

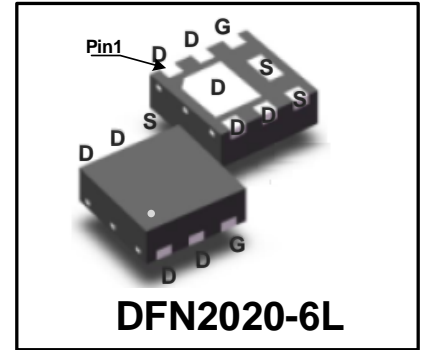
20V N-Channel Enhancement Mode Power MOSFET

Description

WMR13N02TS uses advanced power trench technology that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

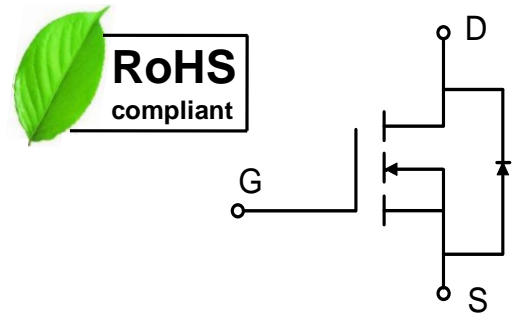
Features

- $V_{DS} = 20V$, $I_D = 13A$
 $R_{DS(on)} < 10m\Omega @ V_{GS} = 4.5V$
 $R_{DS(on)} < 13.5m\Omega @ V_{GS} = 2.5V$
- Green Device Available
- RoHS Compliant & Halogen-Free
- Super Low Gate Charge



Applications

- Load Switches
- DC/DC Converter



Absolute Maximum Ratings ($T_A = 25^\circ C$, unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current	I_D	$T_A=25^\circ C$	13
		$T_A=100^\circ C$	8
Pulsed Drain Current ¹	I_{DM}	52	A
Single Pulse Avalanche Energy ²	EAS	42.25	mJ
Total Power Dissipation	$T_A=25^\circ C$	P_D	2.8
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction-to-Ambient ³	$R_{\theta JA}$	44.6	$^\circ C/W$

Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	20	-	-	V
Gate-body Leakage current	I_{GSS}	$V_{DS} = 0V, V_{GS} = \pm 12V$	-	-	± 100	nA
Zero Gate Voltage Drain Current	$T_J = 25^\circ\text{C}$	$V_{DS} = 20V, V_{GS} = 0V$	-	-	1	μA
	$T_J = 100^\circ\text{C}$		-	-	100	
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	0.5	0.75	1	V
Drain-Source on-Resistance ⁴	$R_{DS(on)}$	$V_{GS} = 4.5V, I_D = 10A$	-	7.8	10	m Ω
		$V_{GS} = 2.5V, I_D = 5A$	-	10	13.5	
Forward Transconductance ⁴	g_{fs}	$V_{DS} = 4.5V, I_D = 10A$	-	44	-	S
Dynamic Characteristics⁵						
Input Capacitance	C_{iss}	$V_{DS} = 10V, V_{GS} = 0V, f = 1\text{MHz}$	-	1259	-	pF
Output Capacitance	C_{oss}		-	160	-	
Reverse Transfer Capacitance	C_{rss}		-	155	-	
Switching Characteristics⁵						
Total Gate Charge	Q_g	$V_{GS} = 4.5V, V_{DS} = 10V, I_D = 10A$	-	13.5	-	nC
Gate-Source Charge	Q_{gs}		-	2.9	-	
Gate-Drain Charge	Q_{gd}		-	2.9	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 4.5V, V_{DD} = 10V, R_G = 3\Omega, I_D = 10A$	-	5.5	-	ns
Rise Time	t_r		-	8.9	-	
Turn-Off Delay Time	$t_{d(off)}$		-	9.8	-	
Fall Time	t_f		-	22.9	-	
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 10A, di/dt = 100A/\mu s$	-	22	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	3.5	-	nC
Drain-Source Body Diode Characteristics						
Diode Forward Voltage ⁴	V_{SD}	$I_S = 4A, V_{GS} = 0V$	-	-	1.2	V
Continuous Source Current	$T_A = 25^\circ\text{C}$	I_S	-	-	13	A

Notes:

1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)} = 150^\circ\text{C}$.
2. The test condition is $V_{DD} = 24V, V_{GS} = 10V, L = 0.5\text{mH}, I_{AS} = 13A$.
3. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
5. This value is guaranteed by design hence it is not included in the production test.

Typical Characteristics

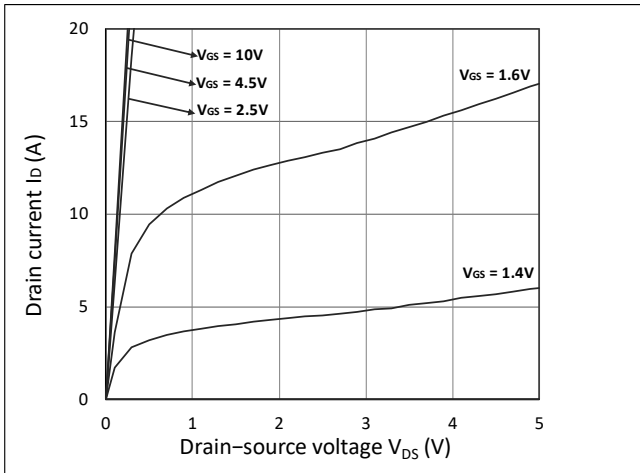


Figure 1. Output Characteristics

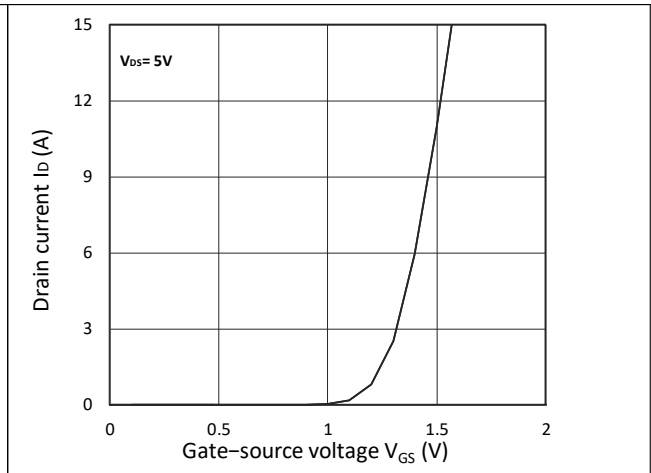


Figure 2. Transfer Characteristics

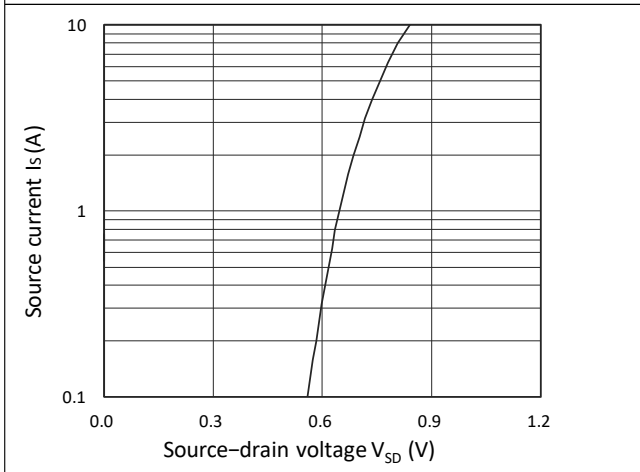


Figure 3. Forward Characteristics of Reverse

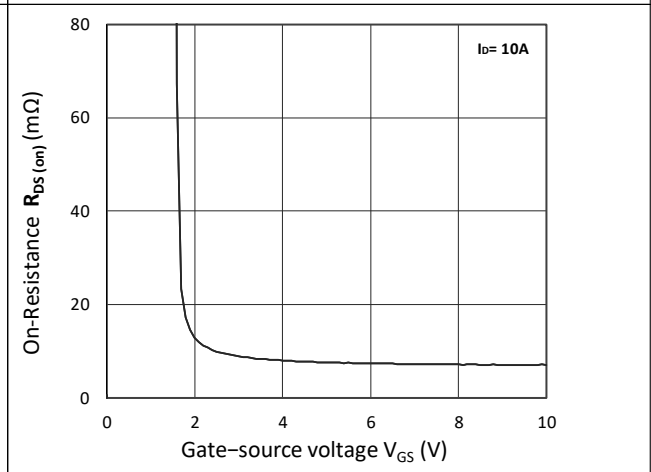


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

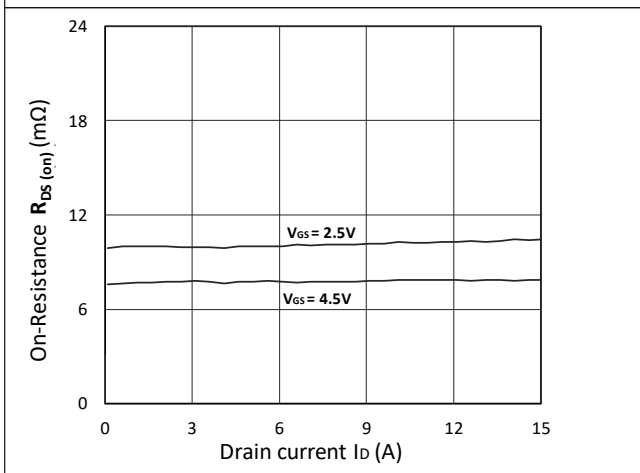


Figure 5. $R_{DS(ON)}$ vs. I_D

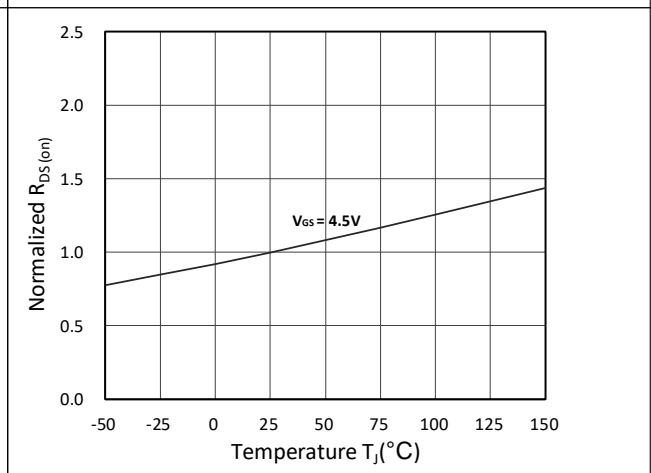


Figure 6. Normalized $R_{DS(ON)}$ vs. Temperature

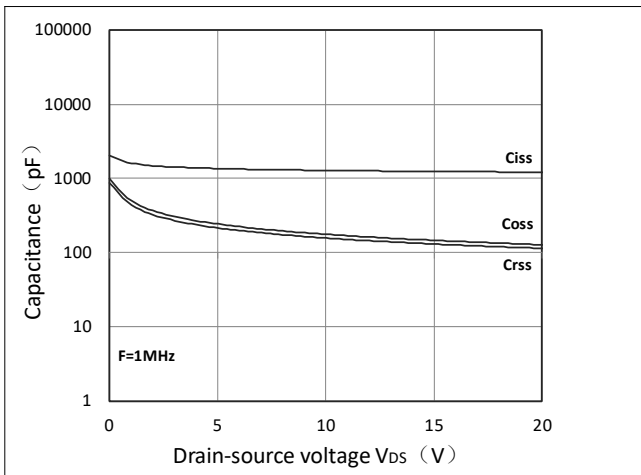


Figure 7. Capacitance Characteristics

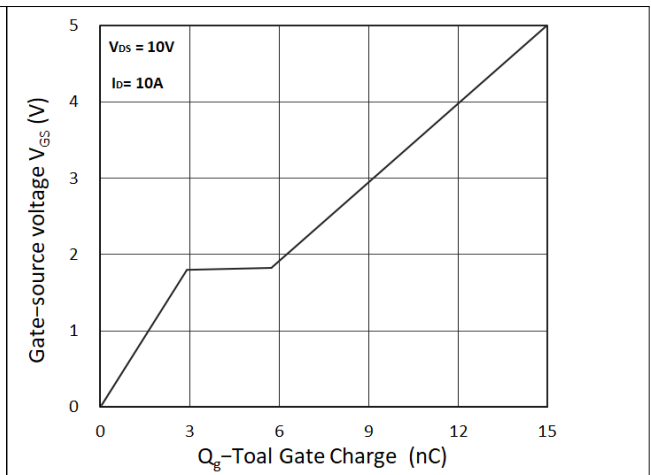


Figure 8. Gate Charge Characteristics

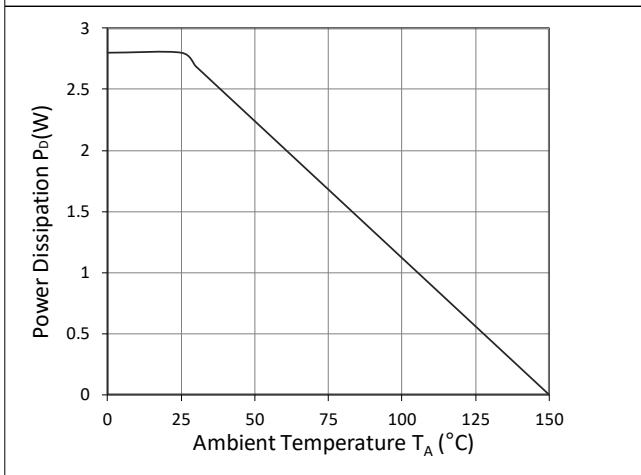


Figure 9. Power Dissipation

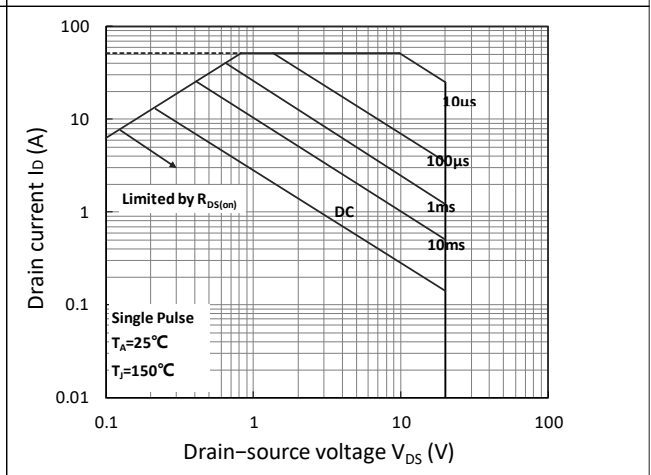


Figure 10. Safe Operating Area

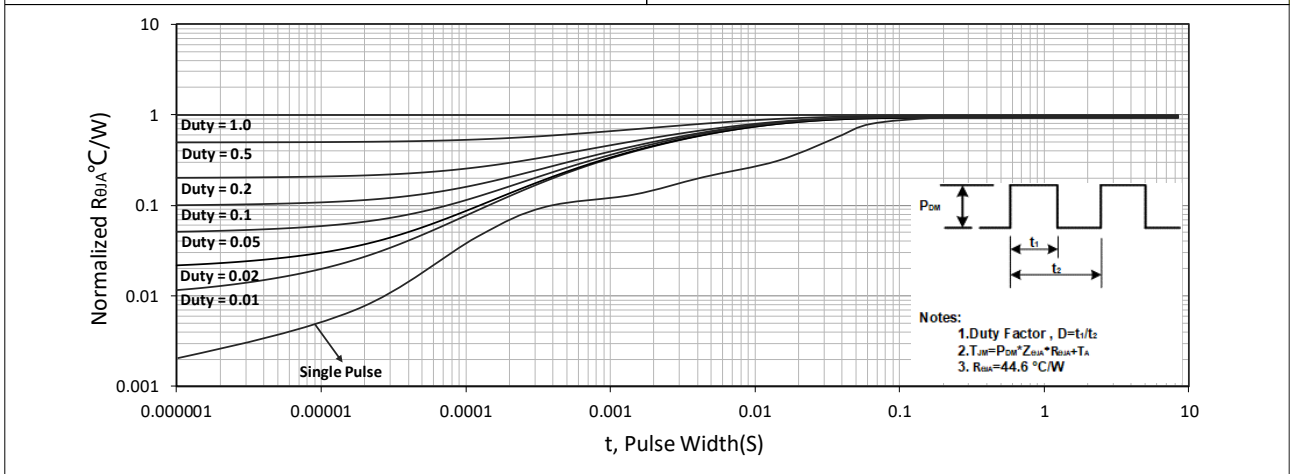


Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuit

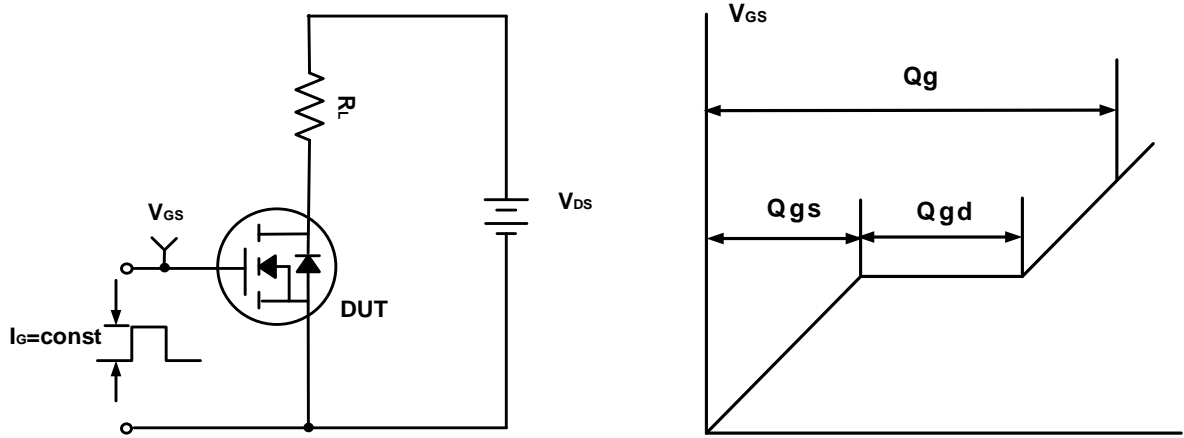


Figure A. Gate Charge Test Circuit & Waveforms



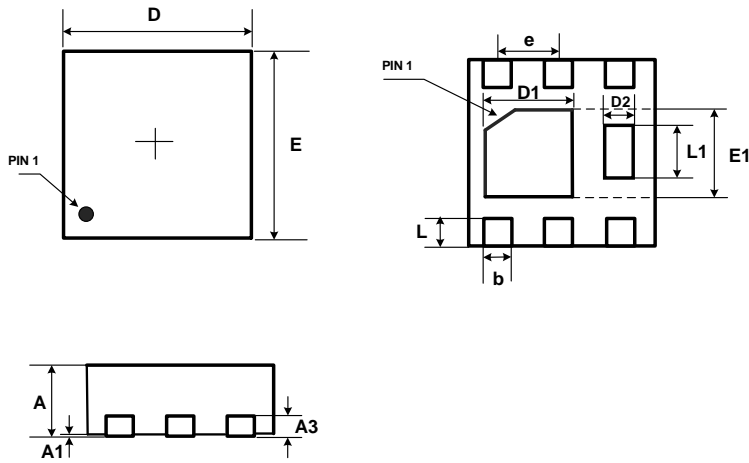
Figure B. Switching Test Circuit & Waveforms



Figure C. Unclamped Inductive Switching Circuit & Waveforms

Mechanical Dimensions for DFN2020-6L

COMMON DIMENSIONS

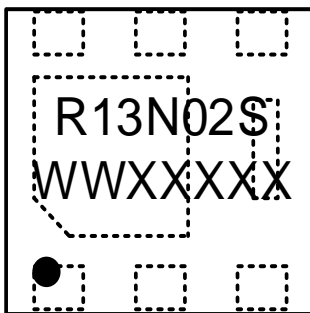


SYMBOL	MM	
	MIN	MAX
A	0.50	0.60
A1	0.00	0.05
A3	0.152REF	
b	0.25	0.35
D	1.90	2.10
D1	0.80	1.00
E	1.90	2.10
E1	0.80	1.00
L1	0.46	0.66
e	0.65BSC	
D2	0.25	0.35
L	0.25	0.35

Ordering Information

Part	Package	Marking	Packing method
WMR13N02TS	DFN2020-6L	R13N02S	Tape and Reel

Marking Information



R13N02S = Device code

WWXXXXX= Date code

Contact Information

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WAYON website: <http://www.way-on.com>

For additional information, please contact your local Sales Representative.

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Product Specification Statement

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2. The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. WAYON shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations. Additionally, users should exercise caution in verifying product compatibility issues, and WAYON assumes no responsibility for the application of the product.
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