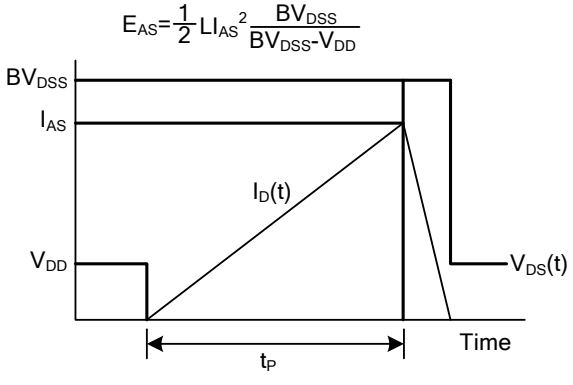
Resistive Switching Test Circuit Resisti



ve Switching Waveforms

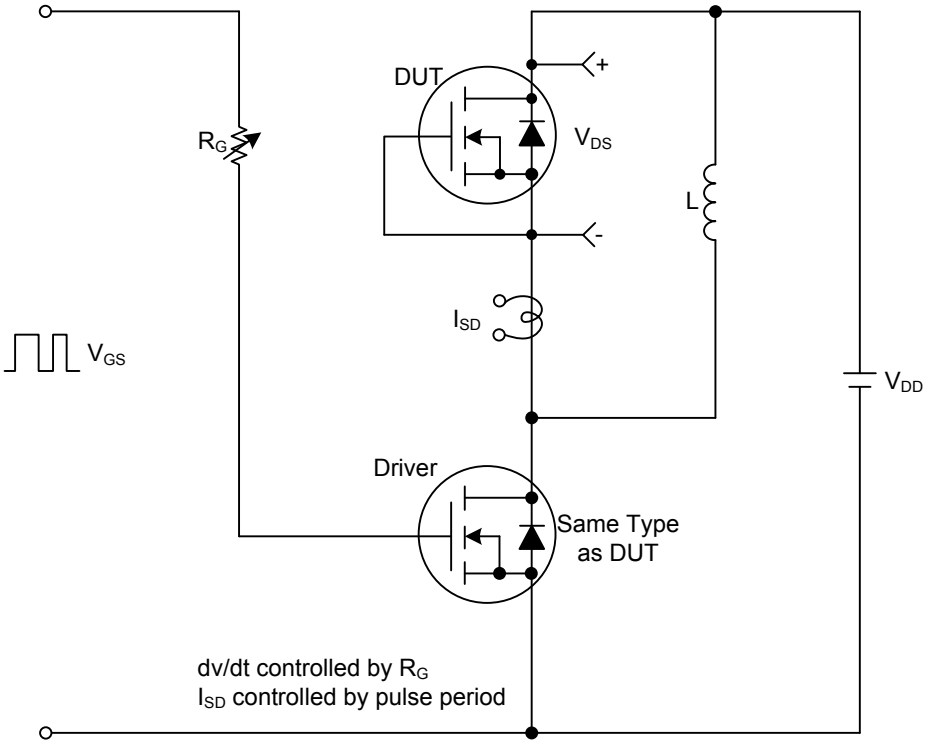


Unclamped Inductive Switching Test Circuit

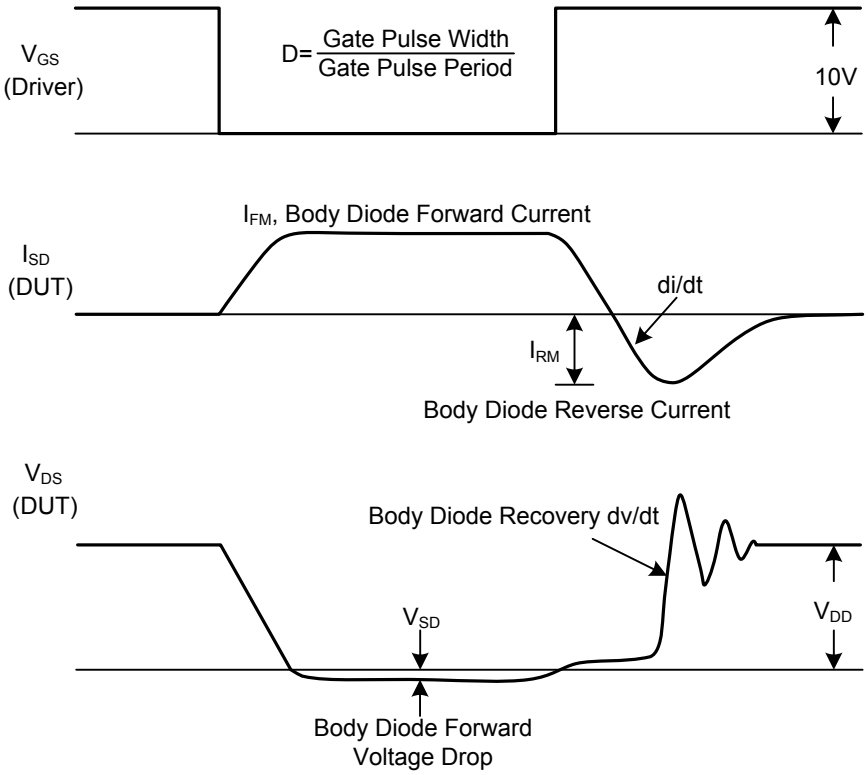


Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)

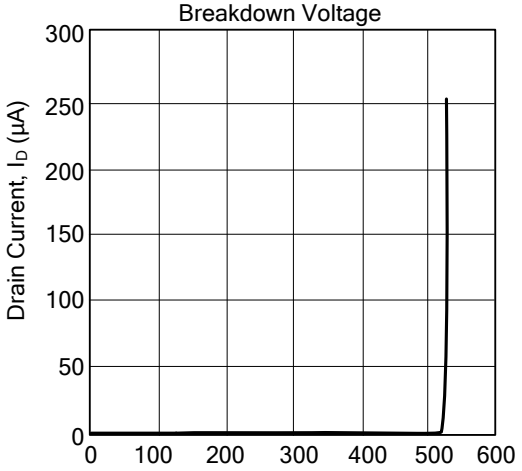


Peak Diode Recovery dv/dt Test Circuit & Waveforms

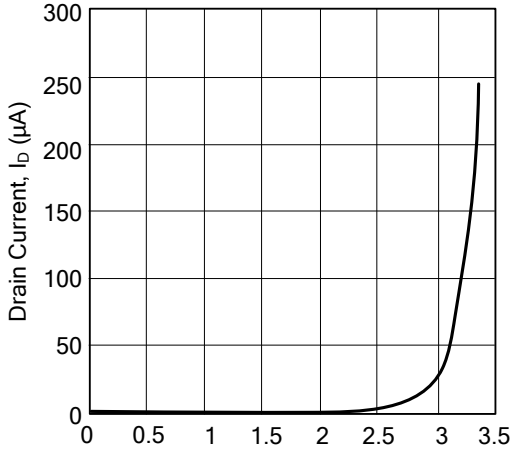


■ TYPICAL CHARACTERISTICS

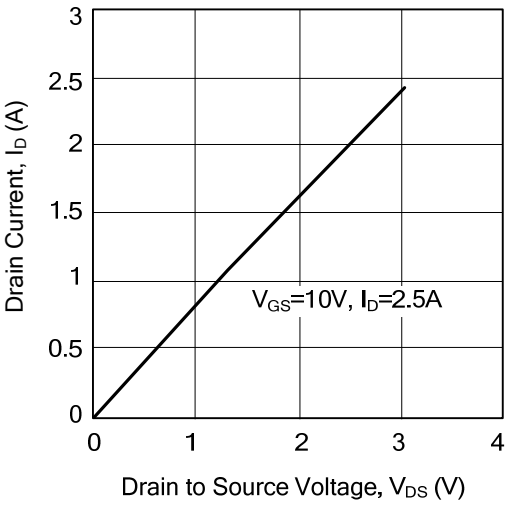
Drain Current vs. Drain-Source Breakdown Voltage



Drain Current vs. Gate Threshold Voltage



Drain-Source On-State Resistance Characteristics



Drain Current vs. Source to Drain Voltage