



4.5 Amps, 500 Volts N-CHANNEL MOSFET

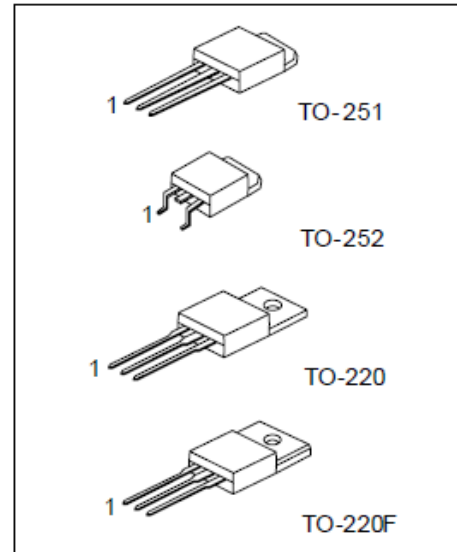
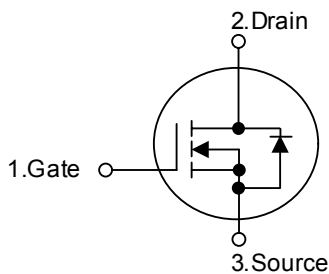
■ DESCRIPTION

The YR 5N50 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

- * $R_{DS(ON)} = 1.5\Omega @ V_{GS} = 10\text{ V}$
- * Ultra low gate charge (typical 15 nC)
- * Low reverse transfer Capacitance ($C_{RSS} = \text{typical } 6.5\text{ pF}$)
- * Fast switching capability
- * Avalanche energy Specified
- * Improved dv/dt capability, high ruggedness

■ SYMBOL



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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	500	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	4.5	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	2.8	A
I_{DM}	Pulsed Drain Current ¹	18	A
$P_D@T_C=25^\circ C$	Total Power Dissipation	74	W
	Linear Derating Factor	0.59	W/ $^\circ C$
E_{AS}	Single Pulse Avalanche Energy ²	101	mJ
I_{AR}	Avalanche Current	4.5	A
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

■ THERMAL DATA

Symbol	Parameter	Value	Unit
Rthj-c	Thermal Resistance Junction-case	Max. 1.7	$^\circ C/W$
Rthj-a	Thermal Resistance Junction-ambient	Max. 62	$^\circ C/W$

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=1mA$	500	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=2.7A$	-	-	1.5	Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	-	4	V
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=2.7A$	-	2.4	-	S
I_{DSS}	Drain-Source Leakage Current ($T_J=25^\circ C$)	$V_{DS}=500V, V_{GS}=0V$	-	-	25	μA
	Drain-Source Leakage Current ($T_J=125^\circ C$)	$V_{DS}=400V, V_{GS}=0V$	-	-	250	μA
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 20V$	-	-	± 100	nA
Q_g	Total Gate Charge ³	$I_D=3.1A$	-	28	45	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=400V$	-	4	-	nC
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=10V$	-	16	-	nC
$t_{d(on)}$	Turn-on Delay Time ³	$V_{DD}=250V$	-	10	-	ns
t_r	Rise Time	$I_D=3.1A$	-	15	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=12\Omega, V_{GS}=10V$	-	41	-	ns
t_f	Fall Time	$R_D=80.6\Omega$	-	20	-	ns
C_{iss}	Input Capacitance	$V_{GS}=0V$	-	710	1140	pF
C_{oss}	Output Capacitance	$V_{DS}=25V$	-	170	-	pF
C_{rss}	Reverse Transfer Capacitance	$f=1.0MHz$	-	60	-	pF
R_g	Gate Resistance	$f=1.0MHz$	-	2	3.0	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Forward On Voltage ³	$T_J=25^{\circ}\text{C}$, $I_S=4.5\text{A}$, $V_{GS}=0\text{V}$	-	-	1.5	V
t_{rr}	Reverse Recovery Time ³	$I_S=3.1\text{A}$, $V_{GS}=0\text{V}$,	-	370	-	ns
Q_{rr}	Reverse Recovery Charge	$di/dt=100\text{A}/\mu\text{s}$	-	3.9	-	μC

Notes:

- 1.Pulse width limited by Max. junction temperature.
- 2.Starting $T_J=25^{\circ}\text{C}$, $V_{DD}=50\text{V}$, $L=10\text{mH}$, $R_G=25\Omega$
- 3.Pulse test

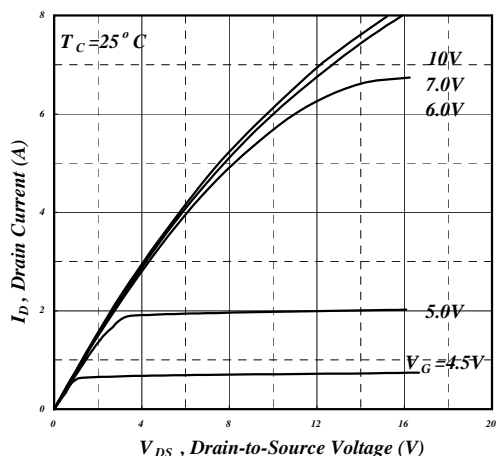


Fig 1. Typical Output Characteristics

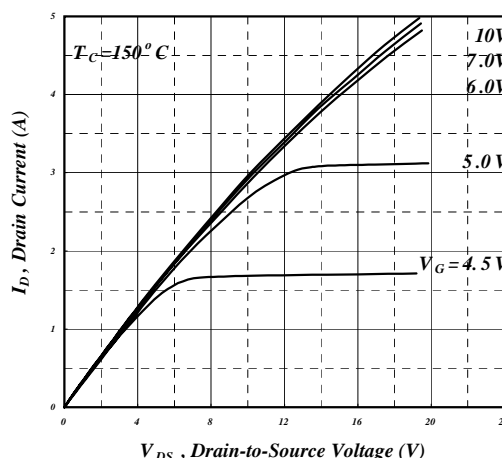


Fig 2. Typical Output Characteristics

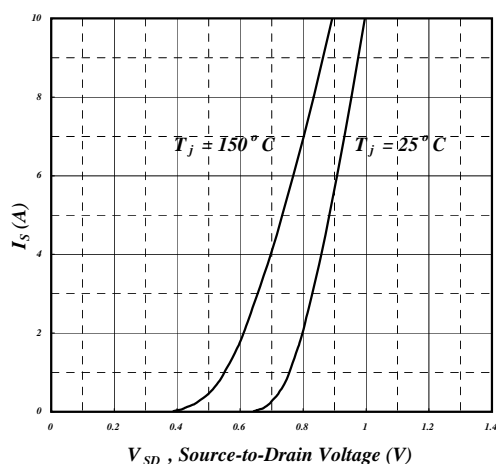
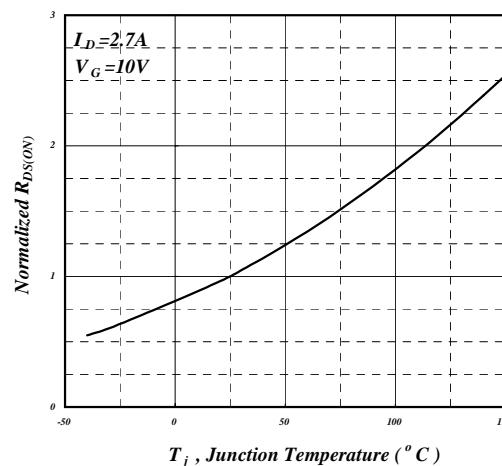
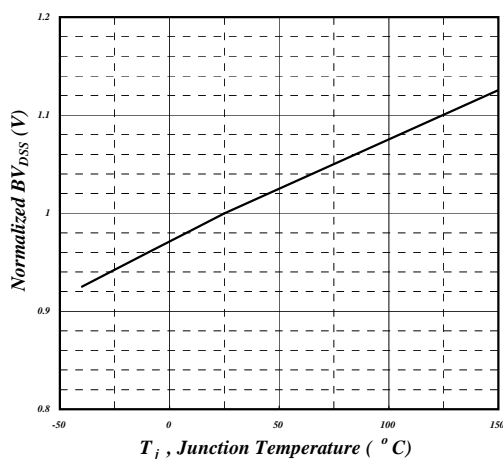


Fig 5. Forward Characteristic of Reverse Diode

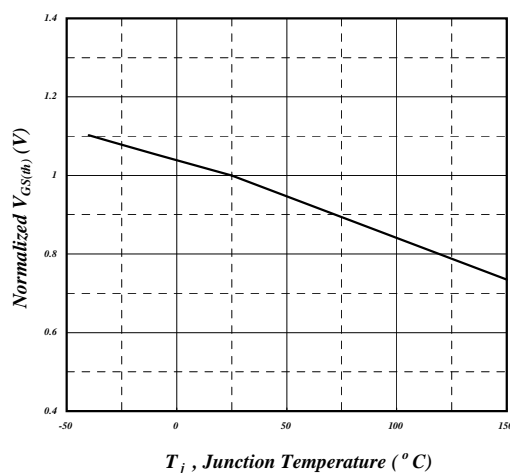


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

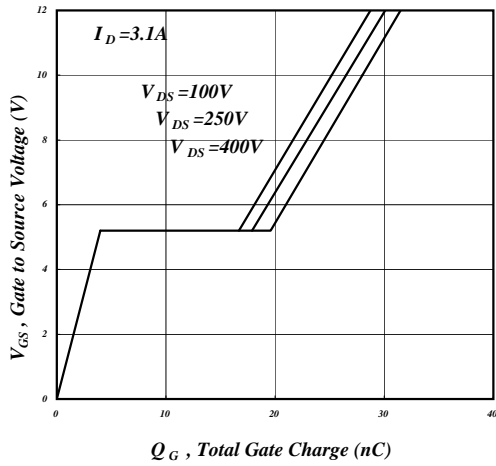


Fig 7. Gate Charge Characteristics

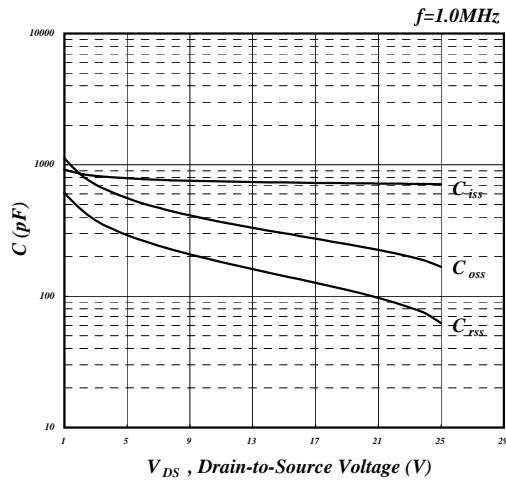


Fig 8. Typical Capacitance Characteristics

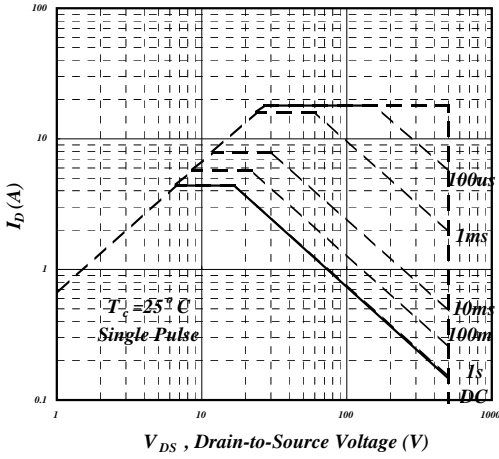


Fig 9. Maximum Safe Operating Area

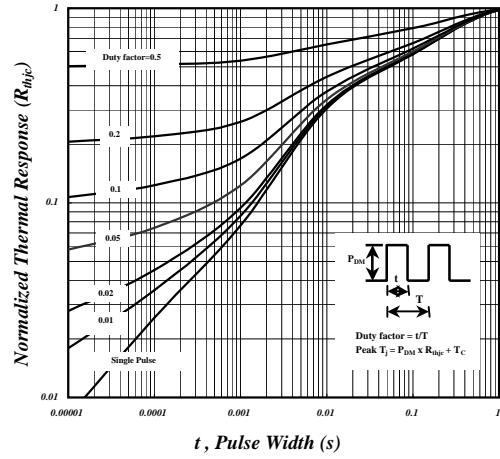


Fig 10. Effective Transient Thermal Impedance

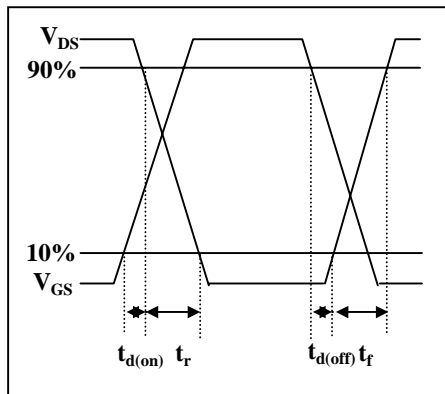


Fig 11. Switching Time Waveform

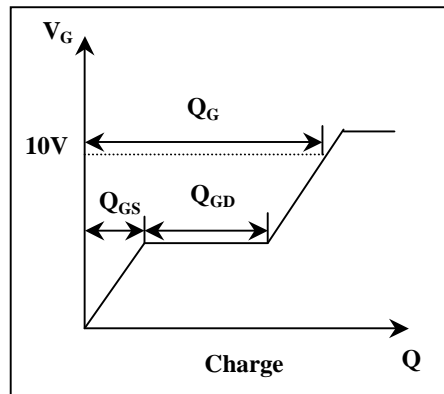


Fig 12. Gate Charge Waveform