



2N60K-TA

Power MOSFET

2A, 600V N-CHANNEL POWER MOSFET

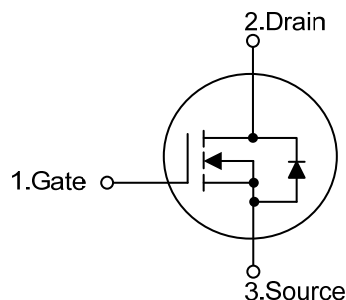
DESCRIPTION

The UTC **2N60K-TA** is a high voltage power MOSFET and is 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

- * $R_{DS(ON)} < 5.0\Omega @ V_{GS} = 10V, I_D = 1A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



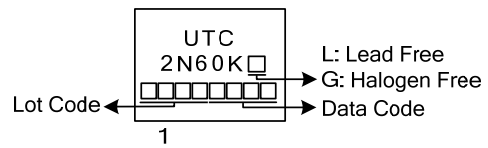
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N60KL-TA3-T	2N60KG-TA3-T	TO-220	G	D	S	Tube
2N60KL-TF3-T	2N60KG-TF3-T	TO-220F	G	D	S	Tube
2N60KL-TF1-T	2N60KG-TF1-T	TO-220F1	G	D	S	Tube
2N60KL-TF2-T	2N60KG-TF2-T	TO-220F2	G	D	S	Tube
2N60KL-TF3T-T	2N60KG-TF3T-T	TO-220F3	G	D	S	Tube
2N60KL-TM3-T	2N60KG-TM3-T	TO-251	G	D	S	Tube
2N60KL-TMS-T	2N60KG-TMS-T	TO-251S	G	D	S	Tube
2N60KL-TN3-R	2N60KG-TN3-R	TO-252	G	D	S	Tape Reel
2N60KL-TND-R	2N60KG-TND-R	TO-252D	G	D	S	Tape Reel

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

2N60KL-TA3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TF3T: TO-220F3, TM3: TO-251 TMS: TO-251S, TN3: TO-252, TND: TO-252D (3) L: Lead Free, G: Halogen Free and Lead Free
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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}	± 30	V
Avalanche Current (Note 2)		I_{AR}	2.0	A
Drain Current	Continuous	I_D	2.0	A
	Pulsed (Note 2)	I_{DM}	8.0	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	85	mJ
	Repetitive (Note 2)	E_{AR}	4.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D	54	W
	TO-220F/TO-220F1		21	W
	TO-220F3			
	TO-220F2		23	W
	TO-251/TO-251S TO-252/TO-252D		44	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. $L=42.5\text{mH}$, $I_{AS}=2.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD}\leq 2.4\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-251/TO-251S TO-252/TO-252D		100	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	2.32	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F3		5.95	$^{\circ}\text{C}/\text{W}$
	TO-220F2		5.43	$^{\circ}\text{C}/\text{W}$
	TO-251/TO-251S TO-252/TO-252D		2.87	$^{\circ}\text{C}/\text{W}$

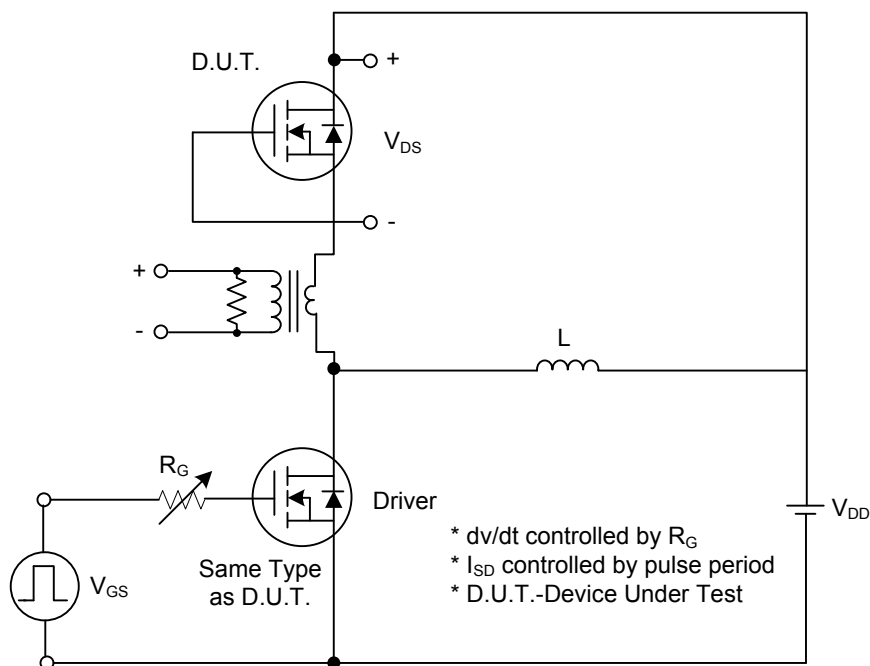
■ **ELECTRICAL CHARACTERISTICS** ($T_C = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
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	μA
			$V_{DS} = 480V, T_C = 125^{\circ}C$			100	μA
Gate-Source Leakage Current	Forward	I_{GSS}	$V_{GS} = 30V, V_{DS} = 0V$			100	nA
	Reverse		$V_{GS} = -30V, V_{DS} = 0V$			-100	nA
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$, Referenced to $25^{\circ}C$		0.4		$V/^{\circ}C$
ON CHARACTERISTICS							
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		$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 1A$		4.0	5.0	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	$V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$		205	290	pF
Output Capacitance		C_{OSS}			40	45	pF
Reverse Transfer Capacitance		C_{RSS}			16	20	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD} = 30V, I_D = 0.5A,$ $R_G = 25\Omega$ (Note 1, 2)		23	40	ns
Turn-On Rise Time		t_R			40	50	ns
Turn-Off Delay Time		$t_{D(OFF)}$			80	100	ns
Turn-Off Fall Time		t_F			40	55	ns
Total Gate Charge		Q_G	$V_{DS} = 50V, V_{GS} = 1.0V,$ $I_D = 1.3A$ (Note 1, 2)		11	13	nC
Gate-Source Charge		Q_{GS}			4.4		nC
Gate-Drain Charge		Q_{GD}			1.3		nC
DRAIN-SOURCE DIODE CHARACTERISTICS							
Drain-Source Diode Forward Voltage		V_{SD}	$V_{GS} = 0V, I_{SD} = 2.0A$			1.4	V
Continuous Drain-Source Current		I_{SD}				2.0	A
Pulsed Drain-Source Current		I_{SM}				8.0	A

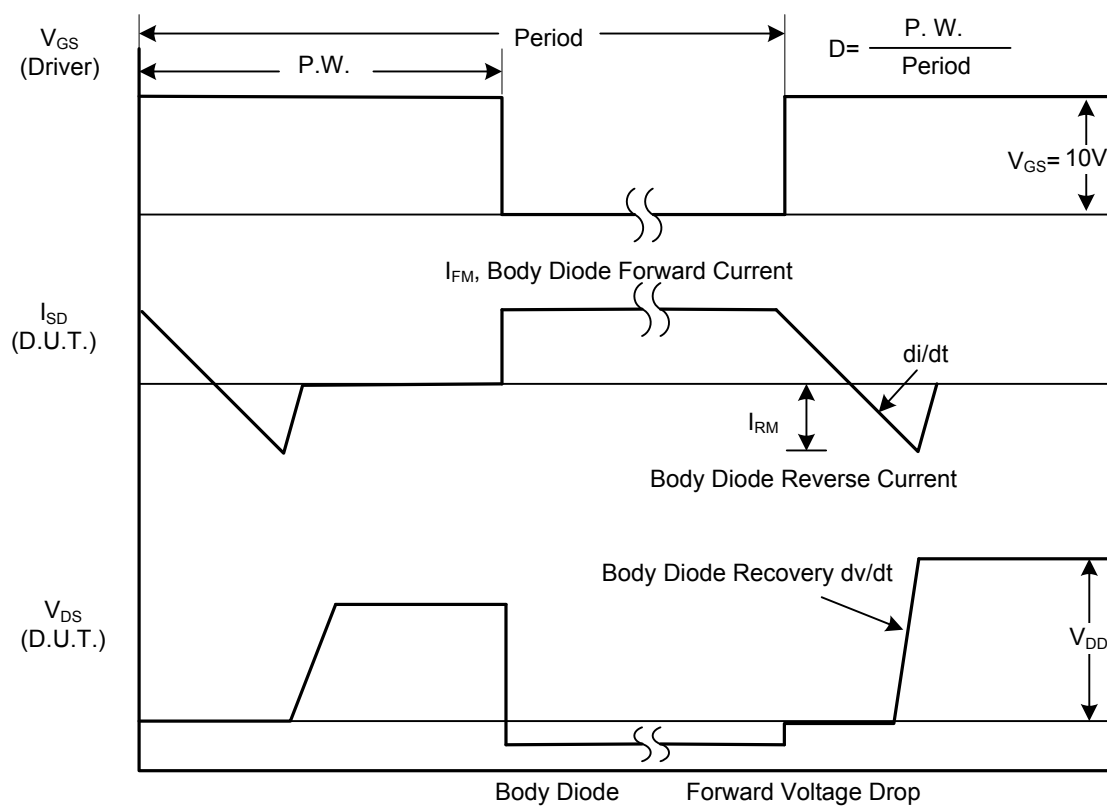
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

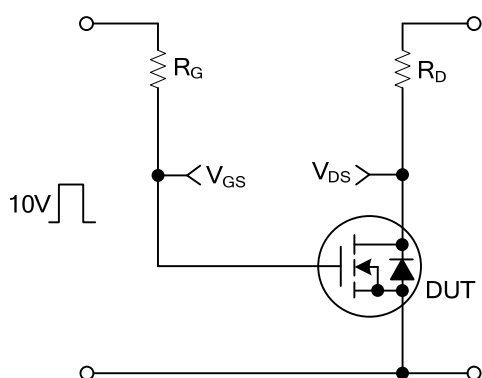


Peak Diode Recovery dv/dt Test Circuit

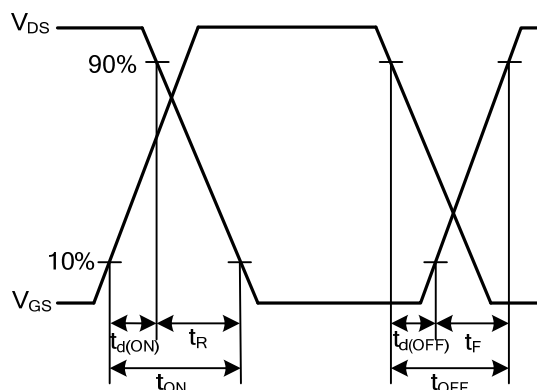


Peak Diode Recovery dv/dt Waveforms

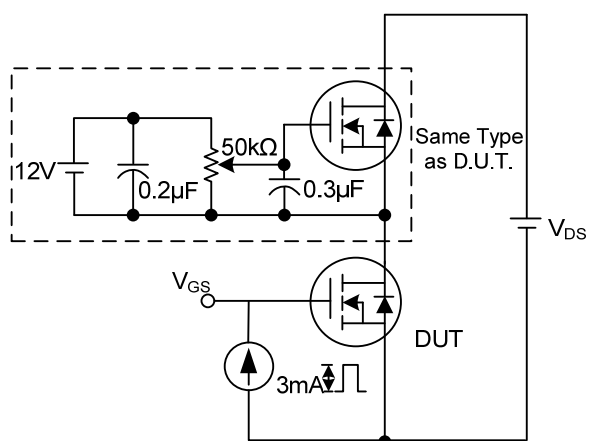
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



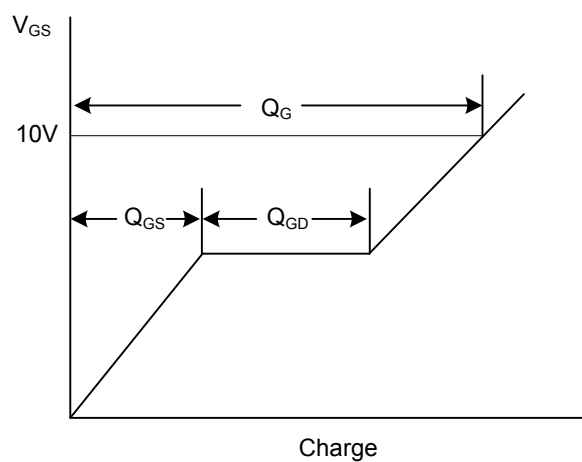
Switching Test Circuit



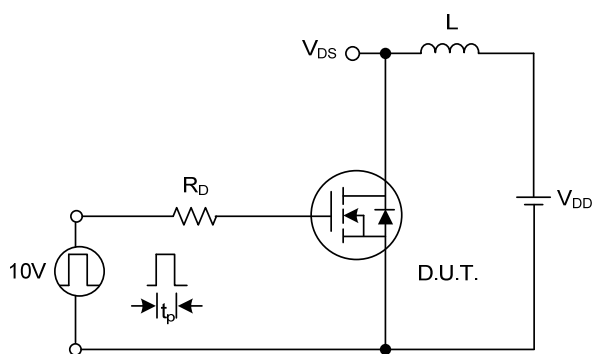
Switching Waveforms



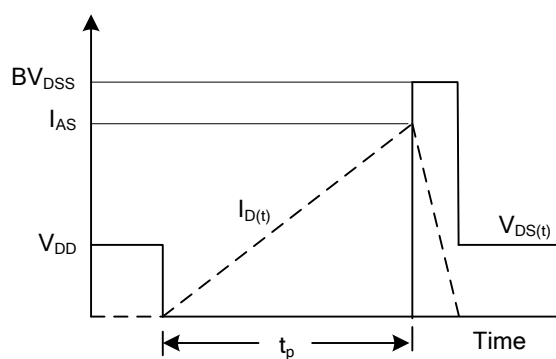
Gate Charge Test Circuit



Gate Charge Waveform

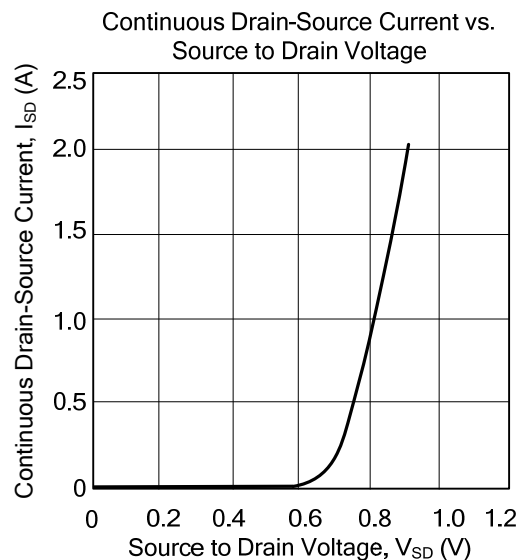
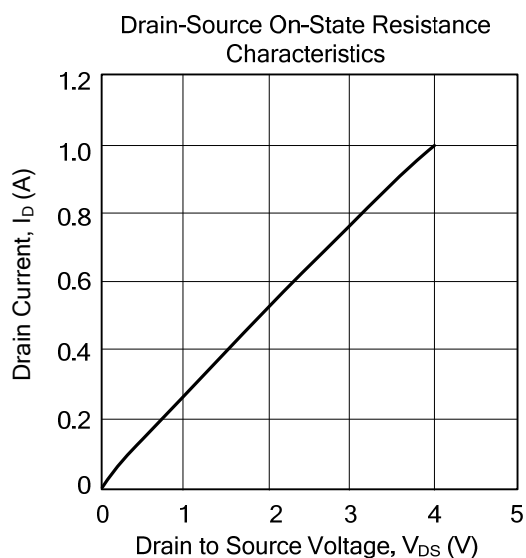
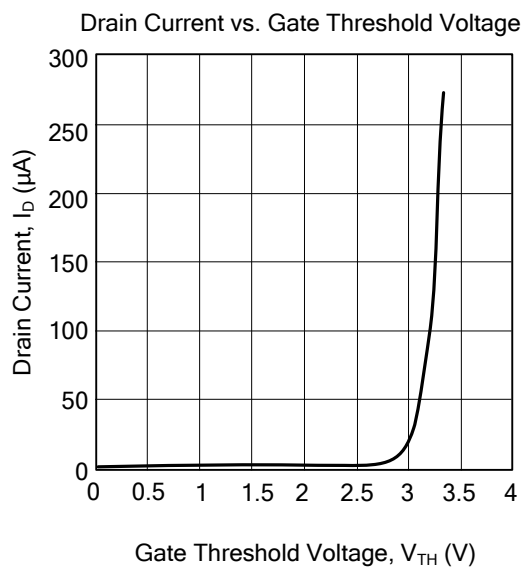
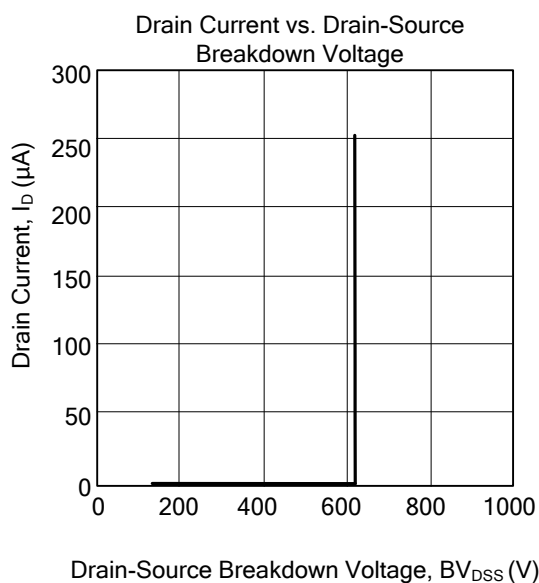


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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