



2N60K-MT

Power MOSFET

2A, 600V N-CHANNEL POWER MOSFET

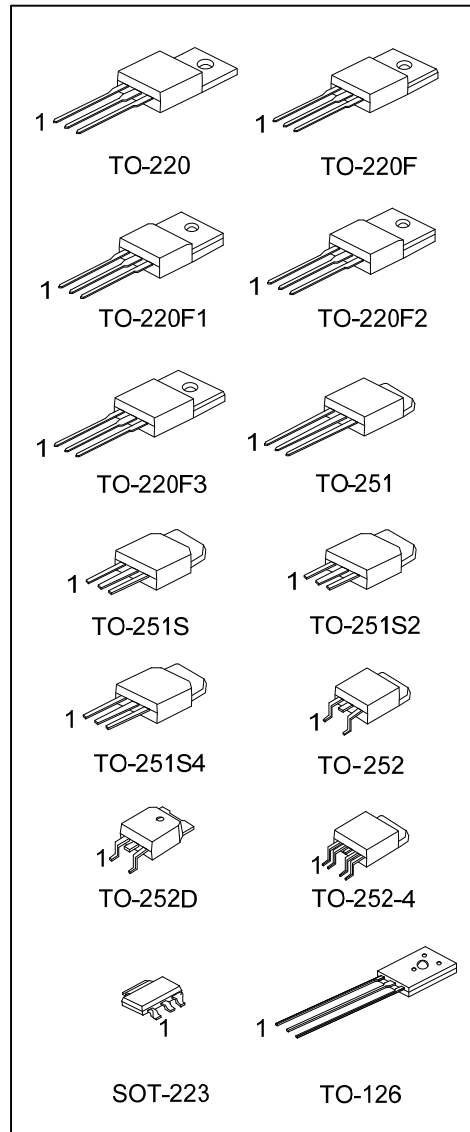
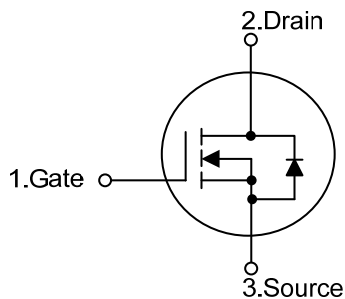
■ DESCRIPTION

The UTC **2N60K-MT** 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	4	5	
2N60KL-AA3-T	2N60KG-AA3-T	SOT-223	G	D	S	-	-	Tape Reel
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-TMS2-T	2N60KG-TMS2-T	TO-251S2	G	D	S	-	-	Tube
2N60KL-TMS4-T	2N60KG-TMS4-T	TO-251S4	G	D	S	-	-	Tube
2N60KL-TN3-R	2N60KG-TN3-R	TO-252	G	D	S	-	-	Tape Reel
2N60KL-TN4-R	2N60KG-TN4-R	TO-252-4	S1	G1	D	S2	G2	Tape Reel
2N60KL-TND-R	2N60KG-TND-R	TO-252D	G	D	S	-	-	Tape Reel
2N60KL-T60-K	2N60KG-T60-K	TO-126	G	D	S	-	-	Bulk

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

2N60KG-AA3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) AA3: SOT-223, 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, T60: TO-126 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

PACKAGE	MARKING
SOT-223	Lot Code ← 1 → Data Code L: Lead Free G: Halogen Free
TO-220 TO-220F TO-220F1 TO-220F2 TO-220F3 TO-251	Lot Code ← 1 → Data Code L: Lead Free G: Halogen Free
TO-251S TO-251S2 TO-251S4 TO-252 TO-252-4 TO-252D	
TO-126	L: Lead Free G: Halogen Free ← 1 → Data Code Lot Code

■ ABSOLUTE MAXIMUM RATINGS (T_C=25°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	SOT-223	P _D	1	W
	TO-220		54	W
	TO-220F/TO-220F1 TO-220F3		21	W
	TO-220F2		23	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252-4 TO-252D		44	W
	TO-126		40	W
Junction Temperature		T _J	+150	°C
Operating Temperature		T _{OPR}	-55 ~ +150	°C
Storage Temperature		T _{STG}	-55 ~ +150	°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=42.5mH, I_{AS}=2.0A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C

4. I_{SD}≤2.4A, di/dt≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ _{JA}	150	°C/W
	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3		62.5	°C/W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252-4 TO-252D		100	°C/W
	TO-126		89	°C/W
Junction to Case	SOT-223	θ _{JC}	14	°C/W
	TO-220		2.32	°C/W
	TO-220F/TO-220F1 TO-220F3		5.95	°C/W
	TO-220F2		5.43	°C/W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252-4 TO-252D		2.87	°C/W
	TO-126		3.12	°C/W

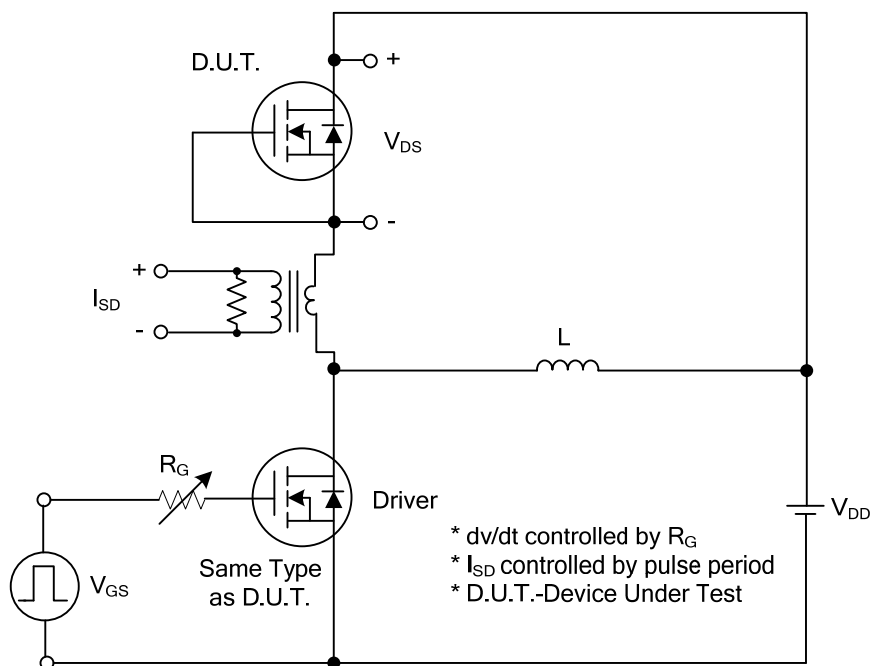
■ **ELECTRICAL CHARACTERISTICS** ($T_C = 25^\circ\text{C}$, unless otherwise specified)

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		$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 1A$		3.9	5.0	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1MHz$		210	290	pF
Output Capacitance		C_{OSS}			31	43	pF
Reverse Transfer Capacitance		C_{RSS}			4.5	6	pF
SWITCHING CHARACTERISTICS							
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
Turn-On Delay Time		$t_{D(ON)}$	$V_{DD} = 30V, I_D = 0.5A,$ $R_G = 25\Omega$ (Note 1, 2)		40	60	ns
Turn-On Rise Time		t_R			30	45	ns
Turn-Off Delay Time		$t_{D(OFF)}$			52	60	ns
Turn-Off Fall Time		t_F			20	35	ns
DRAIN-SOURCE DIODE CHARACTERISTICS							
Continuous Drain-Source Current		I_{SD}				2.0	A
Pulsed Drain-Source Current		I_{SM}				8.0	A
Drain-Source Diode Forward Voltage		V_{SD}	$V_{GS} = 0V, I_{SD} = 2.0A$			1.4	V

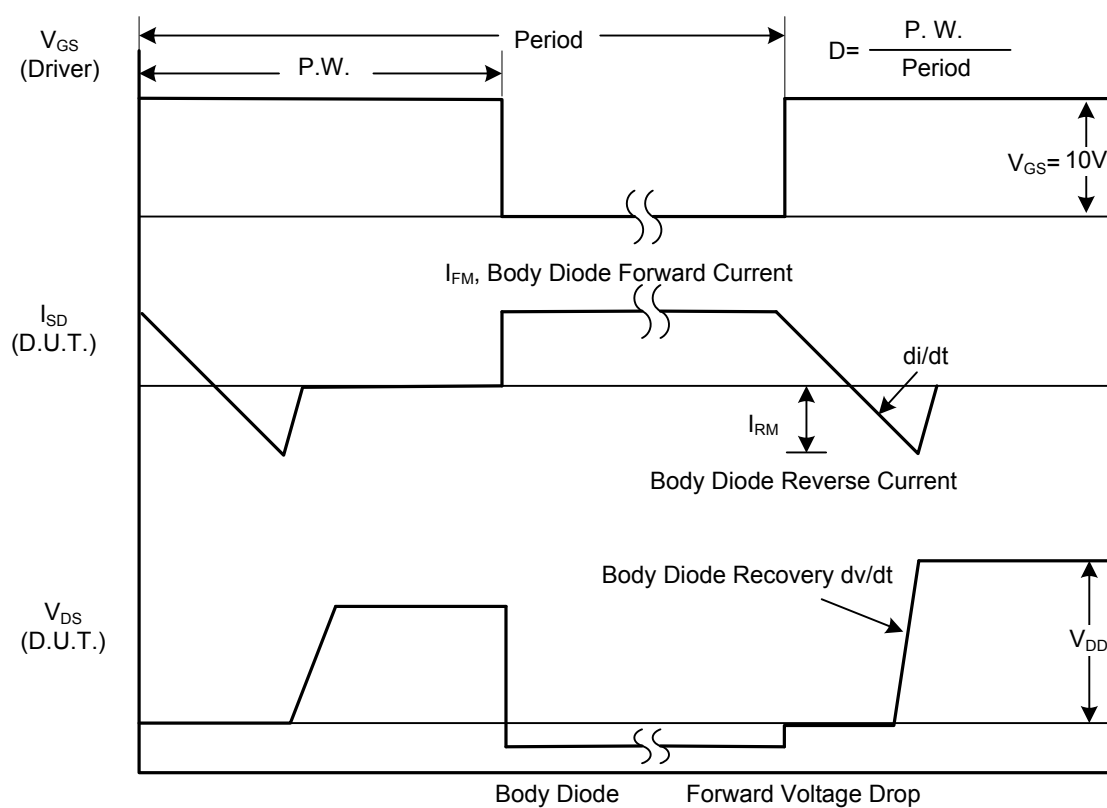
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

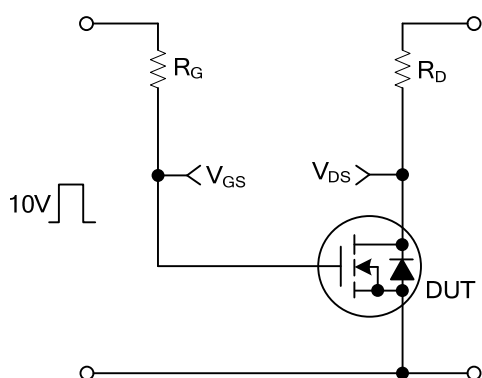


Peak Diode Recovery dv/dt Test Circuit

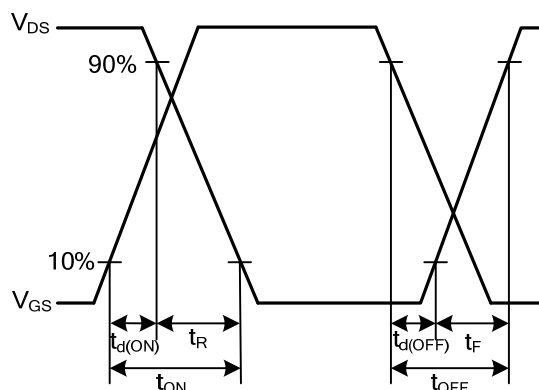


Peak Diode Recovery dv/dt Waveforms

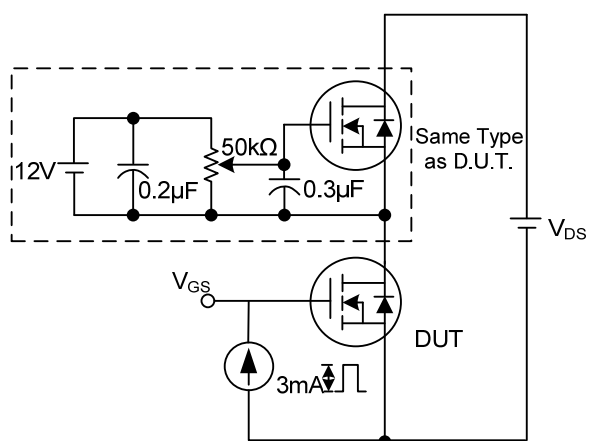
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



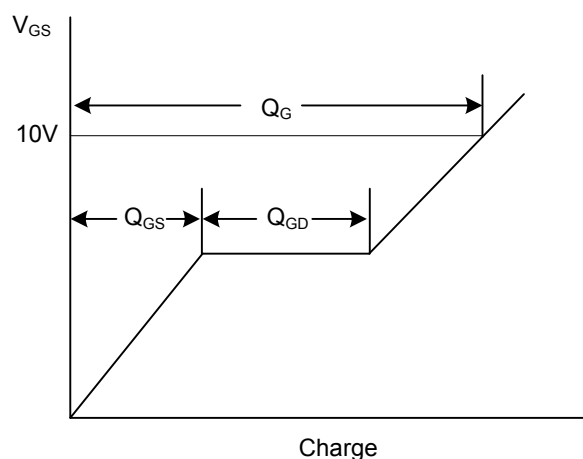
Switching Test Circuit



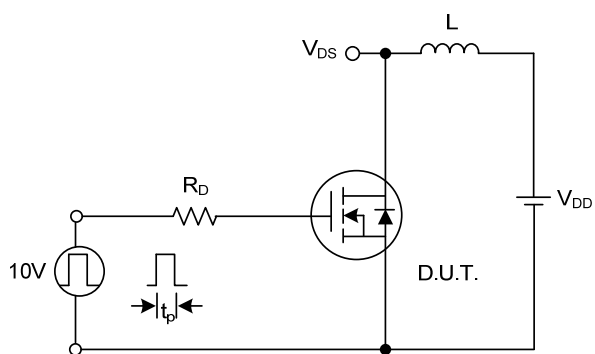
Switching Waveforms



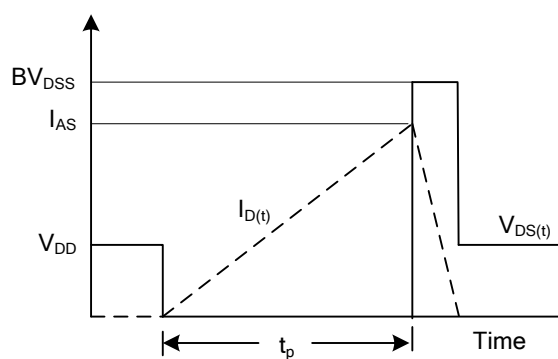
Gate Charge Test Circuit



Gate Charge Waveform

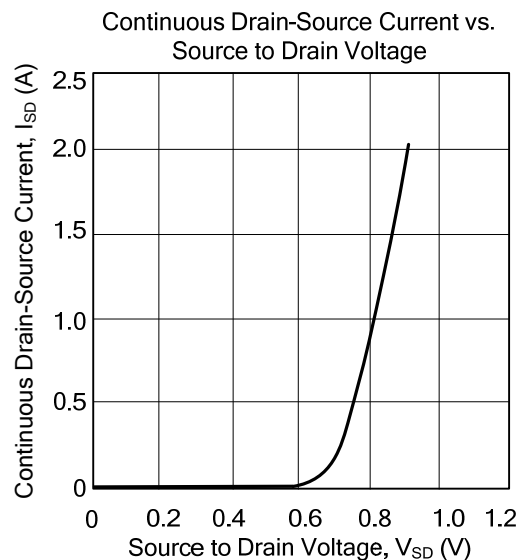
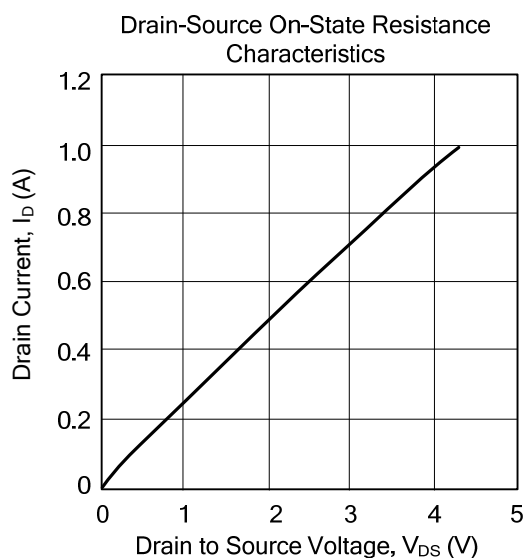
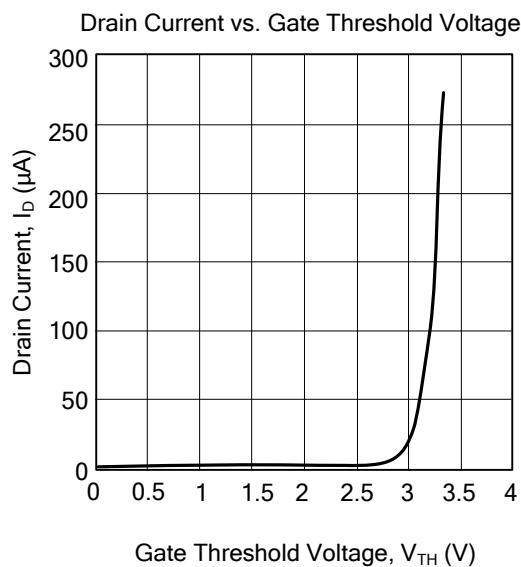
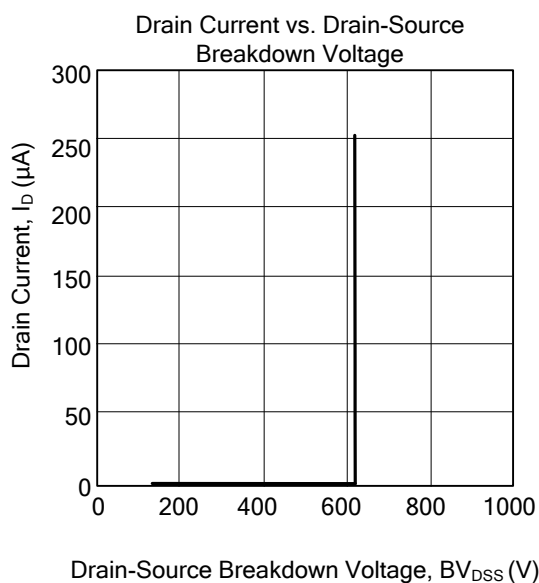


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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