



## 3N60-TA5

Preliminary

Power MOSFET

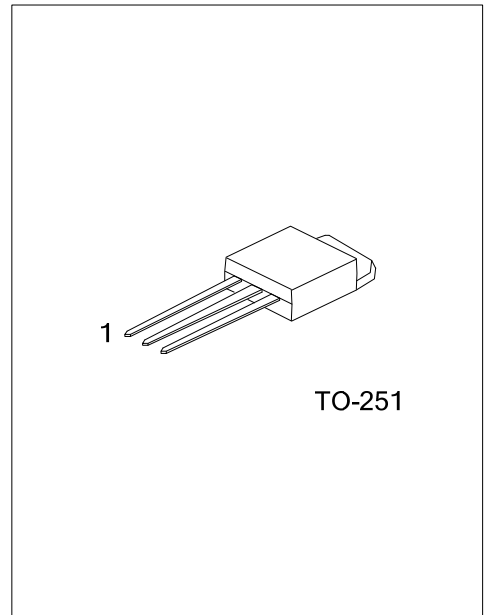
### 3.0A, 600V N-CHANNEL POWER MOSFET

#### DESCRIPTION

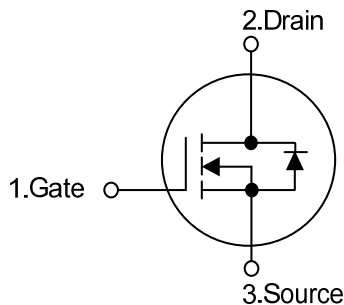
The UTC **3N60-TA5** is a high voltage and high current power MOSFET, designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

#### FEATURES

- \*  $R_{DS(ON)} < 3.6\Omega @ V_{GS} = 10V, I_D = 1.5A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness



#### SYMBOL



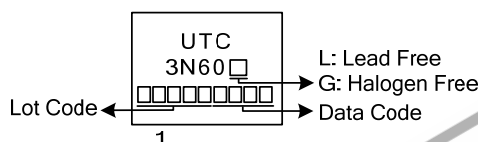
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3N60L-TM3-T	3N60G-TM3-T	TO-251	G	D	S	Tube

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

<p>3N60L-TM3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube</p> <p>(2) TM3: TO-251</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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#### MARKING



■ ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	600	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	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) $E_{AS}$	67	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	2.56	V/ns
Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	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  $T_J$ .

3.  $L=15\text{mH}$ ,  $I_{AS}=3\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\ \Omega$ , 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	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	110	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	2.5	$^\circ\text{C}/\text{W}$

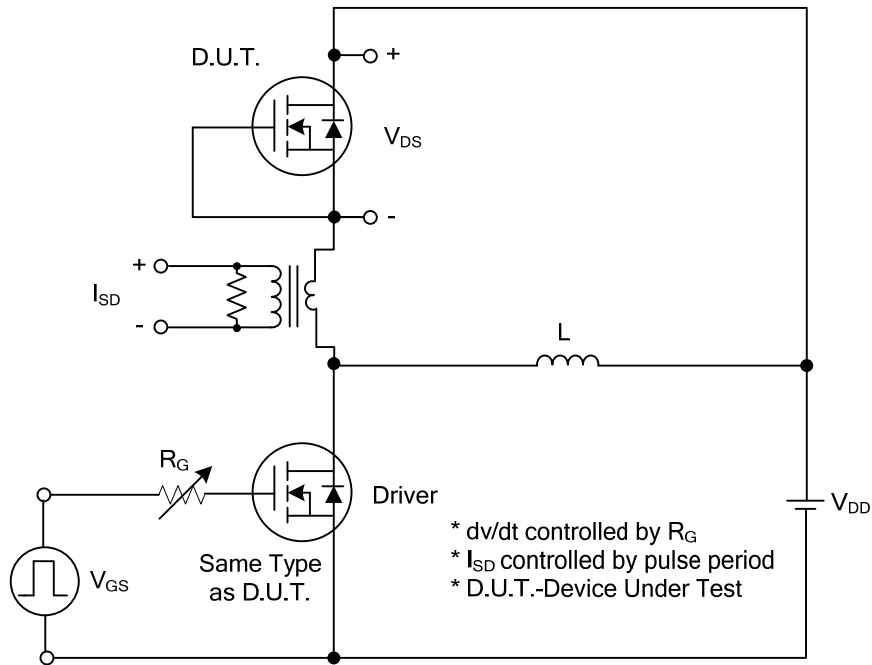
■ ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	600			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse					
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 1.5\text{ A}$			3.6	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$		380		pF
Output Capacitance	$C_{OSS}$			42		pF
Reverse Transfer Capacitance	$C_{RSS}$			5.5		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge	$Q_G$	$V_{DS}=50\text{V}, V_{GS}=10\text{V}, I_D=1.3\text{A},$ $I_G=100\mu\text{A}$ (Note 1, 2)		18		nC
Gate-Source Charge	$Q_{GS}$			3		nC
Gate-Drain Charge	$Q_{GD}$			4		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=30\text{V}, V_{GS}=10\text{V}, I_D=0.5\text{A},$ $R_G=25\Omega$ (Note 1, 2)		40		ns
Turn-On Rise Time	$t_R$			28		ns
Turn-Off Delay Time	$t_{D(OFF)}$			96		ns
Turn-Off Fall Time	$t_F$			35		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				3.0	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				12	A
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 3.0\text{ A}$			1.4	V
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0\text{V}, I_S=3.0\text{A}$ $di_F/dt=100\text{A}/\mu\text{s}$ (Note 1)		310		ns
Reverse Recovery Charge	$Q_{RR}$			1.67		$\mu\text{C}$

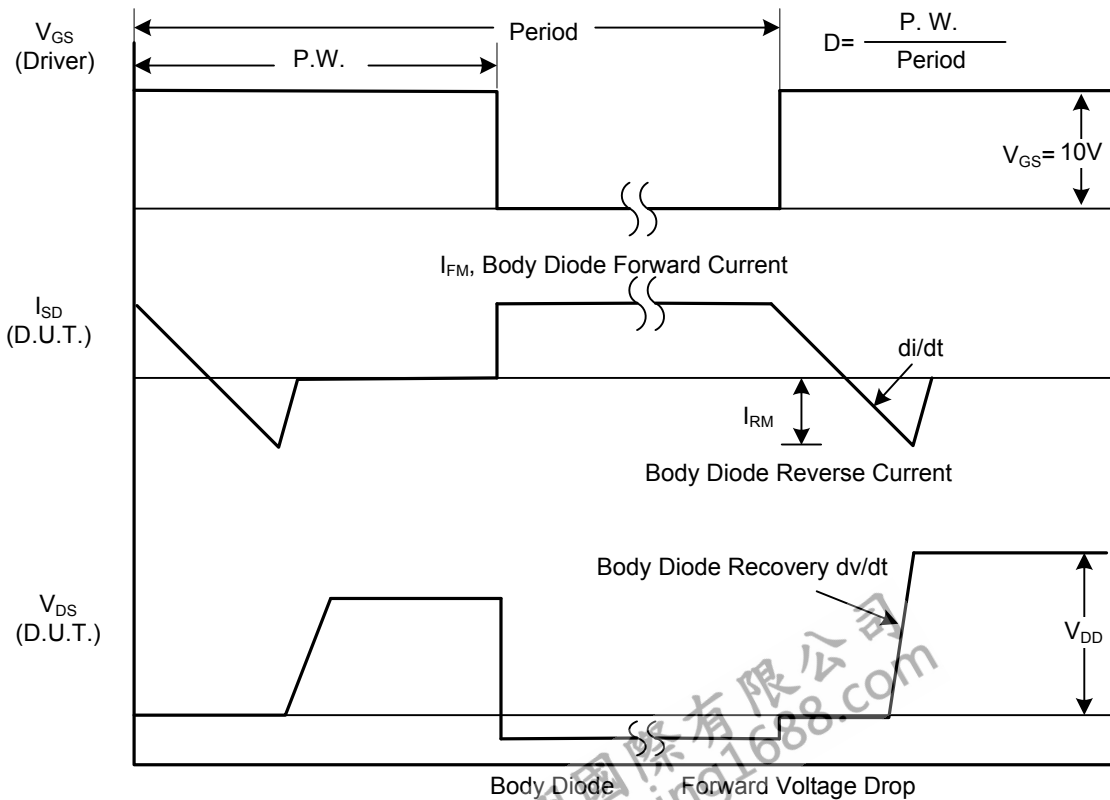
Notes: 1. Pulse Test: Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

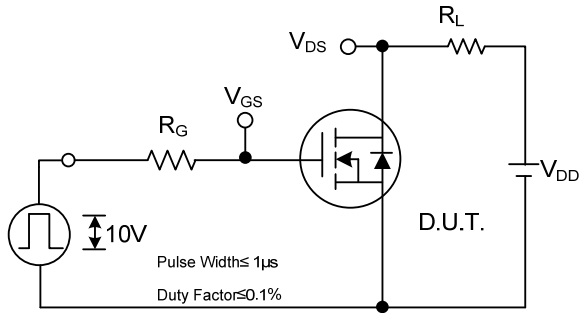


Peak Diode Recovery dv/dt Test Circuit

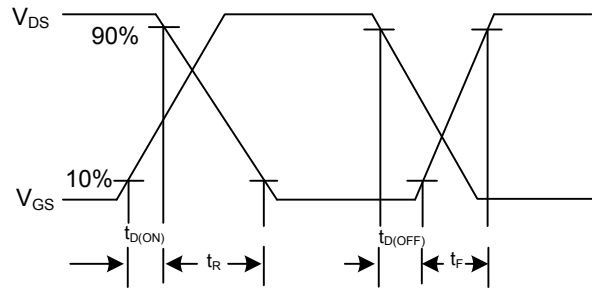


Peak Diode Recovery dv/dt Waveforms

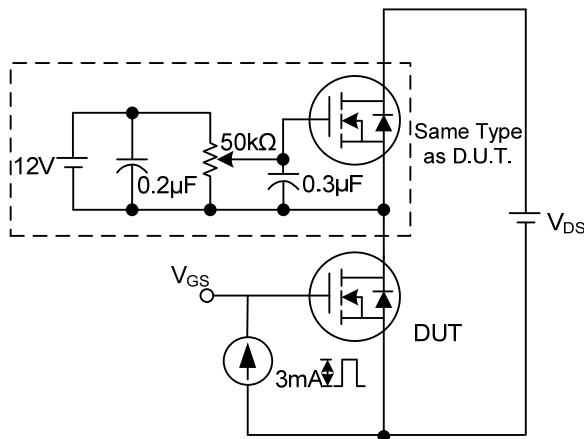
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



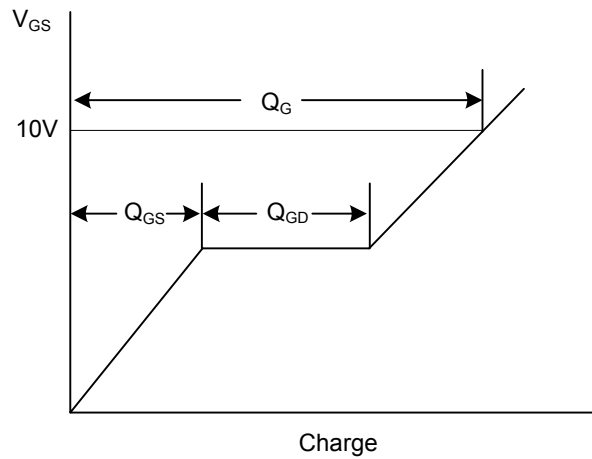
Switching Test Circuit



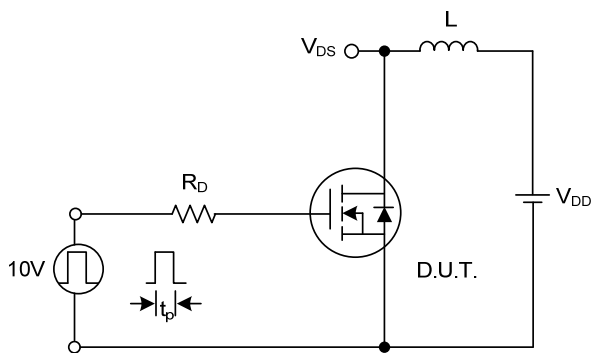
Switching Waveforms



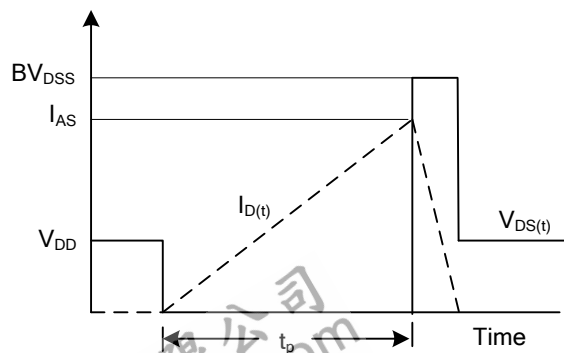
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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