

20 Amps, 60 Volts N-CHANNEL POWER MOSFET

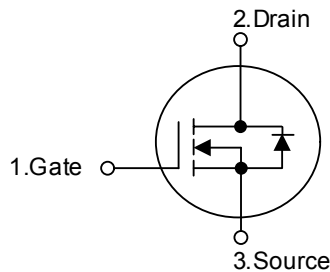
DESCRIPTION

The YR 20N06 is a low voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and excellent avalanche characteristics. This power MOSFET is usually used at automotive applications in power supplies, high efficient DC to DC converters and battery operated products.

FEATURES

- * $R_{DS(ON)} = 38m\Omega @ V_{GS} = 10V$
- * Ultra low gate charge (typical 30 nC)
- * Low reverse transfer Capacitance ($C_{RSS} =$ typical 120 pF)
- * Fast switching capability
- * 100% avalanche energy specified
- * Improved dv/dt capability

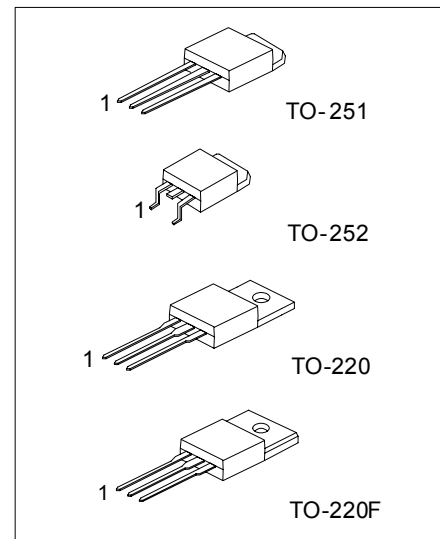
SYMBOL



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT	
Drain-Source Voltage	V_{DSS}	60	V	
Gate to Source Voltage	V_{GSS}	± 20	V	
Continuous Drain Current	I_D	$T_C = 25$	20	A
		$T_C = 100$	10	A
Pulsed Drain Current (Note 1)	I_{DM}	80	A	
Avalanche Energy, Single Pulsed (Note 2)	E_{AS}	170	mJ	
Repetitive Avalanche Energy (Note 1)	E_{AR}	6	mJ	
Peak Diode Recovery dv/dt (Note 3)	dv/dt	5.5	V/ns	
Total Power Dissipation ($T_C = 25$)	P_D	60	W	
Derating Factor Above 25		0.40	W/	
Operation Junction Temperature	T_J	-55 ~ +150		
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.



*Pb-free plating product number: YR20N06

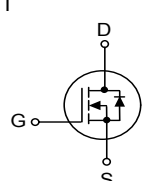
■ THERMAL DATA

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Thermal Resistance, Junction-to-Case	θ_{JC}			2.5	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Case-to-Sink	θ_{CS}		0.5		$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	θ_{JA}			80	$^{\circ}\text{C}/\text{W}$

 ■ ELECTRICAL CHARACTERISTICS ($T_C = 25$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}, T_J = 150$			10	μA
Gate-Source Leakage Current	I_{GSS}	Forward $V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA
		Reverse $V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
Breakdown Voltage Temperature Coefficient	BV_{DSS}/T_J	$I_D = 250\ \mu\text{A}$, Referenced to 25		0.06		V/
On Characteristics						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		30	38	m Ω
Dynamic Characteristics						
Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{MHz}$		1500		pF
Output Capacitance	C_{OSS}			168		pF
Reverse Transfer Capacitance	C_{RSS}			106		pF
Switching Characteristics						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 30\text{ V}, I_D = 10\text{ A}, V_{GS} = 10\text{ V}$ (Note 4, 5)		12		ns
Turn-On Rise Time	t_R			79		ns
Turn-Off Delay Time	$t_{D(OFF)}$			50		ns
Turn-Off Fall Time	t_F			52		ns
Total Gate Charge	Q_G	$V_{DS} = 60\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$ (Note 4, 5)		15.2		nC
Gate-Source Charge	Q_{GS}			2.9		nC
Gate-Drain Charge (Miller Charge)	Q_{GD}			3.2		nC

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Source-Drain Diode Ratings and Characteristics						
Diode Forward Voltage	V_{SD}	$I_S = 20\text{ A}, V_{GS} = 0\text{ V}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S	Integral Reverse p-n Junction Diode in the MOSFET 			20	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}					80
Reverse Recovery Time	t_{RR}	$I_S = 20\text{ A}, V_{GS} = 0\text{ V}$		40		ns
Reverse Recovery Charge	Q_{RR}	$di_F / dt = 100\text{ A}/\mu\text{s}$ (Note4)		70		μC

- Note 1. Repeativity rating: pulse width limited by junction temperature
 2. $L=19.5\text{mH}, I_{AS}=20\text{A}, R_G=20\Omega$, Starting $T_J=25$
 3. $I_{SD} \leq 50\text{A}, di/dt \leq 300\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J=25$
 4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycles $\leq 2\%$
 5. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

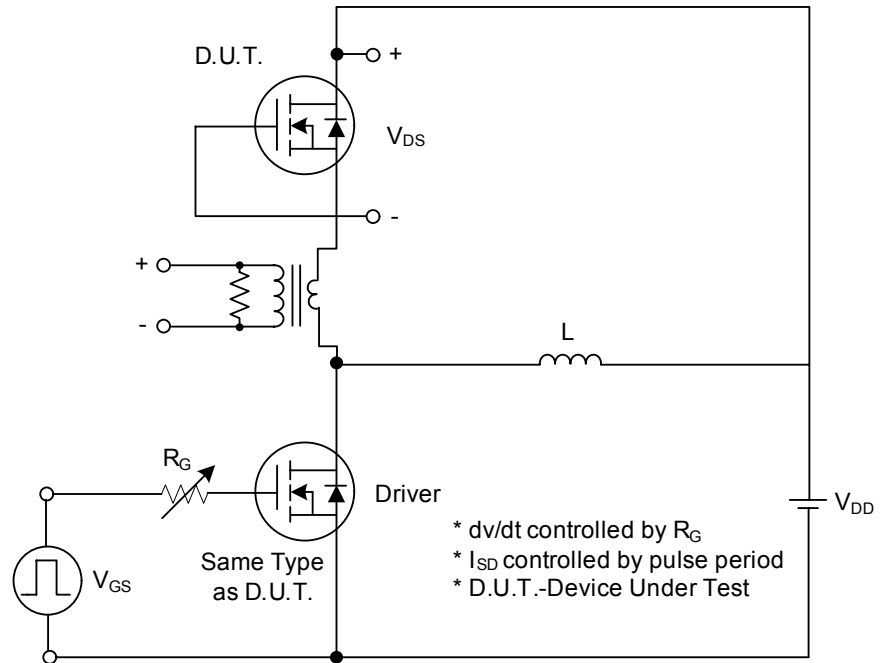


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

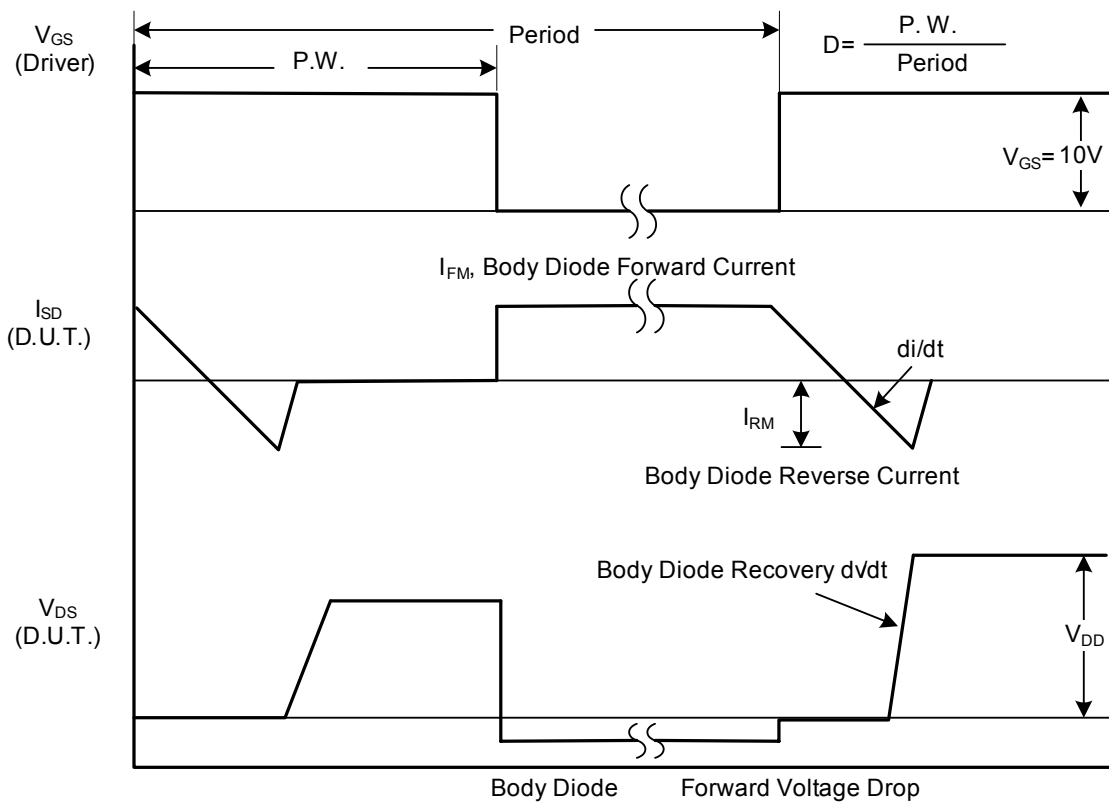


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

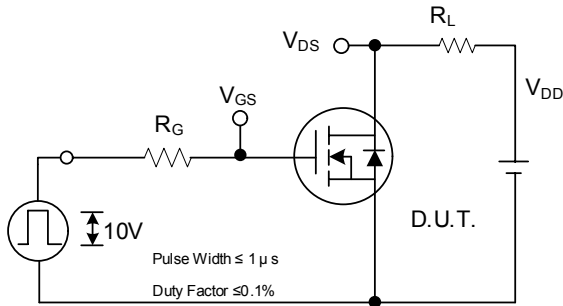


Fig. 2A Switching Test Circuit

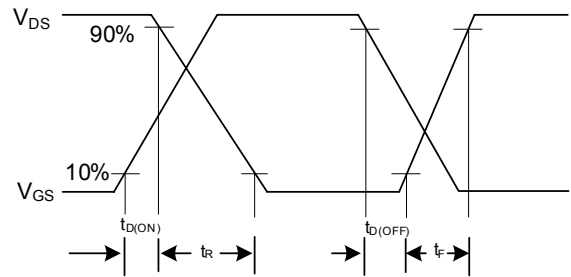


Fig. 2B Switching Waveforms

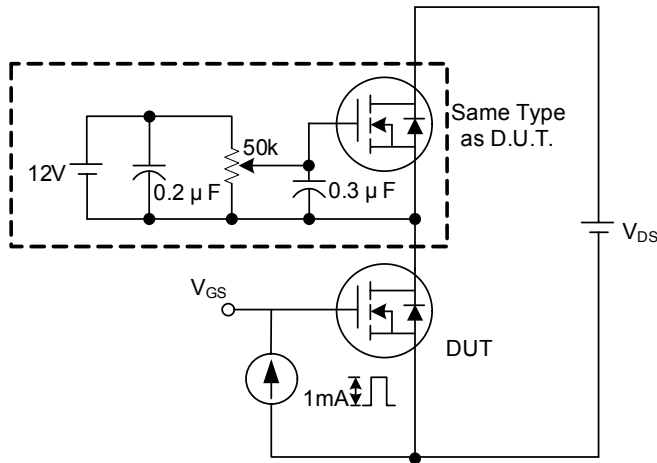


Fig. 3A Gate Charge Test Circuit

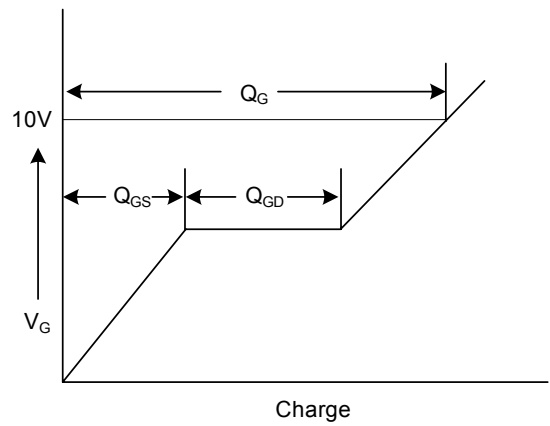


Fig. 3B Gate Charge Waveform

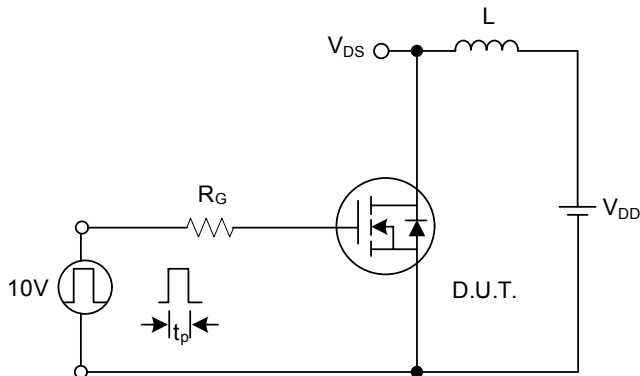


Fig. 4A Unclamped Inductive Switching Test Circuit

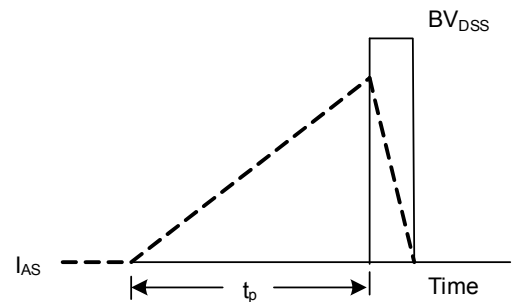
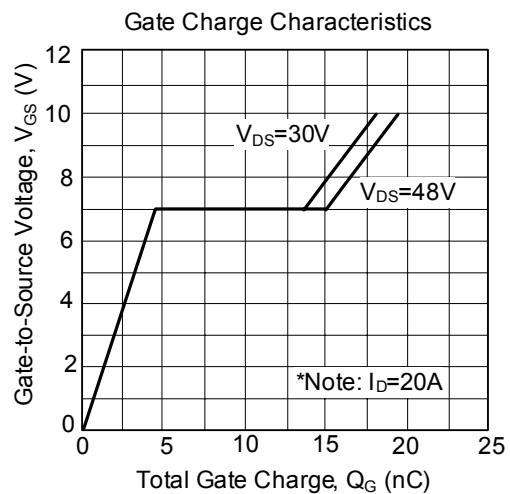
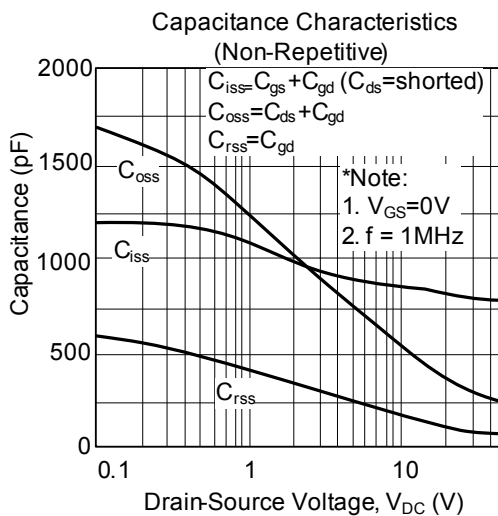
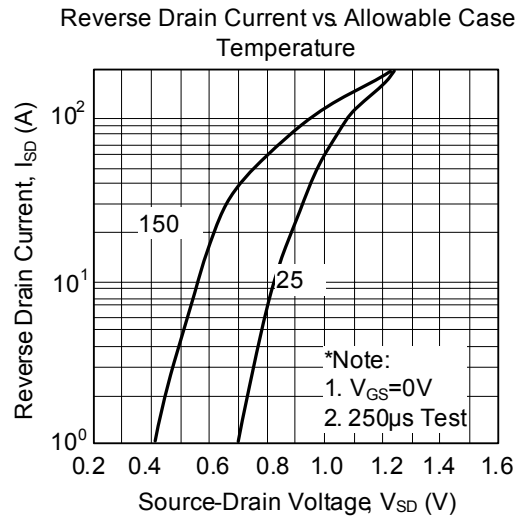
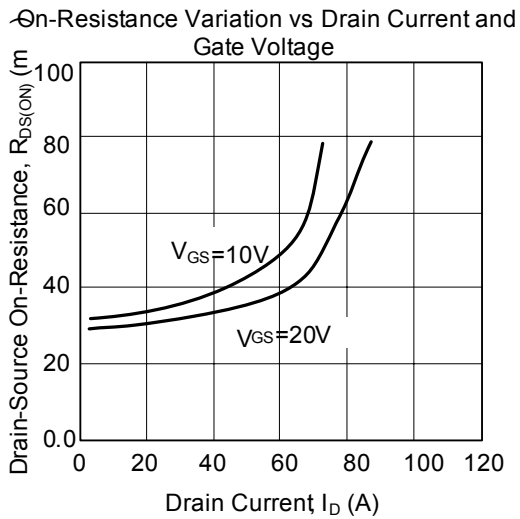
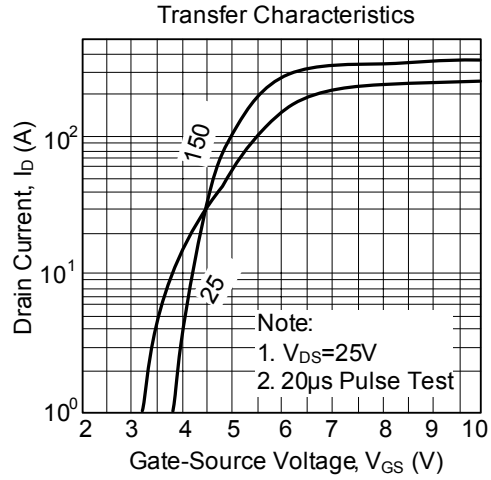
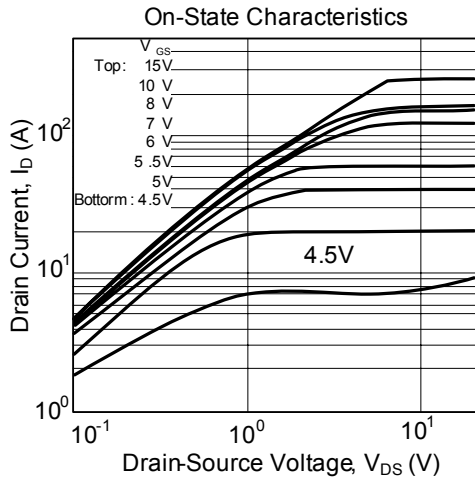


Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)

