



3N70A

Power MOSFET

700V, 3A N-CHANNEL POWER MOSFET

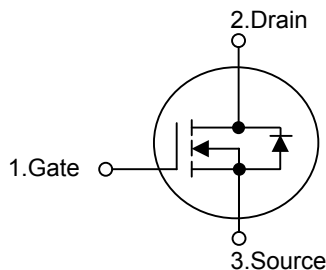
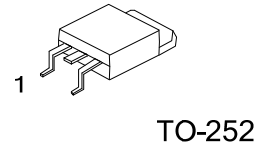
DESCRIPTION

The UTC **3N70A** is a high voltage and high current power MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in the high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

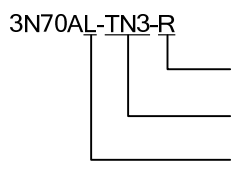
- * $R_{DS(ON)} \leq 4.0\Omega$ @ $V_{GS} = 10V$
- * Ultra low gate charge (typical 10 nC)
- * Low reverse transfer capacitance
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N70AL-TN3-R	3N70AG-TN3-R	TO-252	G	D	S	Tape Reel

		(1) Packing Type (2) Package Type (3) Lead Free	(1) R: Tape Reel (2) TN3: TO-252 (3) G: Halogen Free, L: Lead Free
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■ ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DS}	700	V
Gate-Source Voltage	V_{GS}	± 30	V
Avalanche Current (Note 2)	I_{AR}	3.0	A
Continuous Drain Current	I_D	3.0	A
Pulsed Drain Current (Note 2)	I_{DM}	12	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	200
	Repetitive (Note 2)	E_{AR}	7.5
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	P_D	50	W
Junction Temperature	T_J	+150	$^\circ\text{C}$
Operating 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. $L = 64\text{mH}$, $I_{AS} = 2.4\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 3.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

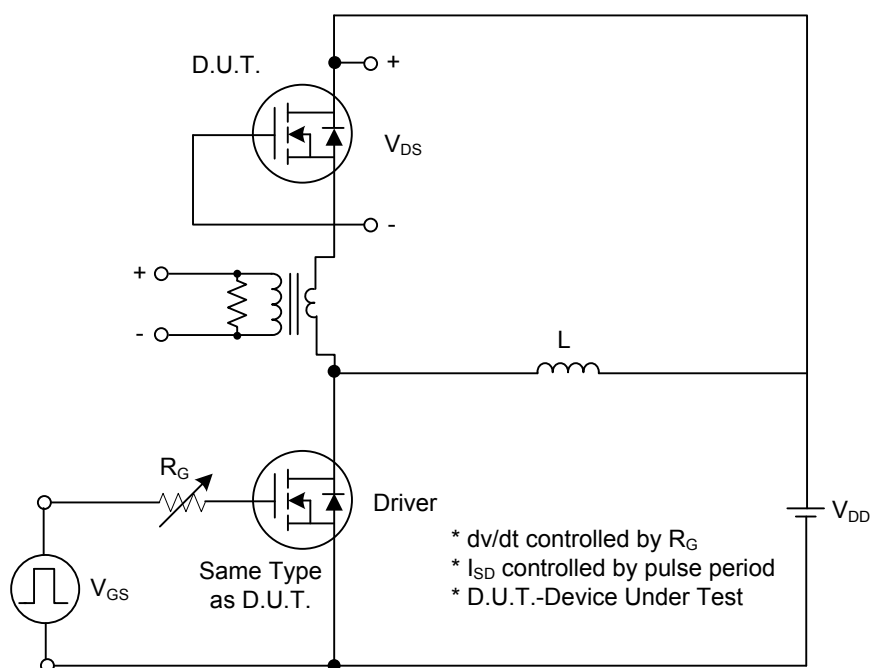
PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	110	$^\circ\text{C}/\text{W}$
Junction to Case	θ_{JC}	2.5	$^\circ\text{C}/\text{W}$

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

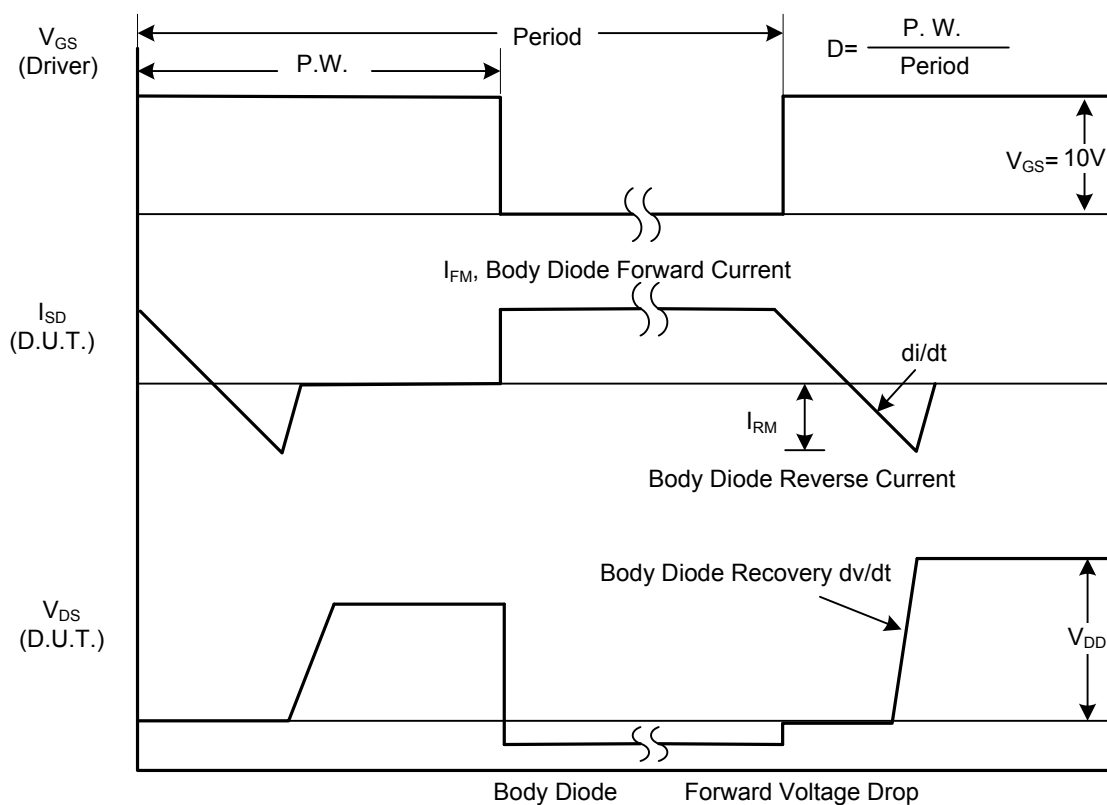
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} = 0 V, I _D = 250μA	700			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} = 700 V, V _{GS} = 0 V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} = 30 V, V _{DS} = 0 V			100	nA
	Reverse		V _{GS} = -30 V, V _{DS} = 0 V			-100	nA
Breakdown Voltage Temperature Coefficient		ΔBV _{DSS} /ΔT _J	I _D =250μA,Referenced to 25°C		0.6		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250 μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} = 10 V, I _D = 1.5A		2.8	4.0	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1MHz		350	450	pF
Output Capacitance		C _{OSS}			50	65	pF
Reverse Transfer Capacitance		C _{RSS}			5.5	32	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		t _{D(ON)}	V _{DD} = 30V, I _D = 1.0 A, R _G = 25Ω (Note 1, 2)		10	40	ns
Turn-On Rise Time		t _R			30	70	ns
Turn-Off Delay Time		t _{D(OFF)}			20	100	ns
Turn-Off Fall Time		t _F			30	70	ns
Total Gate Charge		Q _G	V _{DS} = 480V,I _D = 3.0A, V _{GS} = 10V (Note 1, 2)		10	13	nC
Gate-Source Charge		Q _{GS}			2.7		nC
Gate-Drain Charge		Q _{DD}			4.9		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} = 0 V, I _S = 3.0 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current		I _S				3.0	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				12	A
Reverse Recovery Time		t _{rr}	V _{GS} = 0 V, I _S = 3.0 A,		210		ns
Reverse Recovery Charge		Q _{RR}	dl _F /dt = 100 A/μs (Note 1)		1.2		μC

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

■ TEST CIRCUITS AND WAVEFORMS

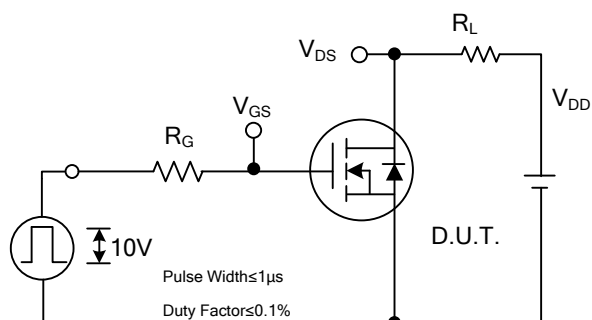


Peak Diode Recovery dv/dt Test Circuit

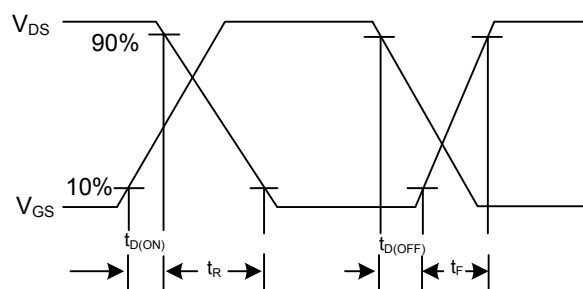


Peak Diode Recovery dv/dt Waveforms

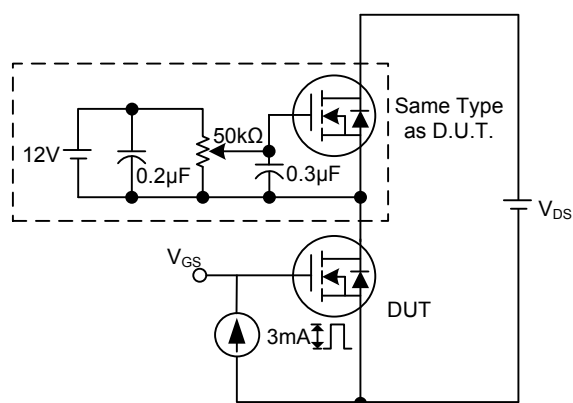
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



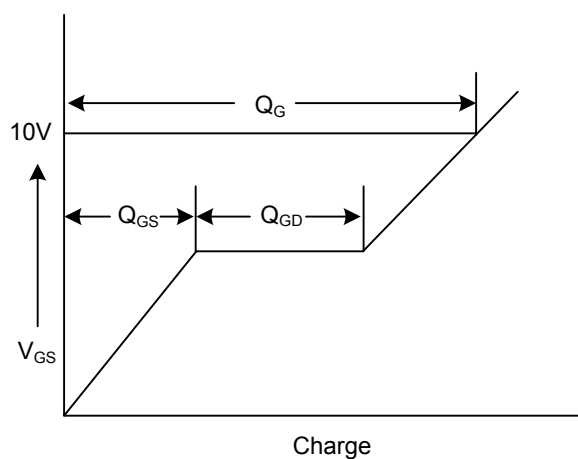
Switching Test Circuit



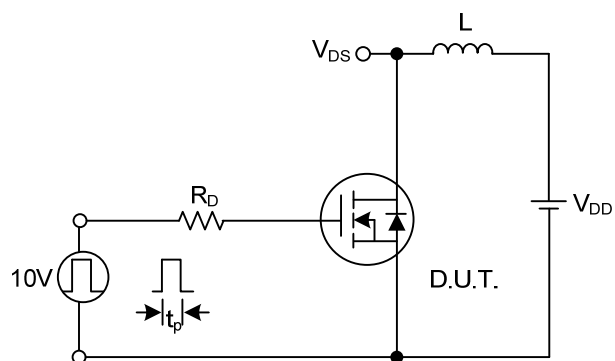
Switching Waveforms



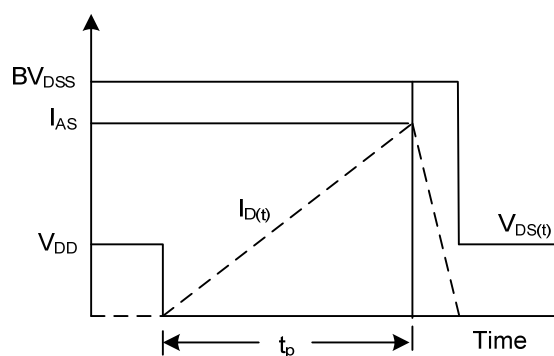
Gate Charge Test Circuit



Gate Charge Waveform

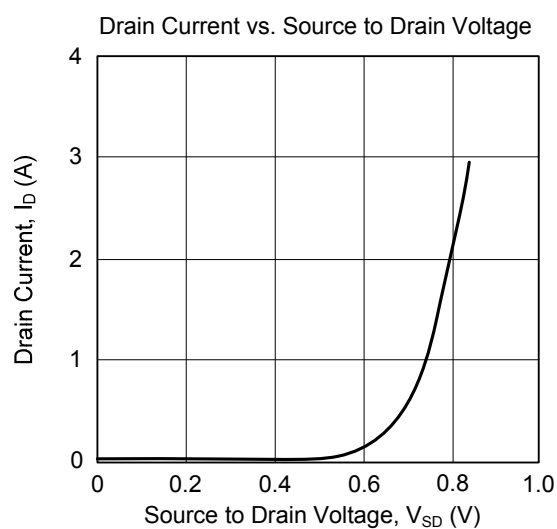
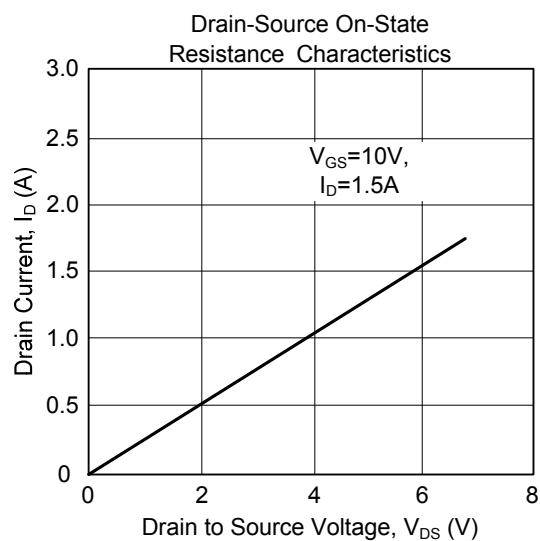
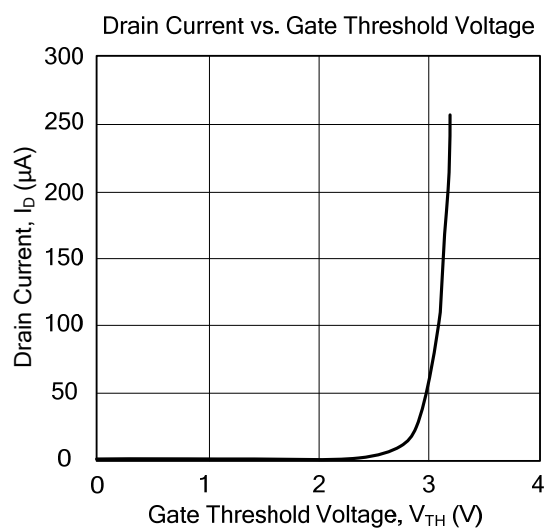
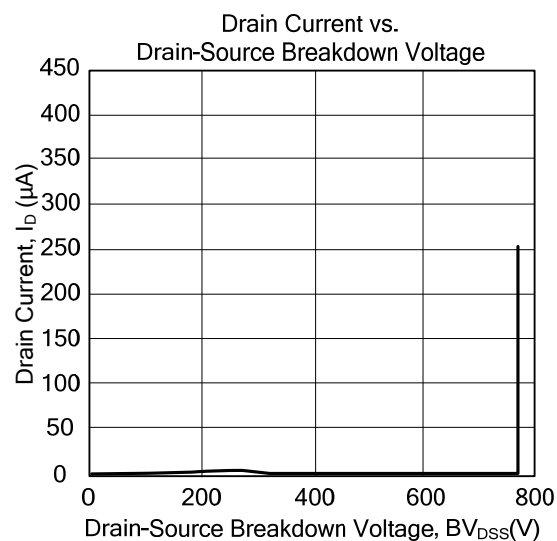
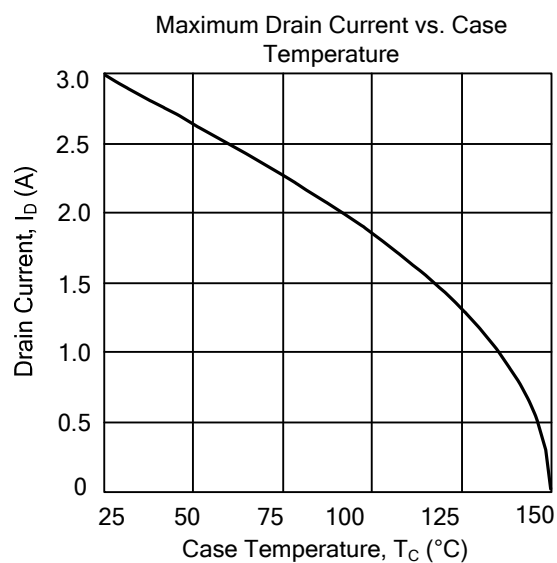


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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