

## 500V 40A 0.1Ω N-ch Power MOSFET

### Description

WMOS D1 is Wayon's 1<sup>st</sup> generation VDMOS family that is dramatic reduction in on-resistance and ultra-low gate charge for applications requiring high power density and high efficiency. And it is very robust and RoHS compliant.

TO-247



TO-3PN

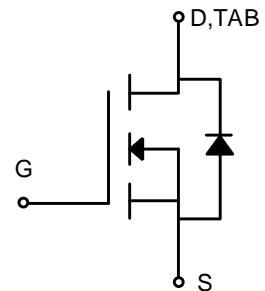


### Features

- Typ. $R_{DS(on)}=0.1\Omega@V_{GS}=10V$
- 100% avalanche tested
- RoHS Compliant

### Applications

- SMPS
- Charger
- DC-DC



### Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ )

Parameter	Symbol	WMJ40N50D1	WMPN40N50D1	Unit
Drain-source voltage	$V_{DSS}$	500		V
Gate-source voltage	$V_{GS}$	$\pm 30$		V
Continuous drain current	$I_D$	40		A
Pulsed drain current <sup>1</sup>	$I_{DM}$	160		A
Avalanche energy, single pulse <sup>2</sup>	$E_{AS}$	1600		mJ
Power dissipation	$P_D$	416	462	W
Derate above 25°C		3.3	3.7	W/°C
Operating junction temperature	$T_j$	-55~150		°C
Storage temperature	$T_{stg}$	-55~150		°C
Continuous diode forward current	$I_S$	40		A
Diode pulse current <sup>1</sup>	$I_{Spulse}$	160		A

### Thermal Characteristic

Thermal resistance,junction-to-case	$R_{\theta JC}$	0.3	0.27	°C/W
Thermal resistance,junction-to-ambient	$R_{\theta JA}$	62.5	50	°C/W

## Electrical Characteristics of MOSFET

				Min.	Typ.	Max.	
Drain-source break down voltage	$BV_{DSS}$	$I_D=250\mu A, V_{GS}=0V$	$T_C=25^\circ C$	500	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	$T_J=25^\circ C$	2	-	4	V
Drain-source leakage current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	$T_J=25^\circ C$	-	-	5	$\mu A$
		$V_{DS}=400V, V_{GS}=0V$	$T_J=125^\circ C$	-	-	100	$\mu A$
Gate-source leakage current,forward	$I_{GSSF}$	$V_{DS}=0V, V_{GS}=30V$	$T_J=25^\circ C$	-	-	100	nA
Gate-source leakage current,reverse	$I_{GSSR}$	$V_{DS}=0V, V_{GS}=-30V$	$T_J=25^\circ C$	-	-	-100	nA
Drain-source on-state resistance <sup>3</sup>	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$	$T_J=25^\circ C$	-	0.1	0.11	$\Omega$
Transconductance <sup>3</sup>	$G_{fs}$	$V_{DS}=25V$	$T_J=25^\circ C$	-	32	-	S

## Dynamic Characteristics of MOSFET ( $T_C=25^\circ C$ )

				Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$f=1MHz, V_{DS}=25V, V_{GS}=0V$		-	8.76	-	nF
Output capacitance	$C_{oss}$			-	0.7	-	nF
Reverse transfer capacitance	$C_{rss}$			-	0.1	-	nF
Gate to source charge	$Q_{gs}$	$V_{DD}=250V$		-	42	-	nC
Gate to drain charge	$Q_{gd}$	$I_D=40A$		-	35	-	nC
Total gate charge	$Q_g$	$V_{GS}=0$ to $10V$		-	165	-	nC

## Switching Characteristics of MOSFET ( $T_C=25^\circ C$ )

				Min.	Typ.	Max.	
Turn-on delay time	$t_{don}$	$V_{DD}=250V, I_D=40A, R_G=10\Omega, V_{GS}=10V$		-	48	-	ns
Rise time	$t_r$			-	64	-	ns
Turn-off delay time	$t_{doff}$			-	274	-	ns
Fall time	$t_f$			-	100	-	ns

## Characteristics of Body Diode ( $T_C=25^\circ C$ )

				Min.	Typ.	Max.	
Forward voltage	$V_{SD}$	$I_{SD}=40A, V_{GS}=0V$		-	-	1.5	V
Reverse recovery time	$t_{rr}$	$I_S=40A, V_{GS}=0V, di/dt=100A/\mu s$		-	338	-	ns
Reverse recovery current	$I_{rr}$			-	20	-	A
Recovery charge	$Q_{rr}$			-	3.4	-	$\mu C$

Notes:

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ C$ .
2. The  $E_{AS}$  data shows Max. rating . The test condition is  $V_{DD}=50V, V_{GS}=10V, L=2mH, I_{AS}=40A, T_C=25^\circ C$ .
3. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .

TYPICAL CHARACTERISTICS

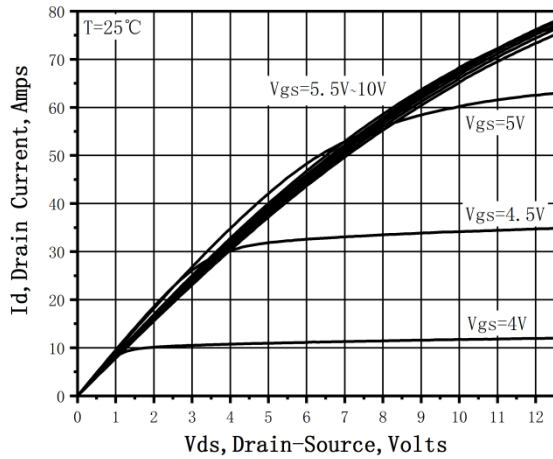


Figure 1. On-Region Characteristics

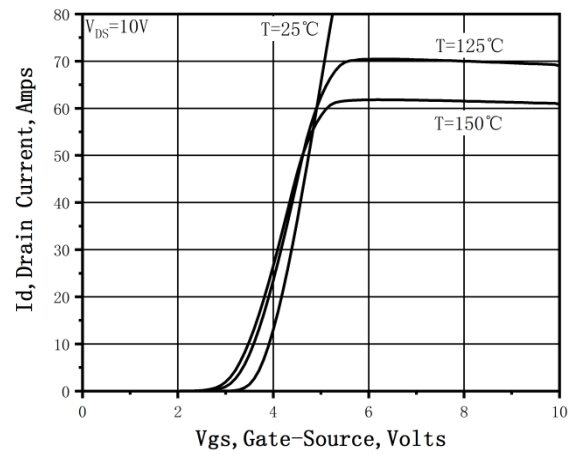


Figure 2. Transfer Characteristics

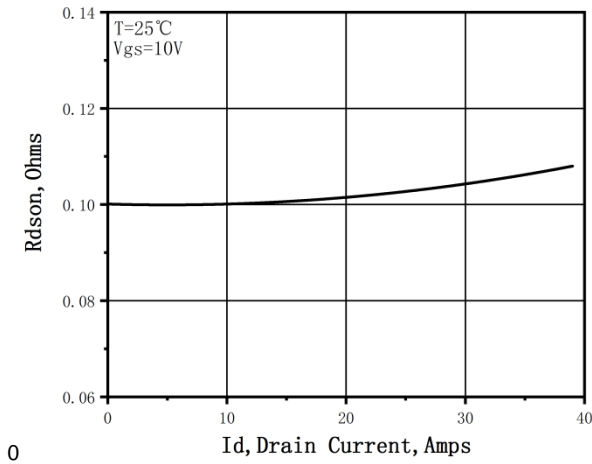


Figure 3. Static Drain-Source On Resistance

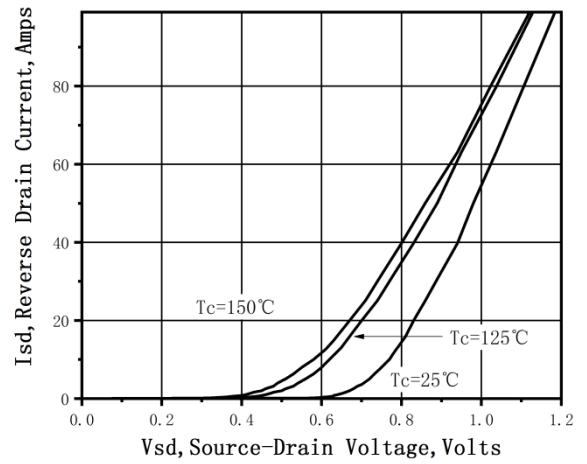


Figure 4. Typical Body Diode Transfer Characteristics

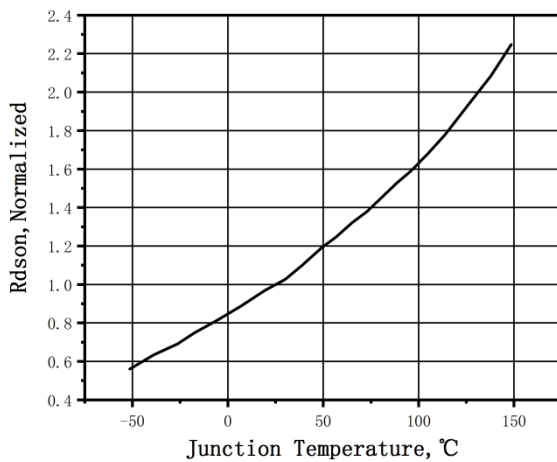


Figure 5. Normalized  $R_{DS(on)}$  vs. Temperature

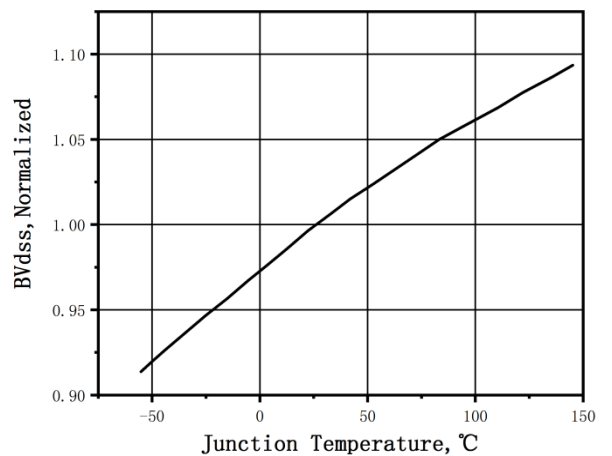


Figure 6. Normalized  $BV_{DSS}$  vs. Temperature

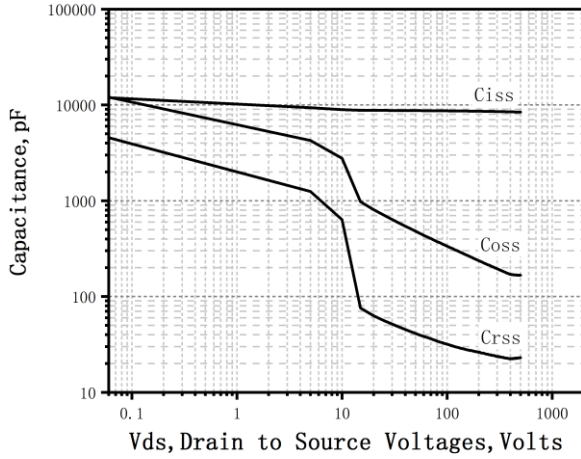


Figure 7. Capacitance Characteristics

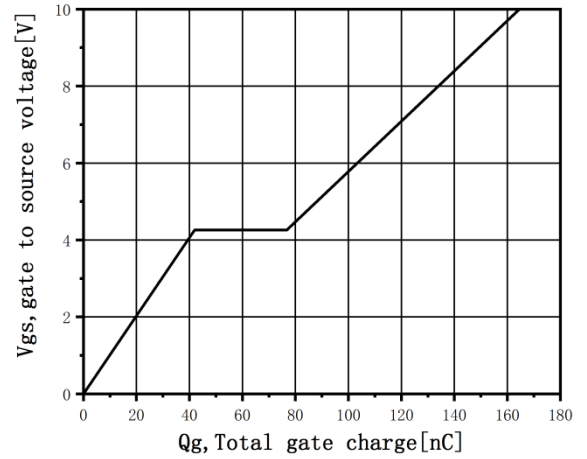


Figure 8. Gate Charge Characteristics

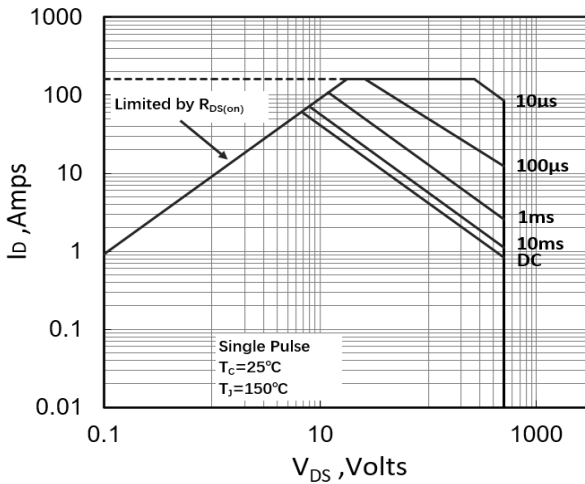


Figure 9. Maximum Safe Operating Area (TO-247)

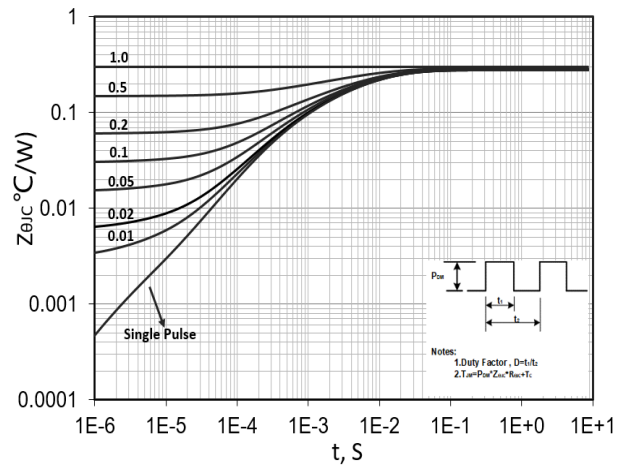


Figure 10. Transient Thermal Response Curve (TO-247)

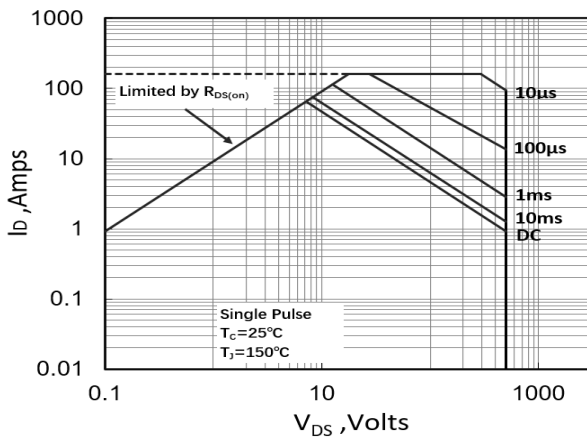


Figure 11. Maximum Safe Operating Area (TO-3PN)

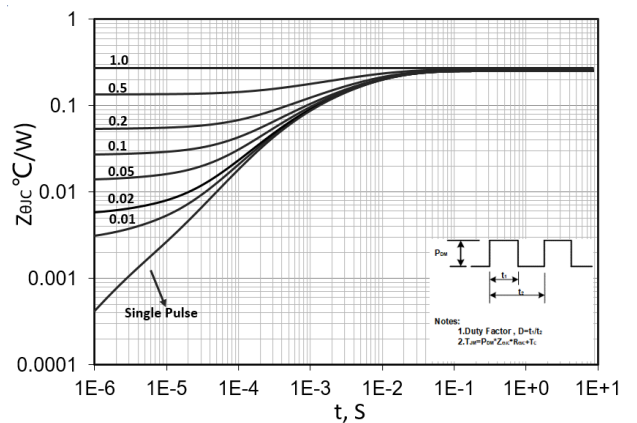
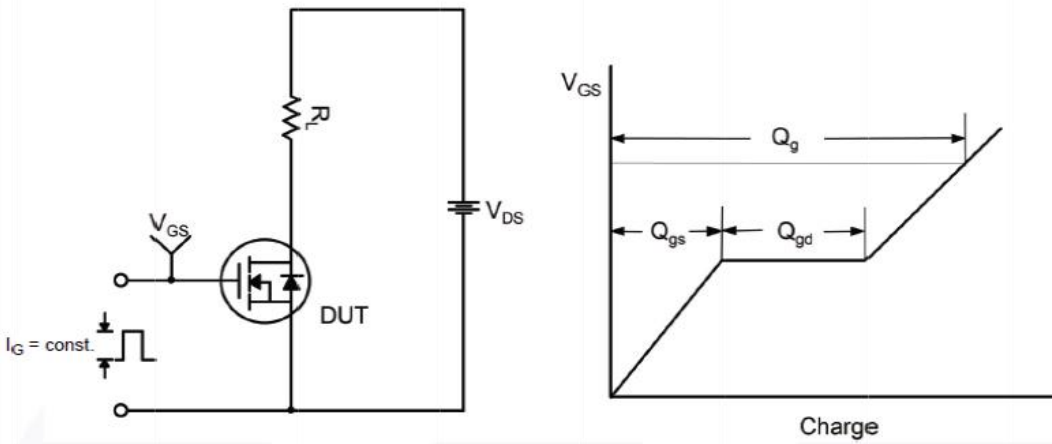


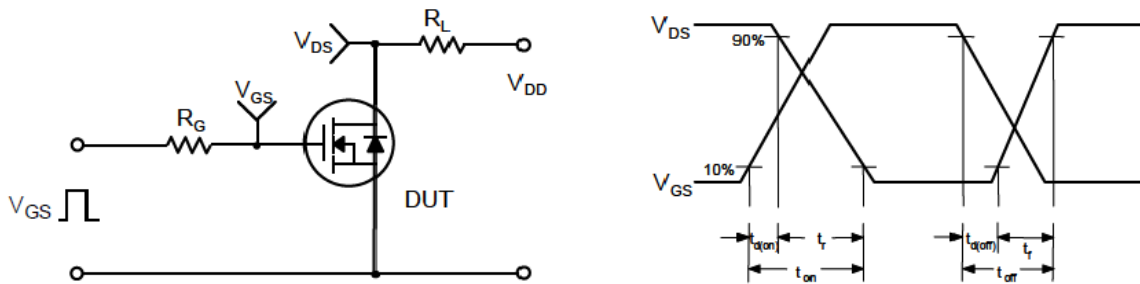
Figure 12. Transient Thermal Response Curve (TO-3PN)

Test Circuit

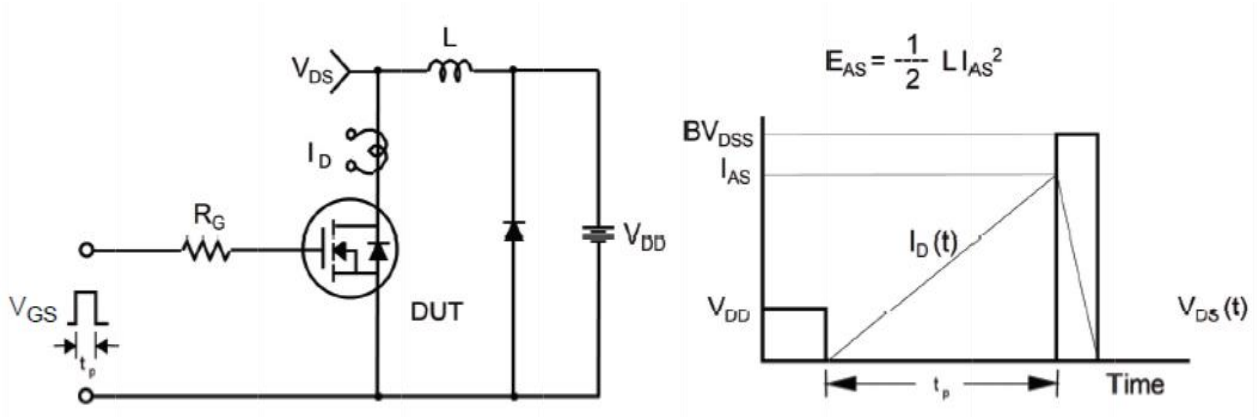
Gate Charge Test Circuit & Waveform



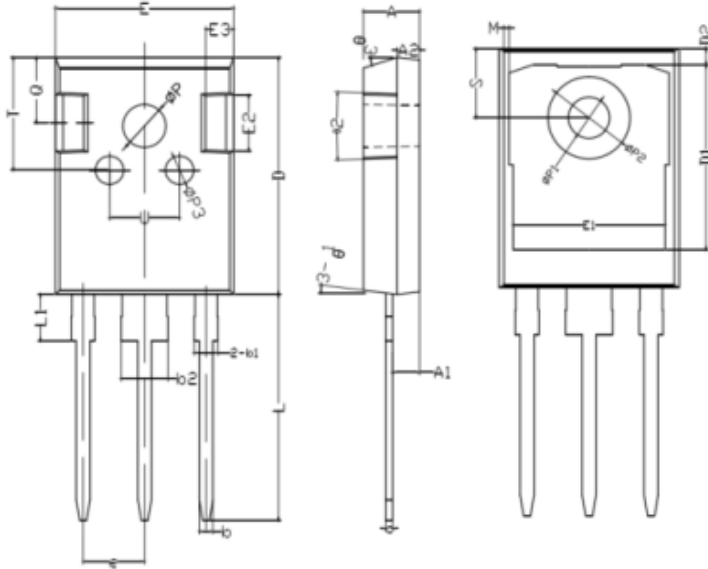
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



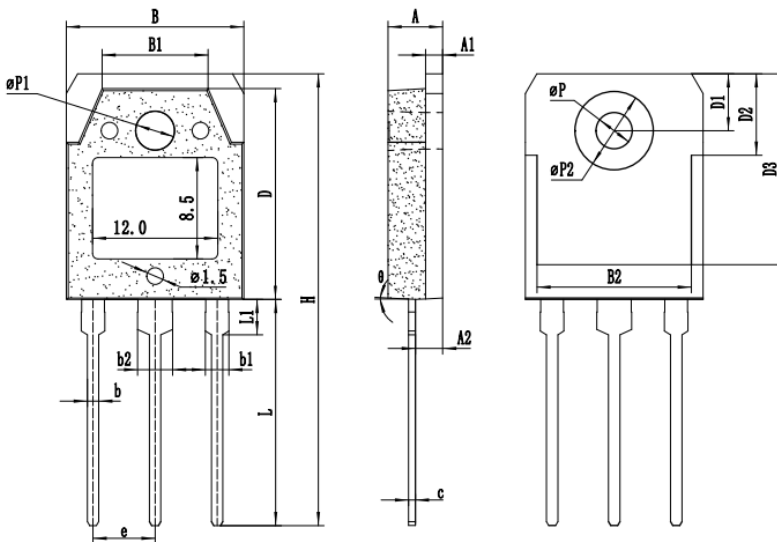
Mechanical Dimensions for TO-247



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.80	5.20
A1	2.21	2.59
A2	1.85	2.15
b	1.11	1.36
b1	1.91	2.25
b2	2.91	3.25
c	0.51	0.75
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.00	13.60
E2	4.80	5.20
E3	2.30	2.70
e	5.40	5.48
L	19.62	20.22
L1	-	4.30
ØP	3.40	3.80
ØP2	6.90	7.30
S	6.05	6.25

Mechanical Dimensions for TO-3PN



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.65	4.95
A1	1.40	1.60
A2	2.20	2.60
b	0.85	1.15
b1	1.90	2.20
b2	2.90	3.30
e	5.40	5.48
B	15.40	15.80
B1	9.10	9.50
B2	13.35	13.75
c	0.50	0.70
D	18.30	18.70
D1	4.80	5.20
D2	6.94	7.34
D3	16.45	17.05
L1	2.90	3.25
L	19.40	20.00
H	39.35	39.95
ΦP	3.00	3.30
ΦP1	3.25	3.55
ΦP2	6.70	7.10

## Ordering Information

Part	Package	Marking	Packing method
WMJ40N50D1	TO-247	WMJ40N50D1	Tube
WMPN40N50D1	TO-3PN	WMPN40N50D1	Tube


## Contact Information

No.1001, Shiwan(7) Road, Pudong District, Shanghai, P.R.China.201207

Tel: 86-21-50310888 Fax: 86-21-50757680 Email: market@way-on.com

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

For additional information, please contact your local Sales Representative.

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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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