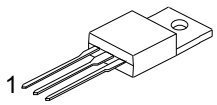
NJ2N60 POWER MOSFET

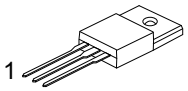
2.0A 600V N-CHANNEL POWER MOSFET

■ DESCRIPTION

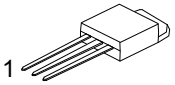
The NJ**2N60** is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.



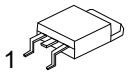
TO-220



TO-220F



TO-251

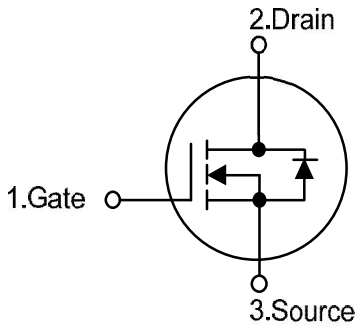


TO-252

■ FEATURES

* $R_{DS(ON)}$ = 5Ω@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

NJ2N60 POWER MOSFET

■ 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)	2N60	E_{AS}	140	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 (T_C = 25°C)	54	W
	TO-220F			22	W
	TO-251 TO-252			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=64mH, 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	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	°C/W
	TO-220F		62.5	°C/W
	TO-251 TO-252		100	°C/W
Junction to Case	TO-220	θ_{Jc}	2.32	°C/W
	TO-220F		5.5	°C/W
	TO-251 TO-252		2.87	°C/W

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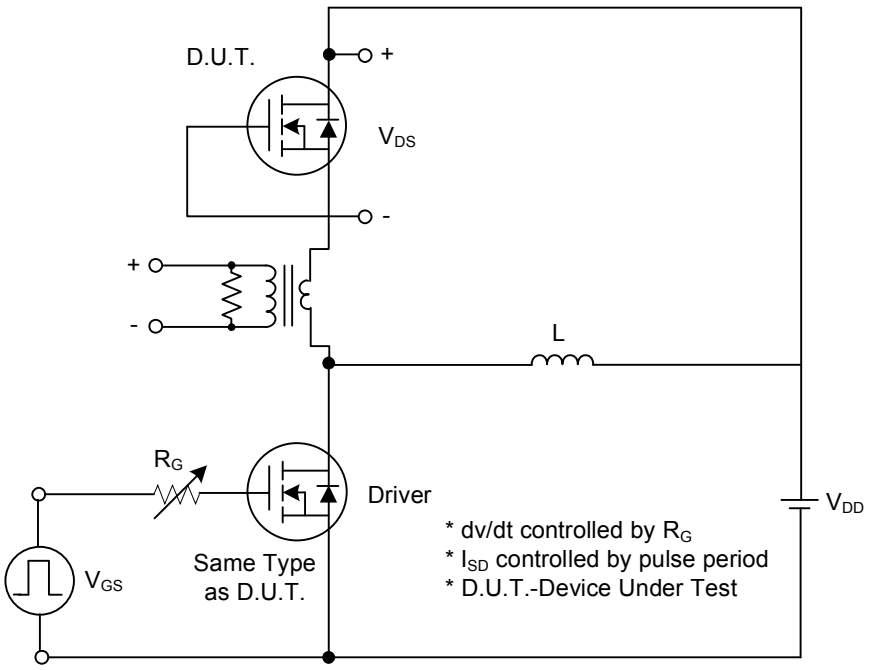
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

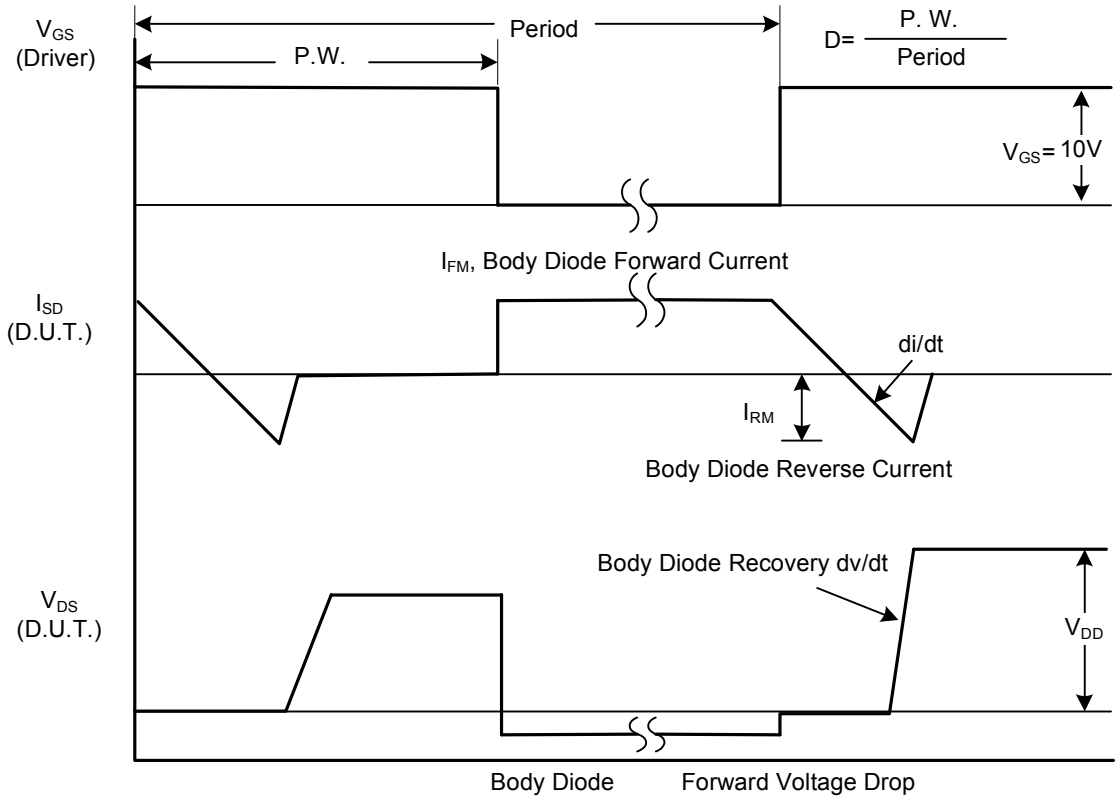
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 600V, V_{GS} = 0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V			100	nA
	Reverse		V_{GS} = -30V, V_{DS} = 0V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D=250μA, Referenced to 25°C		0.4		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	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 =1MHz		270	350	pF
Output Capacitance		C_{OSS}			40	50	pF
Reverse Transfer Capacitance		C_{RSS}			5	7	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D\ (ON)}$	V_{DD} =300V, I_D =2.4A, R_G=25Ω (Note 1, 2)		10	30	ns
Turn-On Rise Time	2N60	t_R			40	60	ns
Turn-Off Delay Time		$t_{D(OFF)}$			20	50	ns
Turn-Off Fall Time	2N60	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} = 0 V, I_{SD} = 2.0 A			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} = 0 V, I_{SD} = 2.4A, di/dt = 100 A/μs (Note 1)		180		ns
Reverse Recovery Charge		Q_{RR}			0.72		μC

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

■ TEST CIRCUITS AND WAVEFORMS

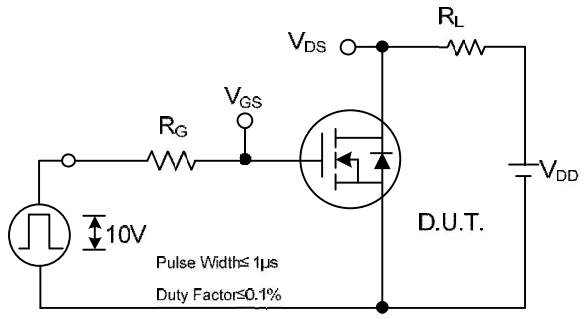


Peak Diode Recovery dv/dt Test Circuit

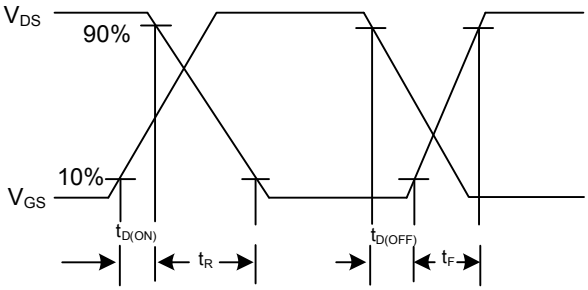


Peak Diode Recovery dv/dt Waveforms

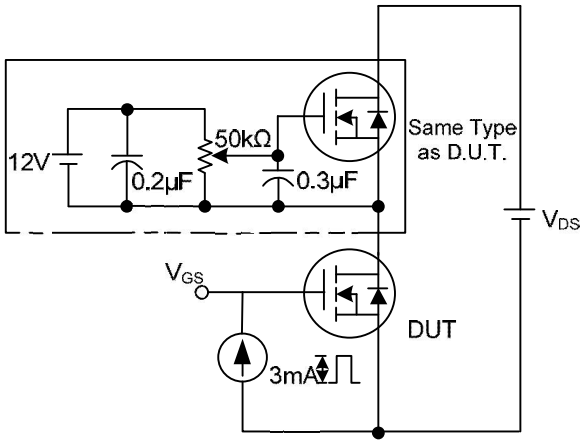
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



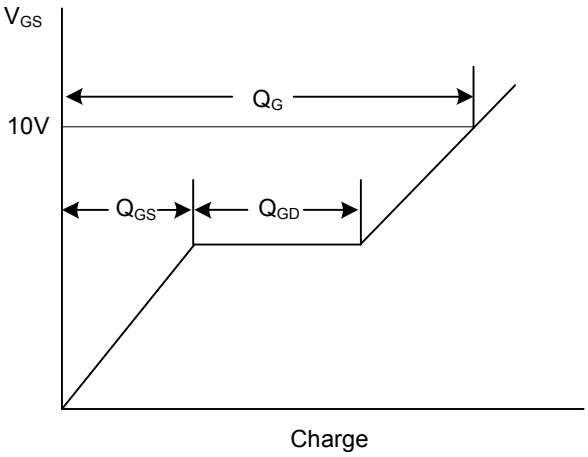
Switching Test Circuit



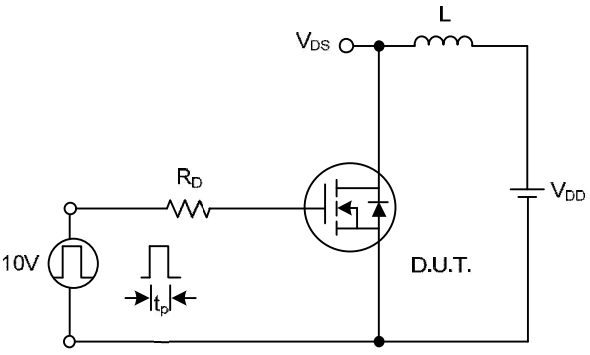
Switching Waveforms



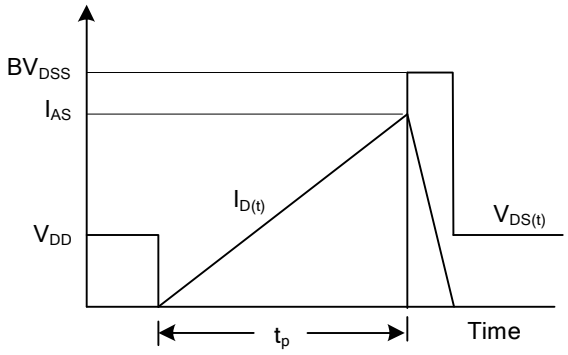
Gate Charge Test Circuit



Gate Charge Waveform



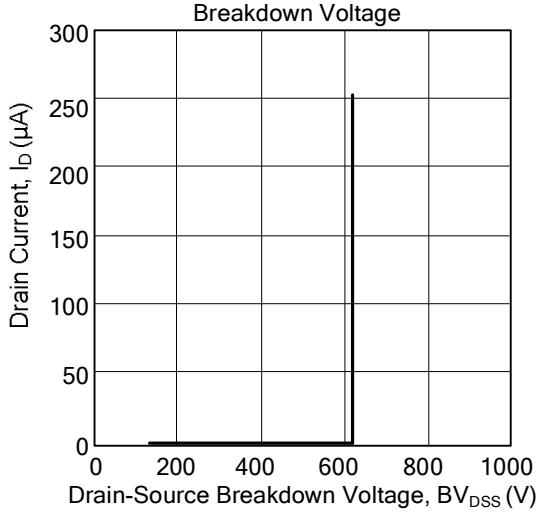
Unclamped Inductive Switching Test Circuit



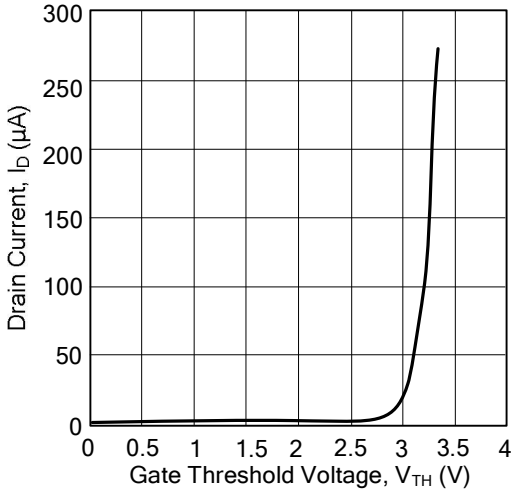
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

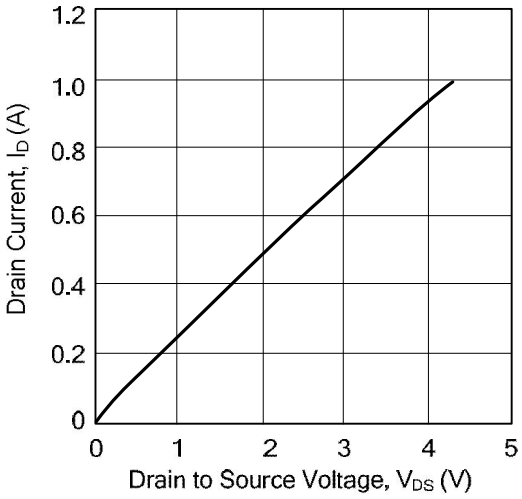
Drain Current vs. Drain-Source Breakdown Voltage



Drain Current vs. Gate Threshold Voltage



Drain-Source On-State Resistance Characteristics



Drain Current vs. Source to Drain Voltage