



## 10N60-TC

Power MOSFET

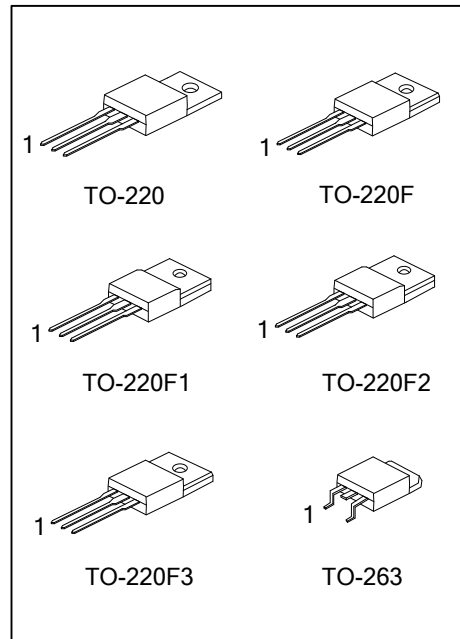
### 10A, 600V N-CANNEL POWER MOSFET

#### DESCRIPTION

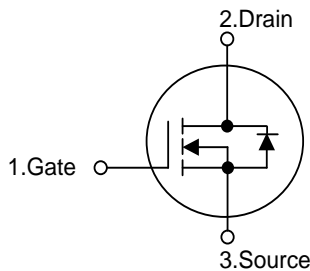
The UTC 10N60-TC is a high voltage and high current power MOSFET, designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

#### FEATURES

- \*  $R_{DS(ON)} \leq 0.8 \Omega @ V_{GS}=10V, I_D=5.0A$
- \* Fast switching
- \* Improved dv/dt capability



#### SYMBOL



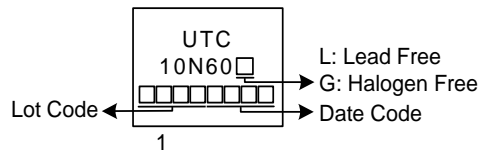
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen-Free		1	2	3	
10N60L-TA3-T	10N60G-TA3-T	TO-220	A	K	A	Tube
10N60L-TF1-T	10N60G-TF1-T	TO-220F1	G	D	S	Tube
10N60L-TF2-T	10N60G-TF2-T	TO-220F2	G	D	S	Tube
10N60L-TF3-T	10N60G-TF3-T	TO-220F	G	D	S	Tube
10N60L-TF3T-T	10N60G-TF3T-T	TO-220F3	G	D	S	Tube
10N60L-TQ2-T	10N60G-TQ2-T	TO-263	G	D	S	Tube
10N60L-TQ2-R	10N60G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>10N60G-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2 TF3: TO-220F, TF3T: TO-220F3, TQ2: TO-263 (3) G: Halogen Free and Lead Free, L: 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
Drain Current	Continuous	$I_D$	10	A
	Pulsed (Note 2)	$I_{DM}$	20	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	799	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.42	V/ns
Power Dissipation	TO-220/TO-263	$P_D$	150	W
	TO-220F/TO-220F1/ TO-220F2/TO-220F3		50	W
Junction Temperature		$T_J$	+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.  $L = 30\text{mH}$ ,  $I_{AS} = 7.3\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$  Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 10\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-263	$\theta_{JC}$	0.83	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1/ TO-220F2/TO-220F3		3.57	$^\circ\text{C}/\text{W}$

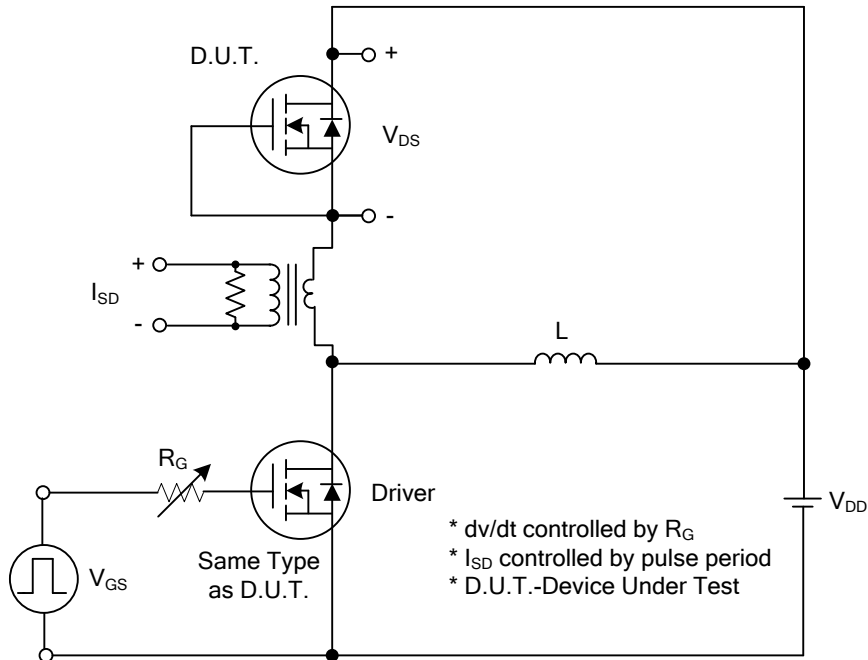
■ **ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	600			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=600V, V_{GS}=0V$			10	$\mu A$
Gate-Source Leakage Current	Forward	$I_{GSS}$			100	nA
	Reverse				-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.0A$			0.8	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=25V, f=1.0\text{ MHz}$		1288		pF
Output Capacitance	$C_{OSS}$			135		pF
Reverse Transfer Capacitance	$C_{RSS}$			6		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=480V, V_{GS}=10V, I_D=10A$ $I_G=1\text{ mA}$ (Note 1, 2)		26		nC
Gate-source Charge	$Q_{GS}$			7.5		nC
Gate-drain Charge	$Q_{GD}$			4		nC
<b>SWITCHING CHARACTERISTICS</b>						
Turn-on Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=100V, V_{GS}=10V, I_D=10A,$ $R_G=25\Omega$ (Note 1, 2)		16		ns
Rise Time	$t_R$			18		ns
Turn-off Delay Time	$t_{D(OFF)}$			68		ns
Fall-Time	$t_F$			34		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				10	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				40	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$V_{GS}=0V, I_S=10A$			1.4	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$V_{GS}=0V, I_S=10A,$ $di_F/dt=100A/\mu s$ (Note1)		400		ns
Reverse Recovery Charge	$Q_{rr}$			4.2		$\mu C$

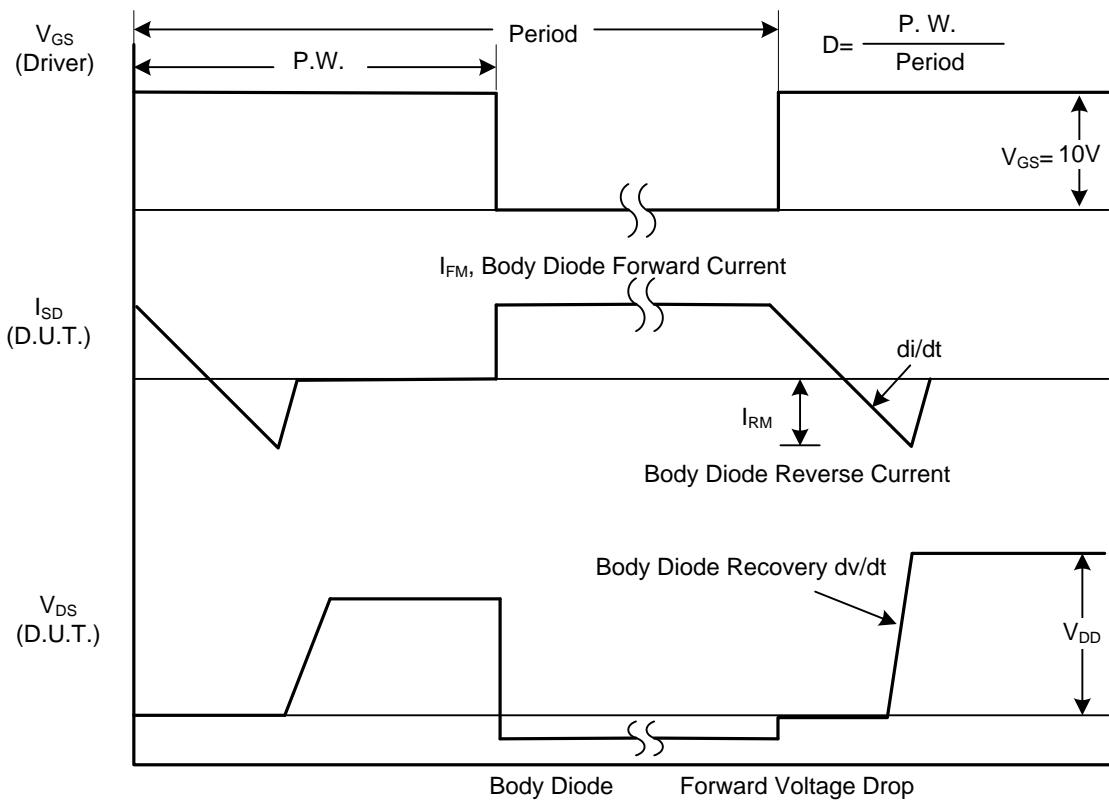
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

## TEST CIRCUITS AND WAVEFORMS

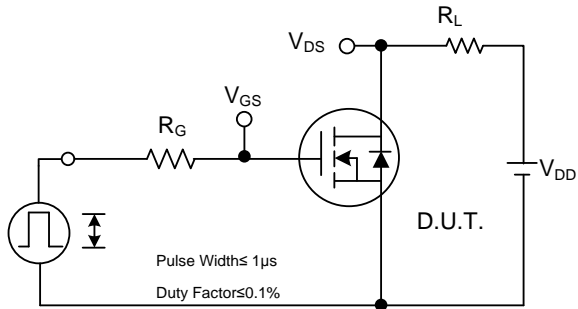


Peak Diode Recovery  $dv/dt$  Test Circuit

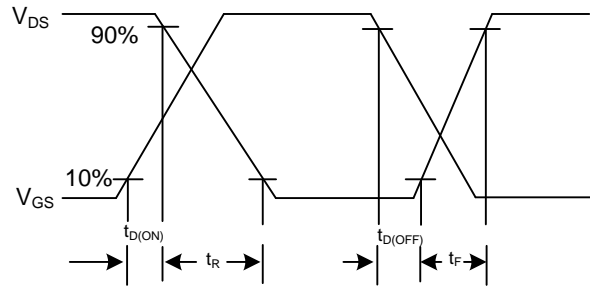


Peak Diode Recovery  $dv/dt$  Waveforms

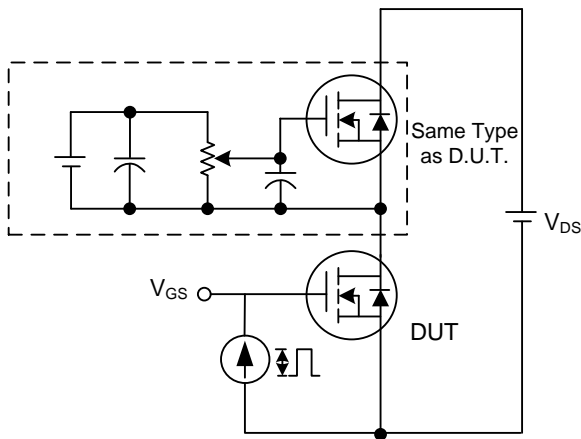
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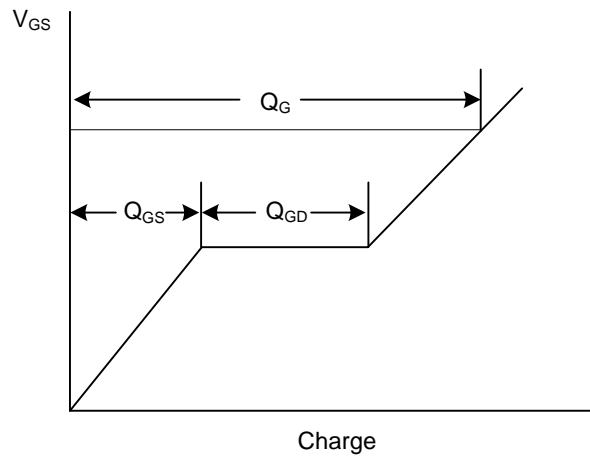
Switching Test Circuit



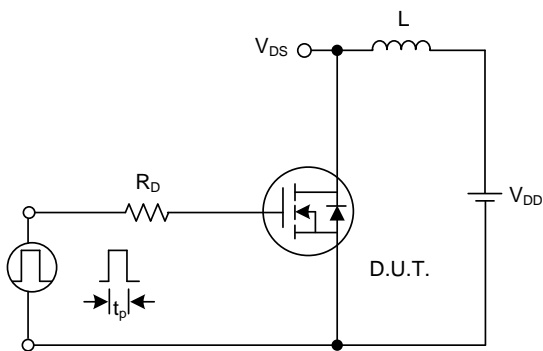
Switching Waveforms



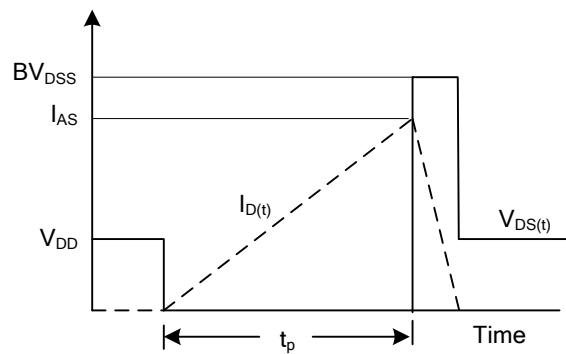
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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