

# NJ2N60 POWER MOSFET

## 2.0A 600V N-CHANNEL POWER MOSFET



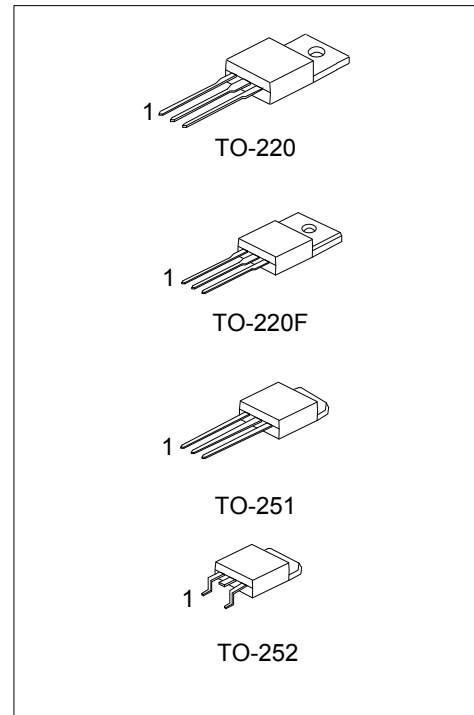
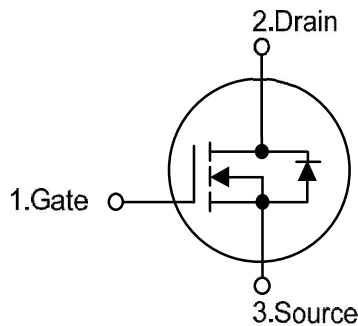
### DESCRIPTION

The NJ2N60 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	
NJ2N60-LI	TO-220	G	D	S	Tape Box
NJ2N60-BL	TO-220	G	D	S	Bulk
NJ2N60F-LI	TO-220F	G	D	S	Tube
NJ2N60A-LI	TO-251	G	D	S	Tube
NJ2N60D-TR	TO-252	G	D	S	Tape Ree
NJ2N60D-LI	TO-252	G	D	S	Tube

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

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## ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	600	V
Gate-Source Voltage		V <sub>GSS</sub>	±30	V
Avalanche Current (Note 2)		I <sub>AR</sub>	2.0	A
Drain Current	Continuous	I <sub>D</sub>	2.0	A
	Pulsed (Note 2)	I <sub>DM</sub>	8.0	A
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	140	mJ
	Repetitive (Note 2)		4.5	
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220	P <sub>D</sub> (T <sub>C</sub> = 25°C)	54	W
	TO-220F		22	W
	TO-251		40	W
	TO-252			
Junction Temperature		T <sub>J</sub>	+150	°C
Operating Temperature		T <sub>OPR</sub>	-55 ~ +150	°C
Storage Temperature		T <sub>STG</sub>	-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<sub>J</sub>

3. L=64mH, I<sub>AS</sub>=2.0A, V<sub>DD</sub>=50V, R<sub>G</sub>=25 Ω, Starting T<sub>J</sub> = 25°C

4. I<sub>SD</sub>≤2.4A, di/dt≤200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C

## ■ THERMAL DATA

PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ <sub>JA</sub>	62.5	°C/W
	TO-220F		62.5	°C/W
	TO-251 TO-252		100	°C/W
Junction to Case	TO-220	θ <sub>Jc</sub>	2.32	°C/W
	TO-220F		5.5	°C/W
	TO-251 TO-252		2.87	°C/W

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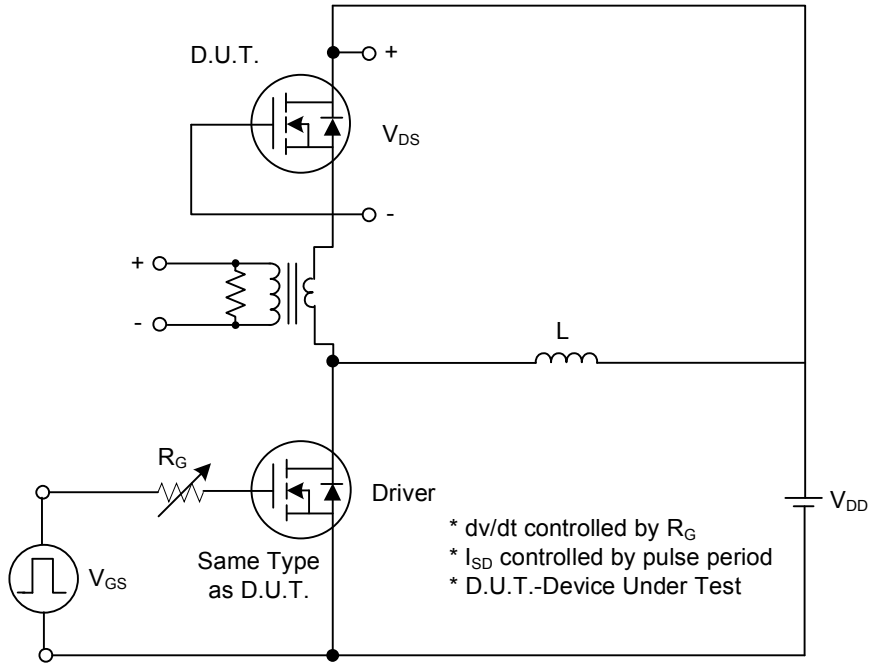
## ■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	600			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V			10	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub> V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V			100	nA
	Reverse		V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V			-100
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA, Referenced to 25°C		0.4		V/°C
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0		4.0	V
Static Drain-Source On-State Resistance	2N60 R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 1A		3.6	5	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1MHz		270	350	pF
Output Capacitance	C <sub>OSS</sub>			40	50	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			5	7	pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	2N60 t <sub>D(ON)</sub>	V <sub>DD</sub> = 300V, I <sub>D</sub> = 2.4A, R <sub>G</sub> = 25Ω (Note 1, 2)		10	30	ns
Turn-On Rise Time	t <sub>r</sub>			40	60	ns
Turn-Off Delay Time	t <sub>D(OFF)</sub>			20	50	ns
Turn-Off Fall Time	2N60 t <sub>f</sub>			50	60	ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> = 480V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.4A (Note 1, 2)		9.0	11	nC
Gate-Source Charge	Q <sub>GS</sub>			1.6		nC
Gate-Drain Charge	Q <sub>GD</sub>			4.3		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 2.0A			1.4	V
Continuous Drain-Source Current	I <sub>SD</sub>				2.0	A
Pulsed Drain-Source Current	I <sub>SM</sub>				8.0	A
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> = 0V, I <sub>SD</sub> = 2.4A, di/dt = 100 A/μs (Note 1)		180		ns
Reverse Recovery Charge	Q <sub>RR</sub>			0.72		μC

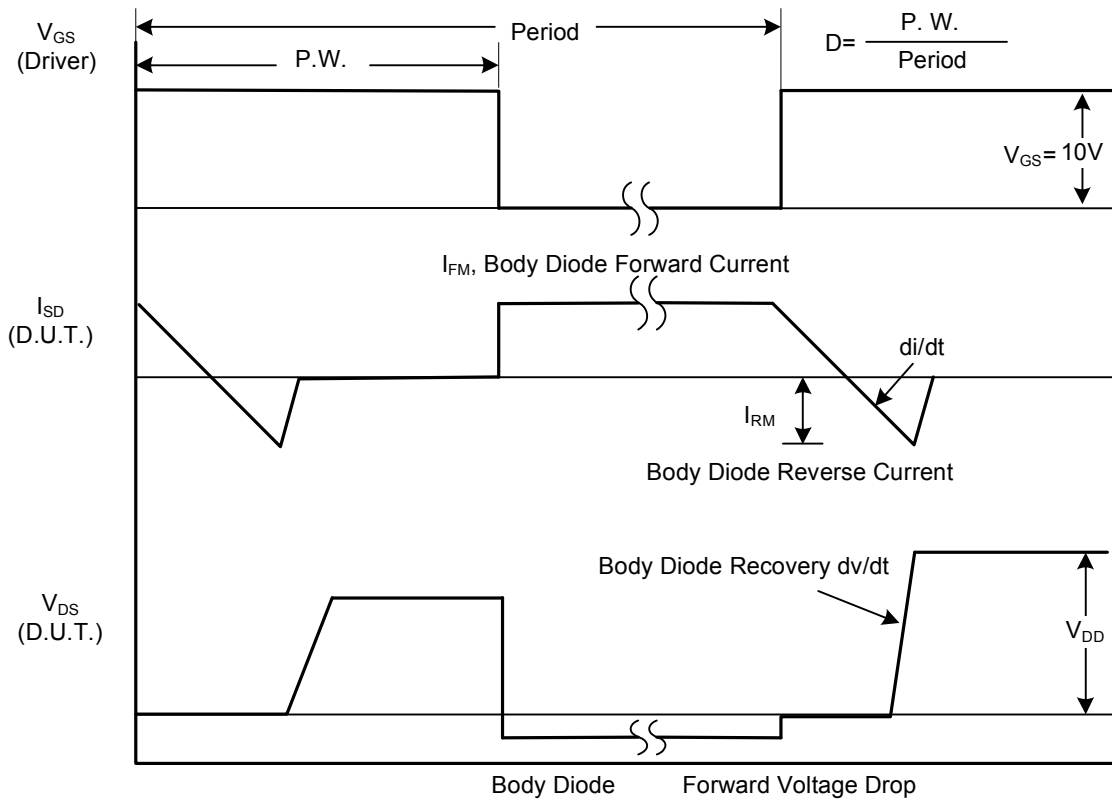
- Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%  
 2. Essentially independent of operating temperature

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## ■ TEST CIRCUITS AND WAVEFORMS



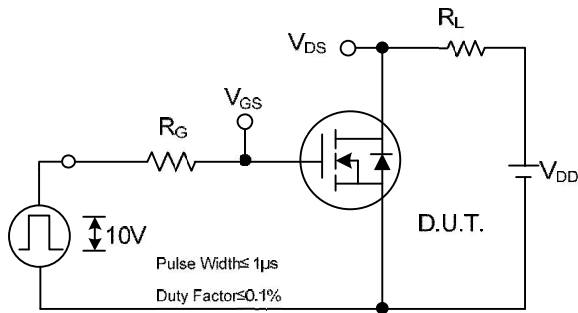
**Peak Diode Recovery  $dv/dt$  Test Circuit**



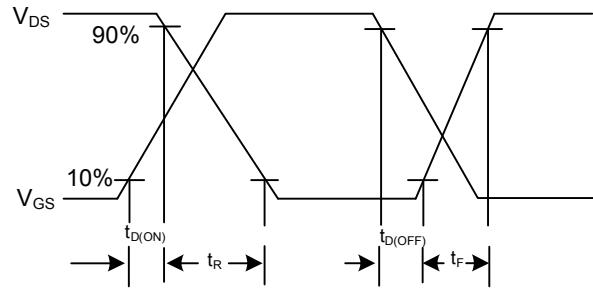
**Peak Diode Recovery  $dv/dt$  Waveforms**

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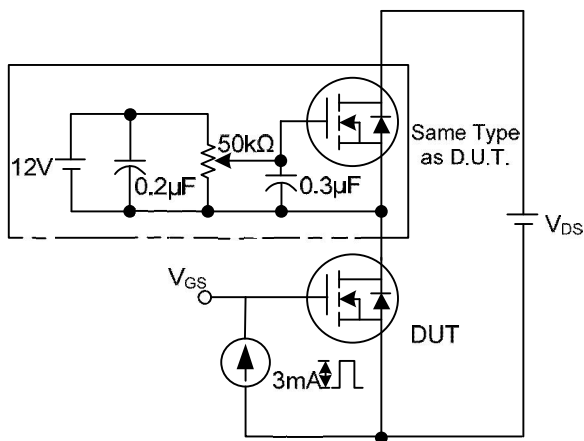
## ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



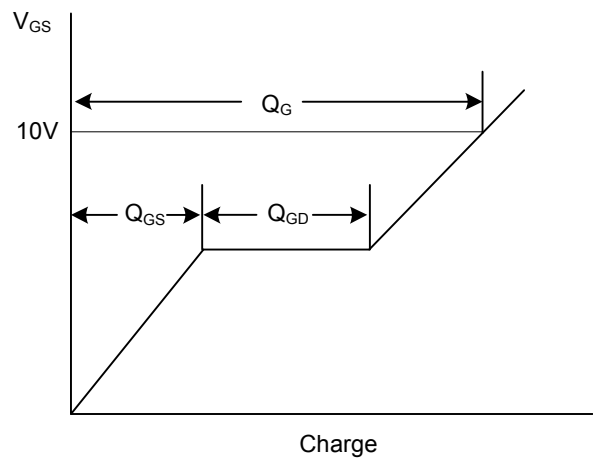
Switching Test Circuit



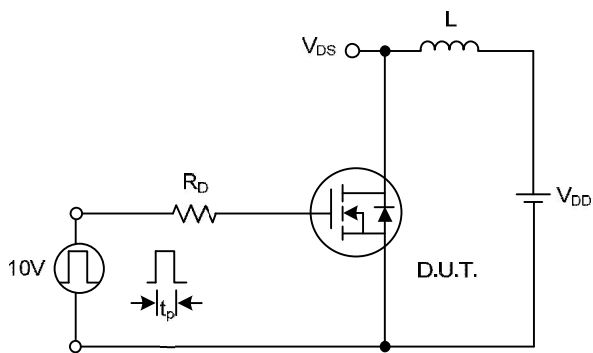
Switching Waveforms



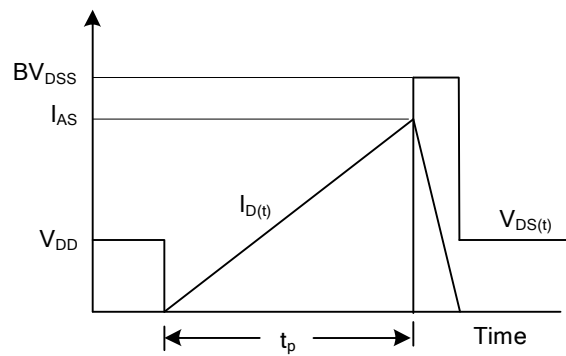
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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## ■ TYPICAL CHARACTERISTICS

