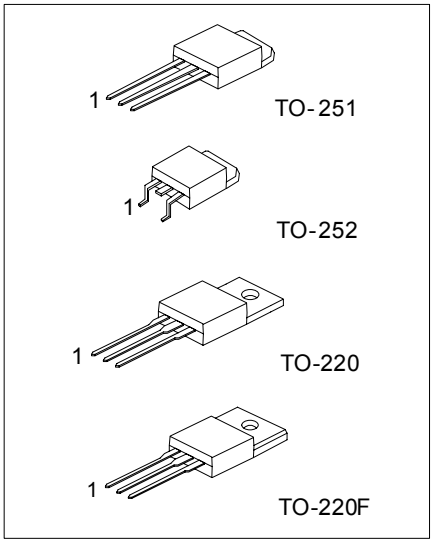
YAREN TECHNOLOGY

2 0N03
Power MOSFET

20 Amps, 30 Volts
N-CHANNEL POWER MOSFET



*Pb-free plating product number: YR20N03

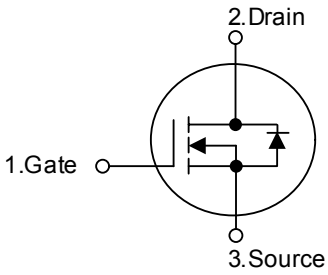
■ DESCRIPTION

The YR 20N03 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

* $R_{DS(ON)}$ = 35mΩ@V_{GS} = 10 V
* 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}	30	V
Gate to Source Voltage		V_{GSS}	±20	V
Continuous Drain Current	T_C = 25℃	I_D	20	A
	T_C = 100℃		10	A
Pulsed Drain Current (Note 1)		I_{DM}	60	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.

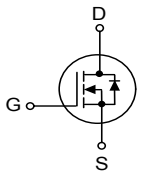
■ THERMAL DATA

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Thermal Resistance, Junction-to-Case	θ_{JC}			2.5	°C/W
Thermal Resistance, Case-to-Sink	θ_{CS}		0.5		°C/W
Thermal Resistance, Junction-to-Ambient	θ_{JA}			80	°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} = 0 V, I_D = 250 μA	30			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V			1	μA
			V_{DS} = 48 V, V_{GS} = 0 V, T_J = 150℃			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 20V, V_{DS} = 0 V			100	nA
	Reverse		V_{GS} = -20V, V_{DS} = 0 V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D = 250 μA, Referenced to 25℃		0.06		V/℃
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250 μA	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10 V, I_D = 10 A		28	35	mΩ
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{GS} = 0 V, V_{DS} = 15 V, f = 1MHz		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} = 15V, I_D =10 A, V_{GS}=10V (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} = 30V, V_{GS} = 10 V, I_D = 10A (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 = 20A, V_{GS} = 0 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	A
Reverse Recovery Time	t_{RR}	I_S = 20A, V_{GS} = 0 V dI$_F$ / dt = 100 A/μs (Note4)		40		ns
Reverse Recovery Charge	Q_{RR}			70		μC

Note 1. Repeativity rating: pulse width limited by junction temperature

2. L=19.5mH, I_{AS}=20A, R_G=20Ω, Starting T_J=25℃
3. I_{SD}≤50A, di/dt≤300A/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

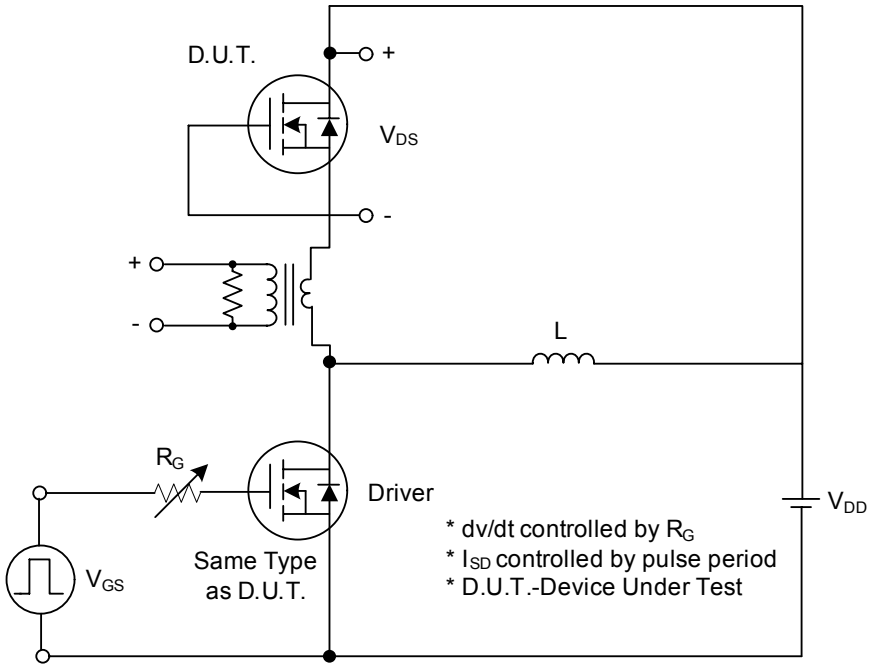


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

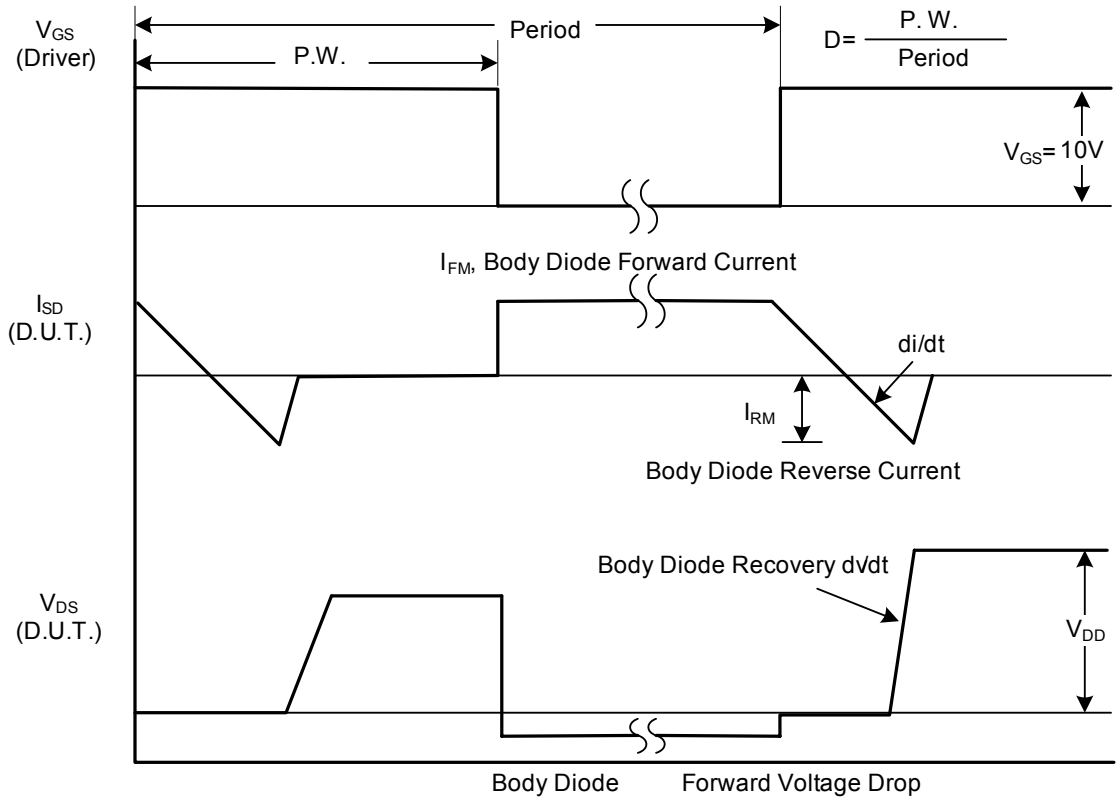


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

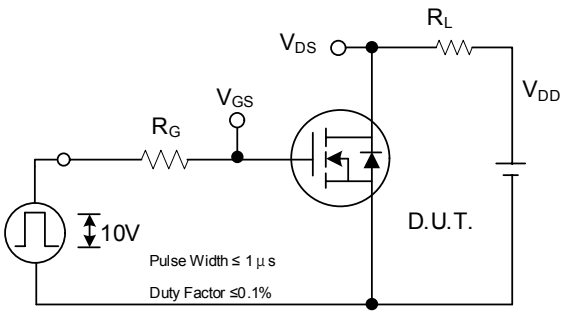


Fig. 2A Switching Test Circuit

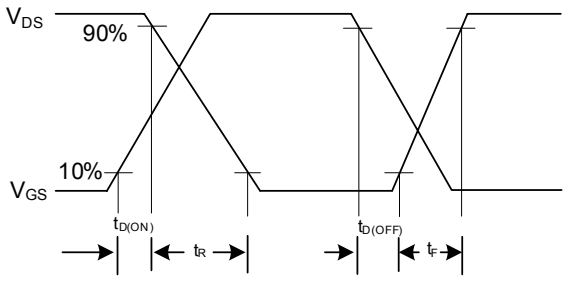


Fig. 2B Switching Waveforms

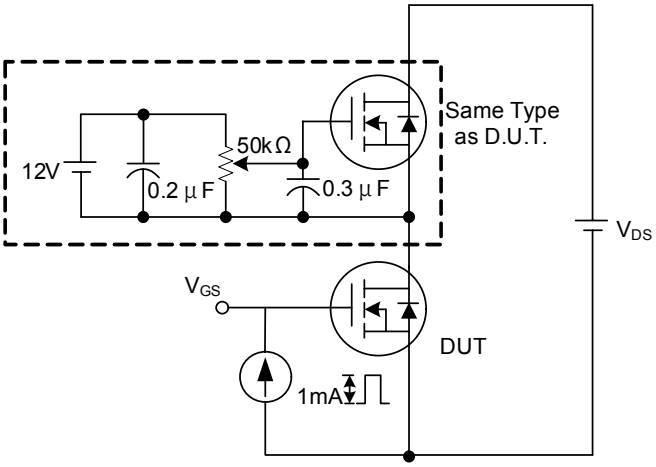


Fig. 3A Gate Charge Test Circuit

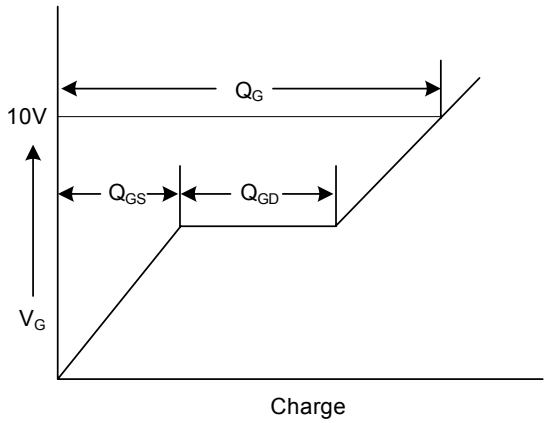


Fig. 3B Gate Charge Waveform

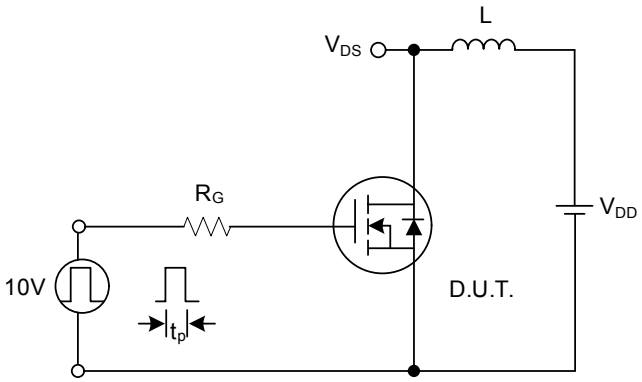


Fig. 4A Unclamped Inductive Switching Test Circuit

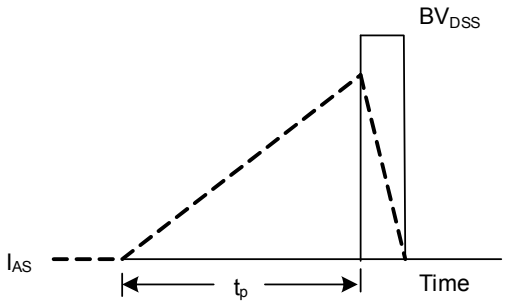
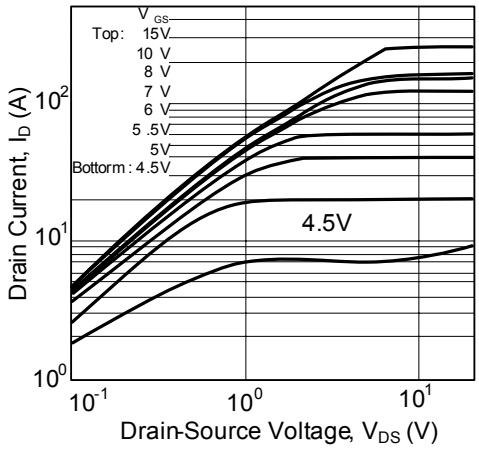


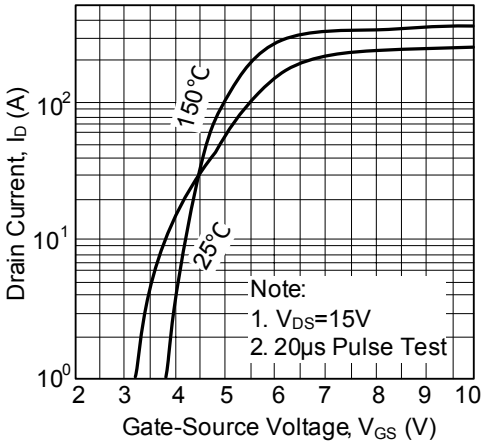
Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

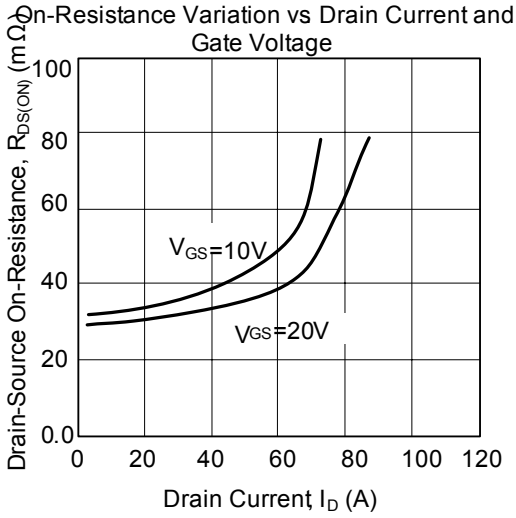
On-State Characteristics



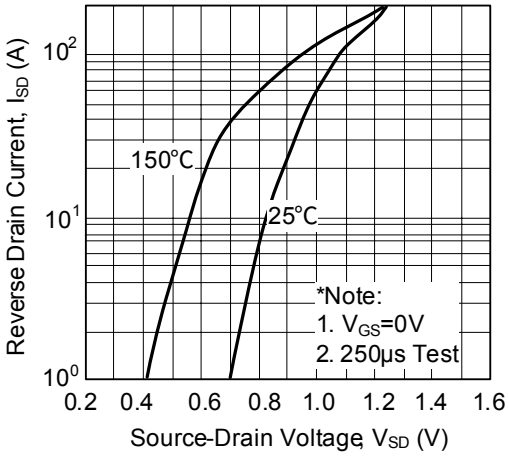
Transfer Characteristics



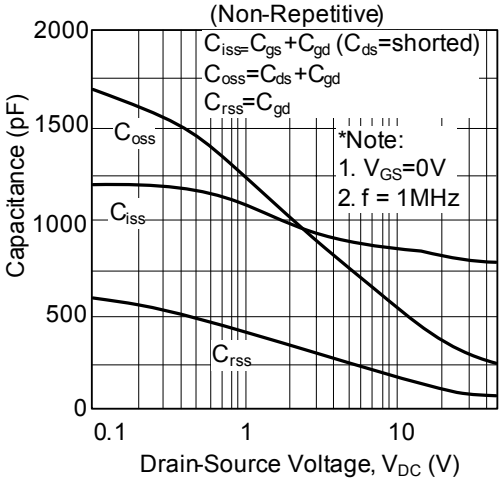
On-Resistance Variation vs Drain Current and Gate Voltage



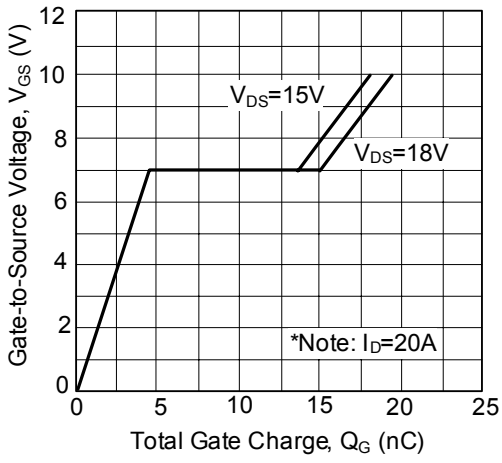
Reverse Drain Current vs. Allowable Case Temperature



Capacitance Characteristics (Non-Repetitive)

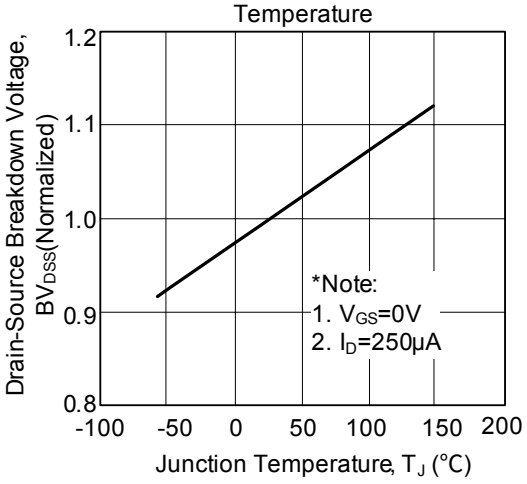


Gate Charge Characteristics

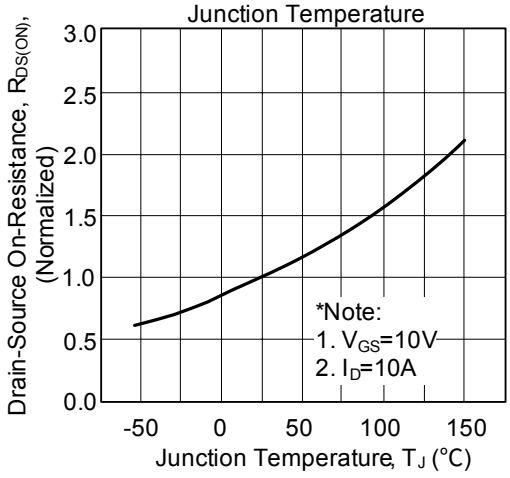


■ TYPICAL CHARACTERISTICS(Cont.)

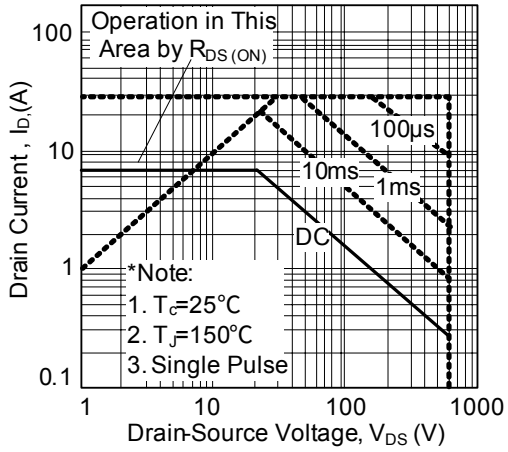
Breakdown Voltage Variation vs Junction Temperature



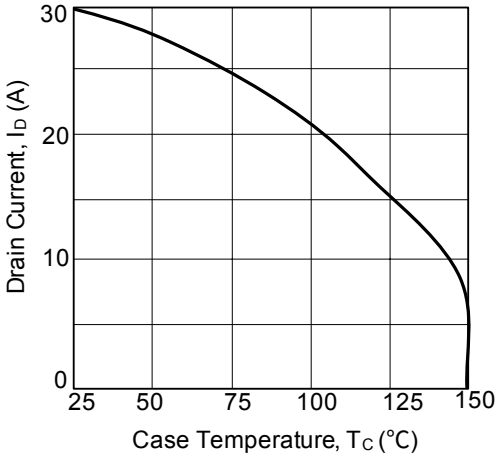
On-Resistance Variation vs Junction Temperature



Maximum Safe Operating



Maximum Drain Current vs. Case Temperature



Transient Thermal Response Curve