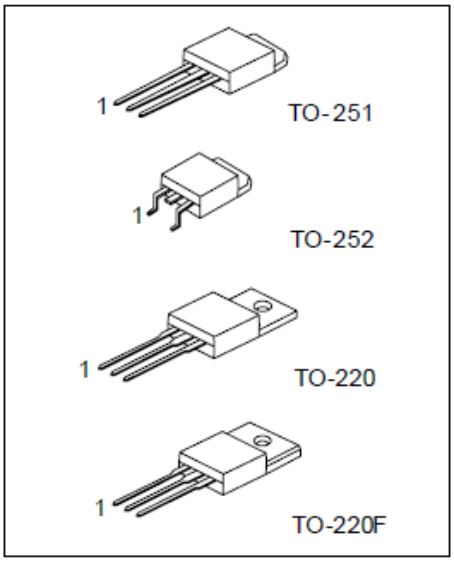
4.5 Amps, 600 Volts N-CHANNEL MOSFET



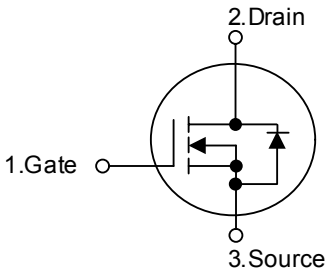
■ DESCRIPTION

The YR 5N60 is a high voltage 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

* $R_{DS(ON)}$ = 2.5Ω @V_{GS} = 10 V
* Ultra low gate charge (typical 15 nC)
* Low reverse transfer Capacitance (C_{RSS} = typical 6.5 pF)
* Fast switching capability
* Avalanche energy Specified
* Improved dv/dt capability, high ruggedness

■ SYMBOL



■ ABSOLUTE MAXIMUM RATING (T_C = 25℃ unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	±20	V
Avalanche Current (Note 1)		I_{AR}	4.5	A
Continuous Drain Current	T_C = 25℃	I_D	4.5	A
	T_C = 100℃		2.6	A
Pulsed Drain Current (Note 1)		I_{DM}	18	A
Avalanche Energy, Single Pulsed (Note 2)		E_{AS}	210	mJ
Avalanche Energy, Repetitive Limited by $T_{J(MAX)}$		E_{AR}	10	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	V/ns
Power Dissipation	T_C = 25℃	P_D	100	W
	Derate above 25℃		0.8	W/℃
Junction Temperature		T_J	+150	℃
Operating and Storage Temperature		T_{STG}	-55 ~ +150	℃

Note 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.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction-to-Ambient	θ_{JA}	62.5	°C/W
Junction-to-Case	θ_{JC}	1.25	°C/W
Case-to-Sink	θ_{CS}	0.5	°C/W

■ ELECTRICAL CHARACTERISTICS (T_C = 25℃ 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			1	μA
			V_{DS} =480V, T_C = 125℃			10	μA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D =250μA, Referenced to 25℃		0.6		V/℃
Gate-Body Leakage Current	Forward	I_{GSS}	V_{GS} =20V, V_{DS} = 0V			100	nA
	Reverse		V_{GS} =-20V, V_{DS} = 0V			-100	nA
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} =V_{GS}, I_D = 250μA	2.0		4.0	V
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS} =10V, I_D = 2.25A		2.0	2.5	Ω
Forward Transconductance		g_{FS}	V_{DS} =40V, I_D = 2.25A (Note 4)		4.7		S
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz		515	670	pF
Output Capacitance		C_{OSS}			55	72	pF
Reverse Transfer Capacitance		C_{RSS}			6.5	8.5	pF
Switching Characteristics							
Turn-On	Delay Time	$t_{D(ON)}$	V_{DD} = 300V, I_D =4.5 A, R_G = 25Ω (Note 4, 5)		10	30	ns
	Rise Time	t_R			42	90	ns
Turn-Off	Delay Time	$t_{D(OFF)}$			38	85	ns
	Fall Time	t_F			46	100	ns
Total Gate Charge		Q_G	V_{DS} = 480 V, I_D = 4.5A, V_{GS} = 10 V (Note 4, 5)		15	19	nC
Gate-Source Charge		Q_{GS}			2.5		nC
Gate-Drain Charge		Q_{GD}			6.6		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, I_S = 4.5 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S				4.5	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				18	A
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_S = 4.5 A,		300		ns
Reverse Recovery Charge	Q_{RR}	d_{IF} / dt = 100 A/μs (Note 4)		2.2		μC

Note 1. Repetitive Rating : Pulse width limited by T_J

2. L = 18.9mH, I_{AS} = 4.5 A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25℃

3. I_{SD} ≤ 4.5A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25℃

4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

5. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

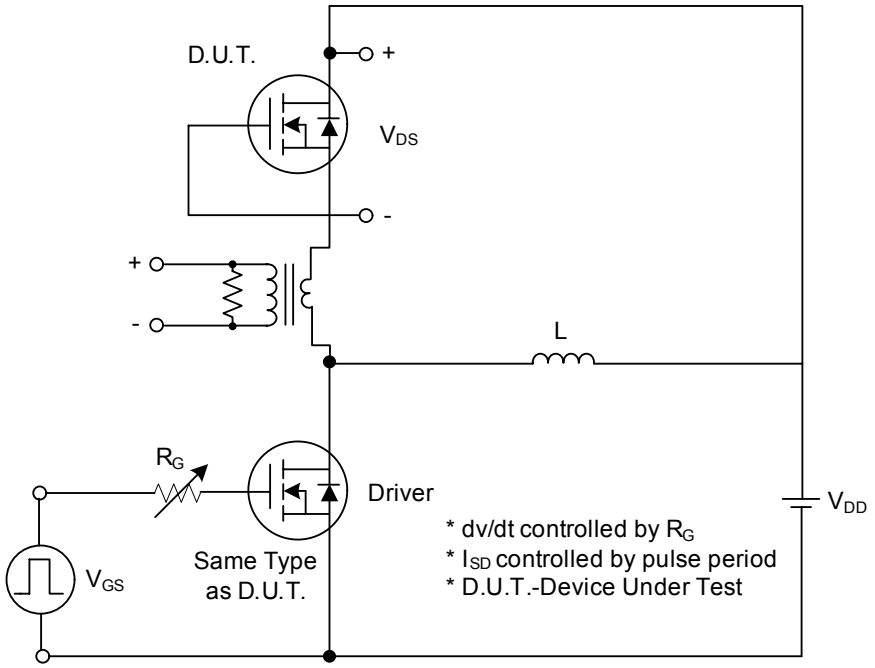


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

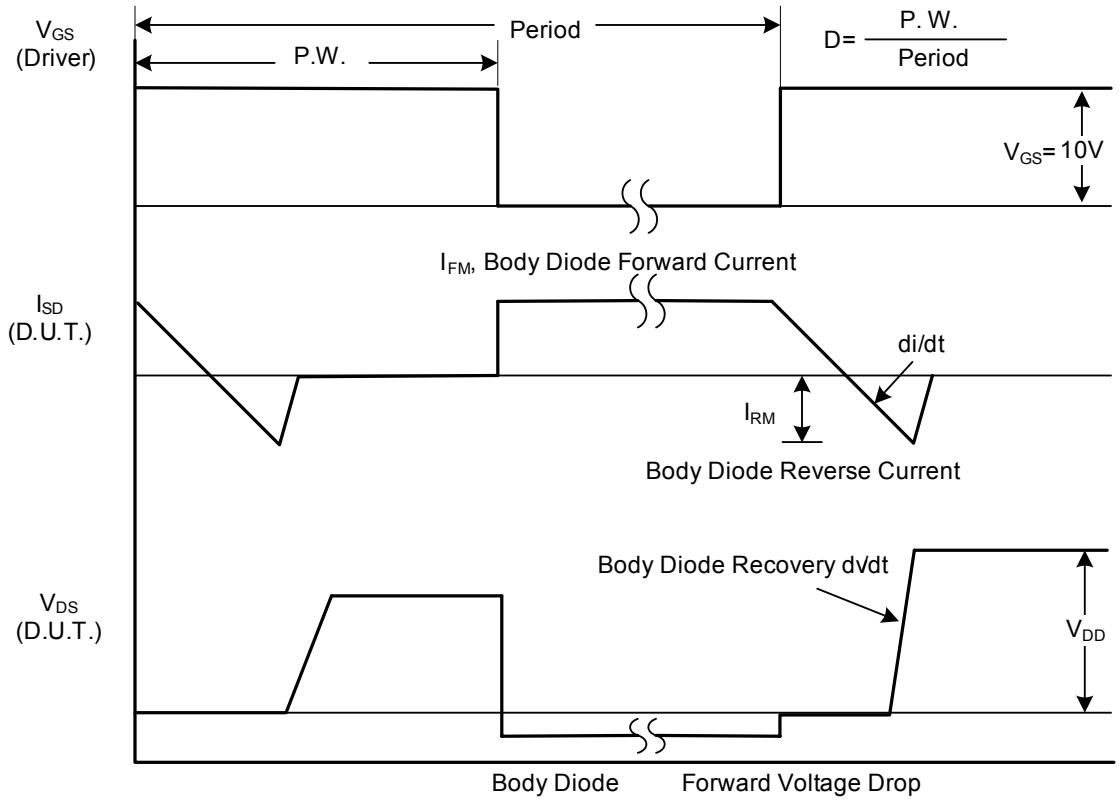


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

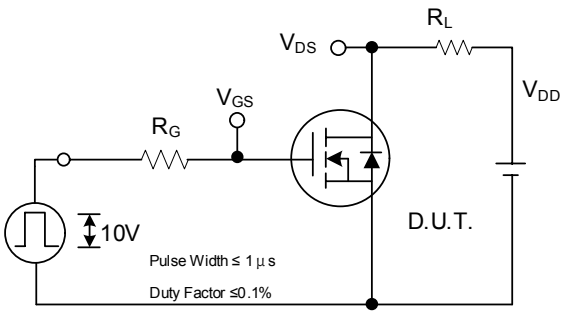


Fig. 2A Switching Test Circuit

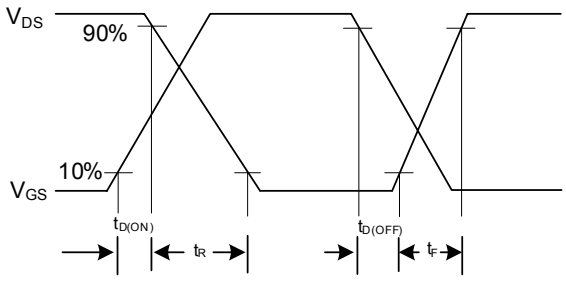


Fig. 2B Switching Waveforms

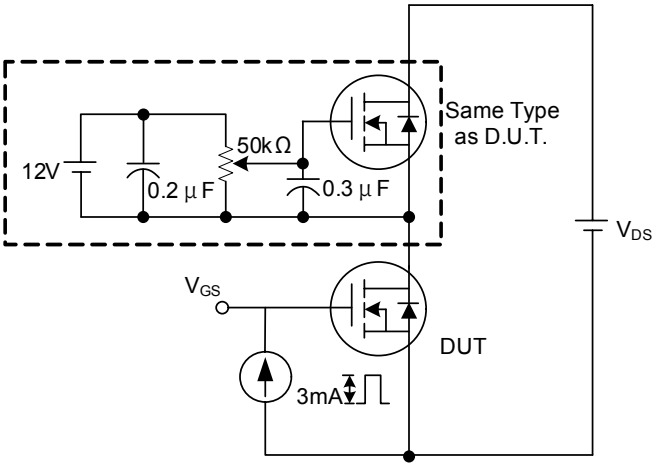


Fig. 3A Gate Charge Test Circuit

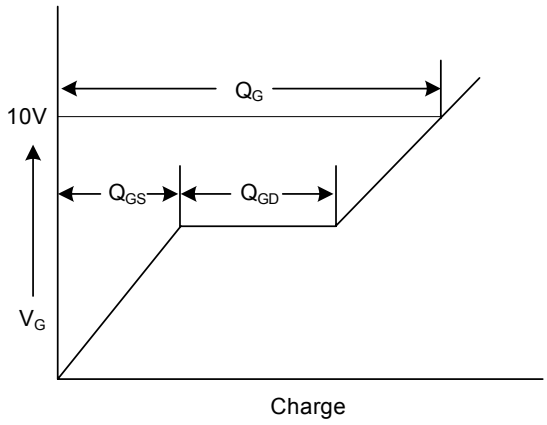


Fig. 3B Gate Charge Waveform

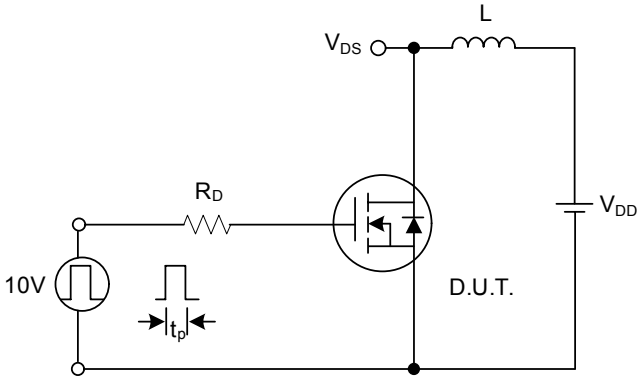


Fig. 4A Unclamped Inductive Switching Test Circuit

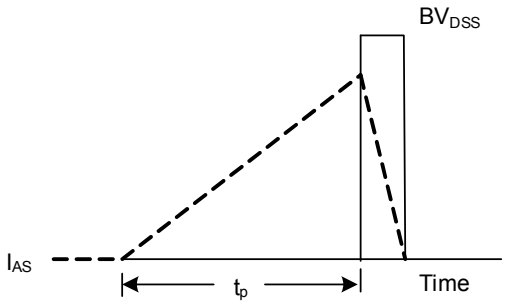


Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS