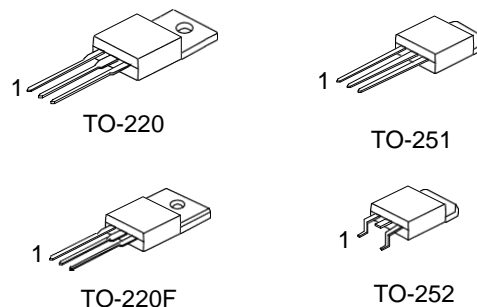


2.0A 600V N-CHANNEL POWER MOSFET

Description:

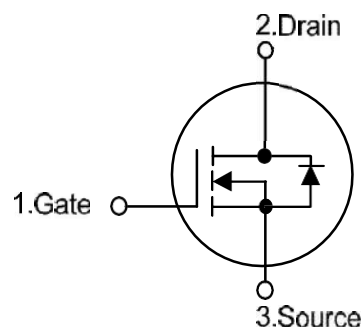
The KWNJ2N60 is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.



Features:

- * $R_{DS(ON)} = 5\Omega @ V_{GS} = 10V$
- * Ultra Low gate charge (typical 9.0nC)
- * Low reverse transfer capacitance ($C_{RSS} =$ typical 5.0 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

■ SYMBOL



• ORDERING INFORMATION

Ordering Number	Package	Pin Assignment			Packing
		1	2	3	
KWNJ2N60-LI	TO-220	G	D	S	Tape Box
KWNJ2N60-BL	TO-220	G	D	S	Bulk
KWNJ2N60F-LI	TO-220F	G	D	S	Tube
KWNJ2N60A-LI	TO-251	G	D	S	Tube
KWNJ2N60D-TR	TO-252	G	D	S	Tape Ree
KWNJ2N60D-LI	TO-252	G	D	S	Tube

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

■ **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}	140	mJ
	Repetitive (Note 2)			
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P_D ($T_C = 25^\circ\text{C}$)	54	W
	TO-220F		22	W
	TO-251		40	W
	TO-252			
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. $L=64\text{mH}$, $I_{AS}=2.0\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

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

■ **THERMAL DATA**

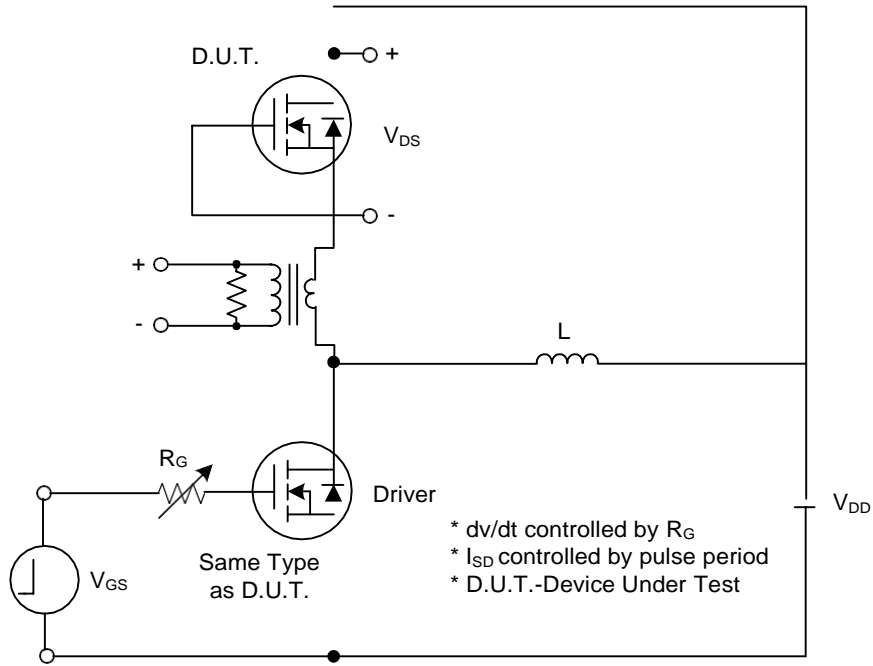
PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-220F		62.5	$^\circ\text{C}/\text{W}$
	TO-251		100	$^\circ\text{C}/\text{W}$
	TO-252			
Junction to Case	TO-220	θ_{JC}	2.32	$^\circ\text{C}/\text{W}$
	TO-220F		5.5	$^\circ\text{C}/\text{W}$
	TO-251		2.87	$^\circ\text{C}/\text{W}$
	TO-252			

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

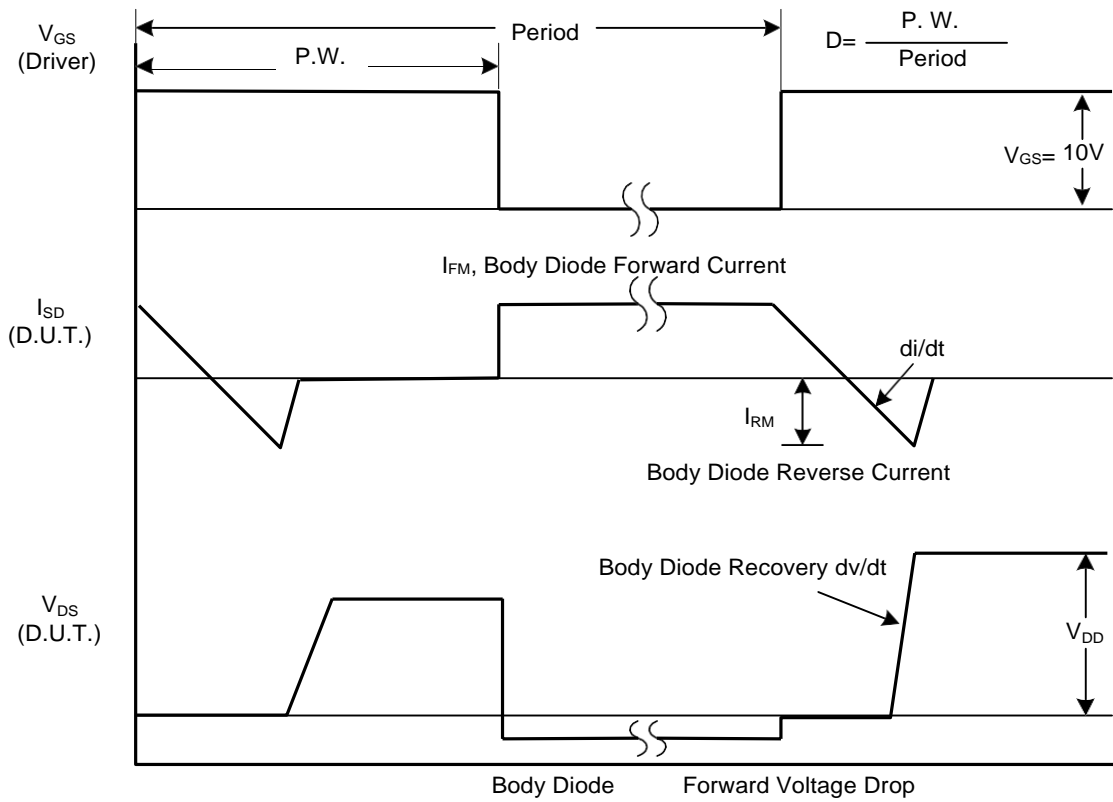
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 600V, V_{GS} = 0V$			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	$V_{GS} = 30V, V_{DS} = 0V$		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°C		0.4		$V/^\circ\text{C}$
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	2N60 $R_{DS(ON)}$	$V_{GS} = 10V, I_D = 1A$		3.6	5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1\text{MHz}$		270	350	pF
Output Capacitance	C_{OSS}			40	50	pF
Reverse Transfer Capacitance	C_{RSS}			5	7	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	2N60 $t_{D(ON)}$	$V_{DD} = 300V, I_D = 2.4A,$ $R_G = 25\Omega$ (Note 1, 2)		10	30	ns
Turn-On Rise Time	t_R			40	60	ns
Turn-Off Delay Time	2N60 $t_{D(OFF)}$			20	50	ns
Turn-Off Fall Time	t_F			50	60	ns
Total Gate Charge	Q_G	$V_{DS} = 480V, V_{GS} = 10V,$ $I_D = 2.4A$ (Note 1, 2)		9.0	11	nC
Gate-Source Charge	Q_{GS}			1.6		nC
Gate-Drain Charge	Q_{GD}			4.3		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
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V, I_{SD} = 2.4A,$ $di/dt = 100A/\mu s$ (Note 1)		180		ns
Reverse Recovery Charge	Q_{RR}			0.72		μC

Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
 2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

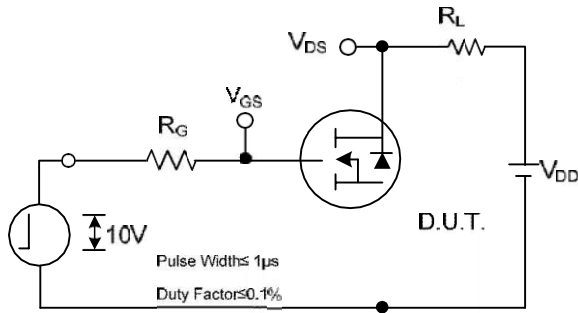


Peak Diode Recovery dv/dt Test Circuit

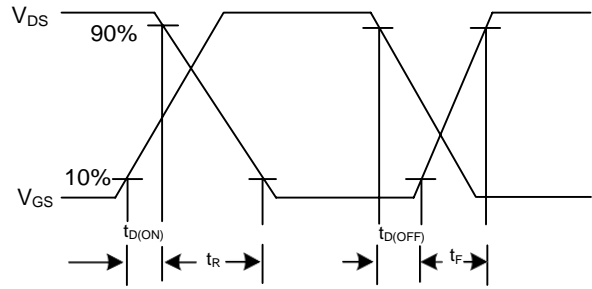


Peak Diode Recovery dv/dt Waveforms

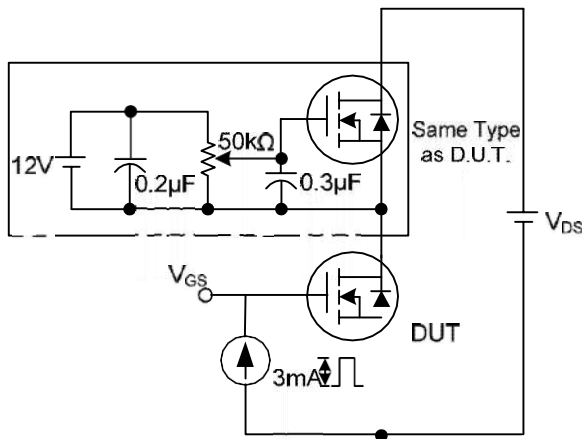
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



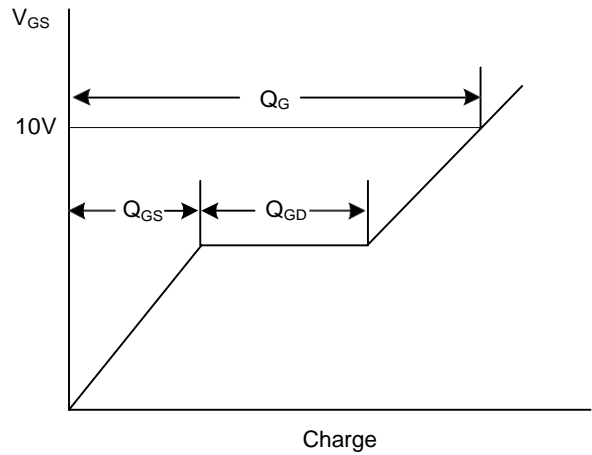
Switching Test Circuit



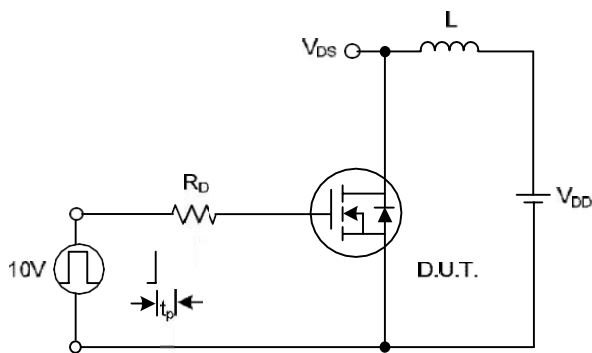
Switching Waveforms



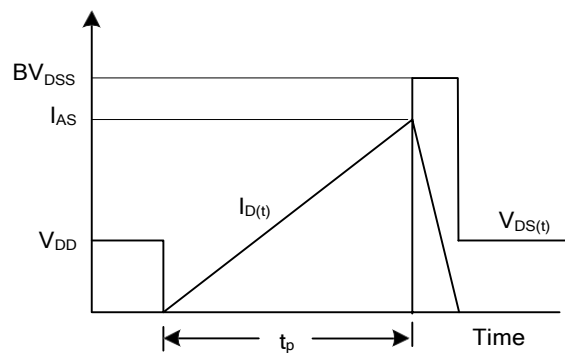
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ **TYPICAL CHARACTERISTICS**

