

500V 40A 0.1Ω N-ch Power MOSFET

Description

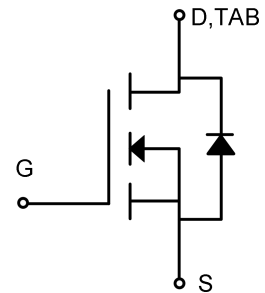
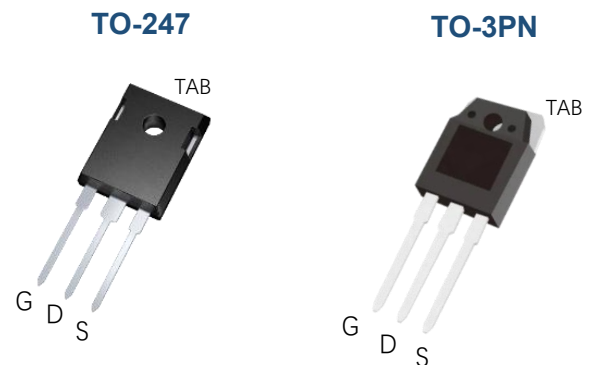
WMOST™ D1 is Wayon's 1st generation VDMOS family that is dramatic reduction in on-resistance and ultra-low gate charge for applications requiring high power density and high efficiency. And it is very robust and RoHS compliant.

Features

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

Applications

- SMPS
- Electric Welder
- DC-DC



Absolute Maximum Ratings (T_c=25°C)

Parameter	Symbol	WMJ40N50D1	WMPN40N50D1	Unit
Drain-source voltage	V _{DSS}	500		V
Gate-source voltage	V _{GS}	±30		V
Continuous drain current	I _D	40		A
Pulsed drain current	I _{DM}	160		A
Avalanche energy, single pulse	E _{AS}	5000		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	I _{Spulse}	160		A

Thermal Characteristic

Thermal resistance, junction-to-case	R _{θJC}	0.3	0.27	°C/W
Thermal resistance, junction-to-ambient	R _{θJA}	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	2.6	4	V
Drain-source leakage current	I_{DSS}	$V_{DS}=500V, V_{GS}=0V$	$T_J=25^\circ C$	-	-	5	μA
		$V_{DS}=40V, V_{GS}=0V$	$T_J=125^\circ C$	-	-	500	μA
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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=23A$	$T_J=25^\circ C$	-	0.1	0.11	Ω
Transconductance	G_{fs}	$V_{DS}=25V, I_D=23A$	$T_J=25^\circ C$	-	31.5	-	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}	$I_D=23A$		-	34.8	-	nC
Total gate charge	Q_g	$V_{GS}=0$ to 10V		-	165.3	-	nC

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

				Min.	Typ.	Max.	
Turn-on delay time	$t_{d on}$	$V_{DD}=250V, I_D=23A, R_G=10\Omega, V_{GS}=10V$		-	48	-	ns
Rise time	t_r			-	64	-	ns
Turn-off delay time	$t_{d off}$			-	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}			-	20.3	-	A
Recovery charge	Q_{rr}			-	3.4	-	μC

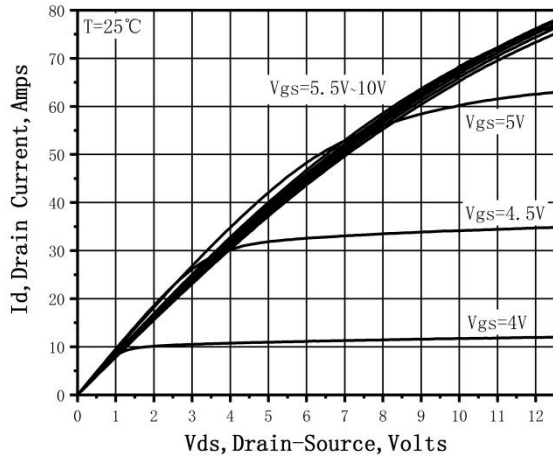


Figure 1. On-Region Characteristics

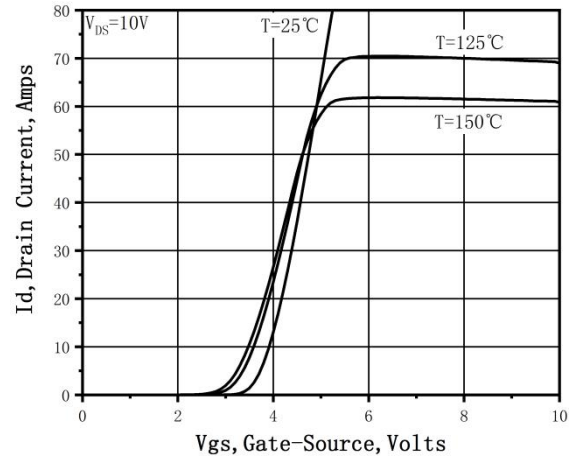


Figure 2. Transfer Characteristics

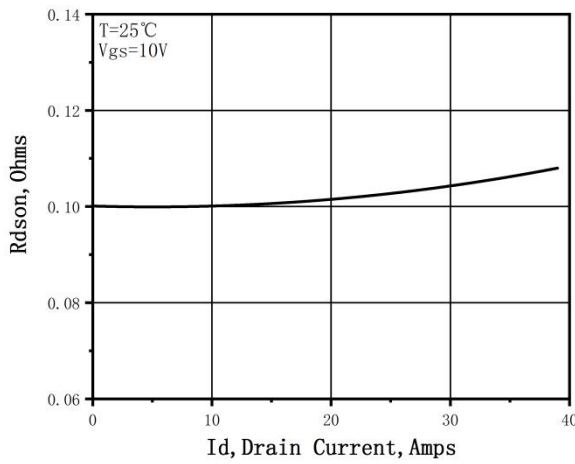


Figure 3. Static Drain-Source On Resistance

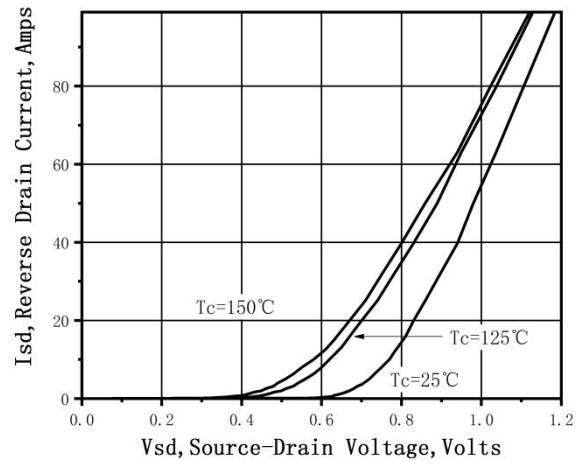


Figure 4. Typical Body Diode Transfer Characteristics

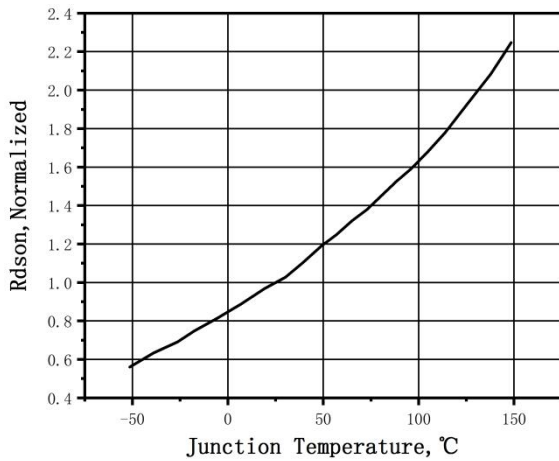


Figure 5. Normalized $R_{DS(on)}$ vs. Temperature

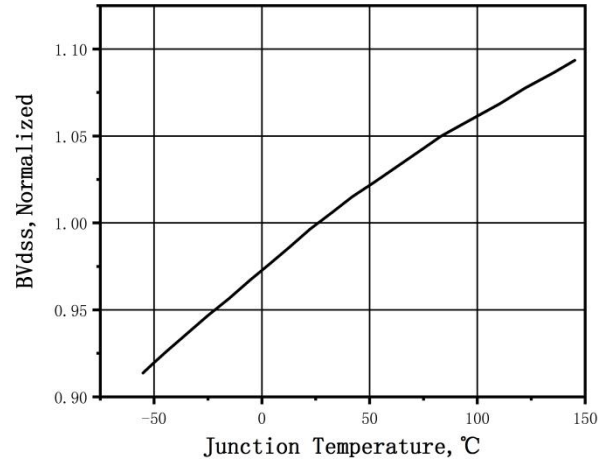


Figure 6. Normalized BV_{DSS} vs. Temperature

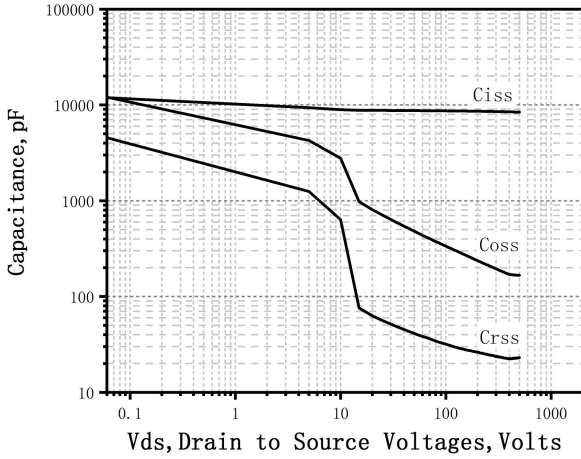


Figure 7. Capacitance Characteristics

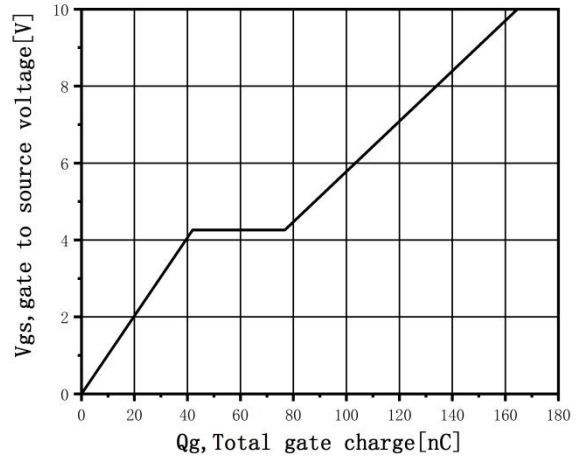


Figure 8. Gate Charge Characteristics

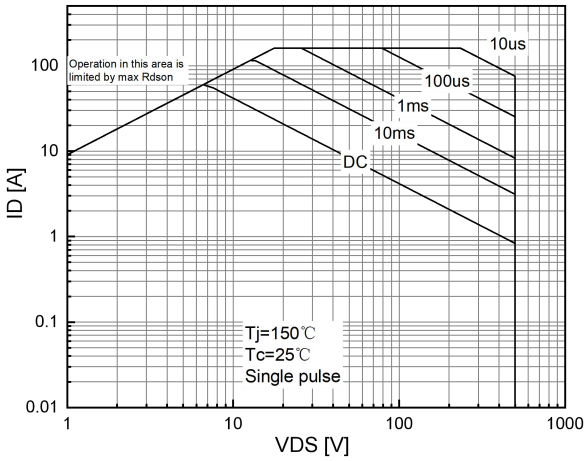


Figure 9. Maximum Safe Operating Area (TO-247)

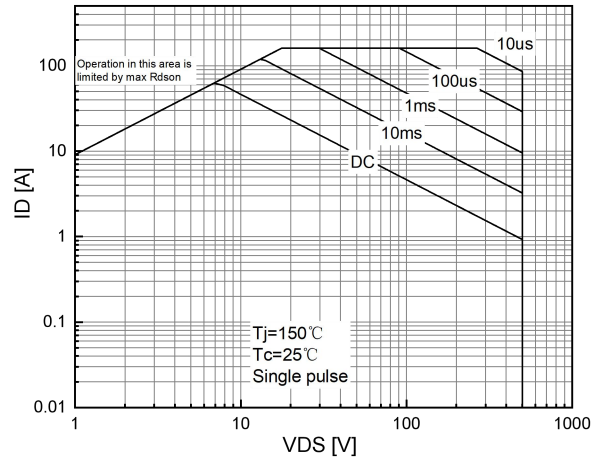


Figure 10. Maximum Safe Operating Area (TO-3PN)

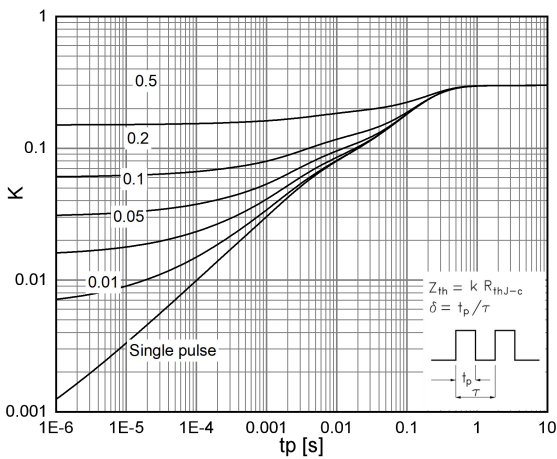


Figure 11. Transient Thermal Response Curve (TO-247)

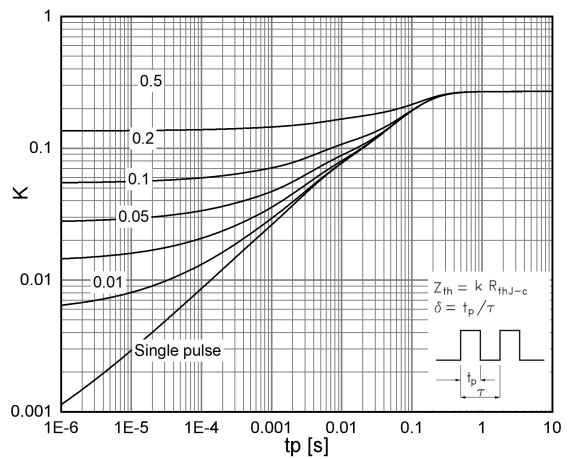
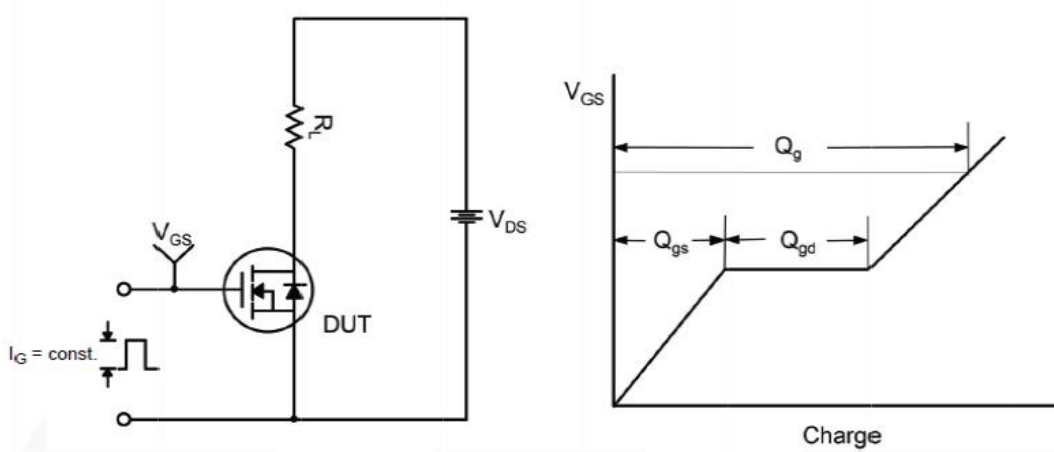
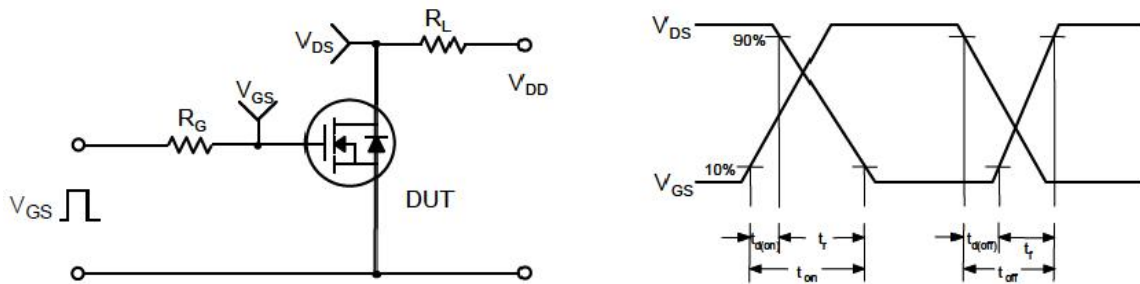


Figure 12. Transient Thermal Response Curve (TO-3PN)

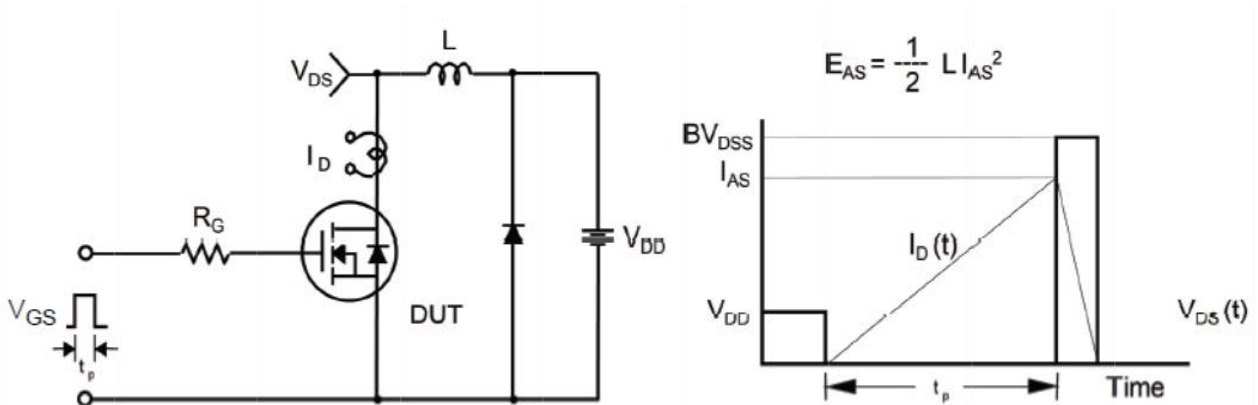
Gate Charge Test Circuit & Waveform



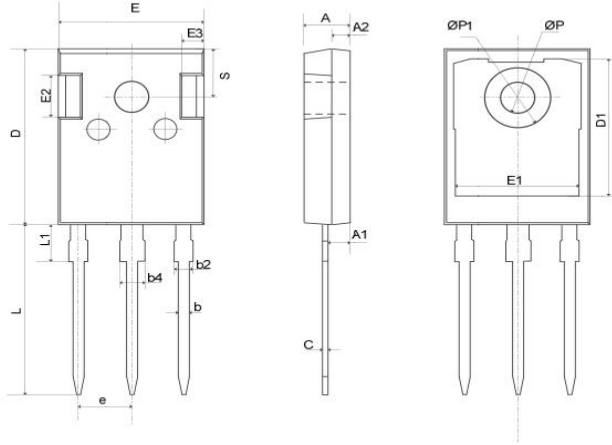
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



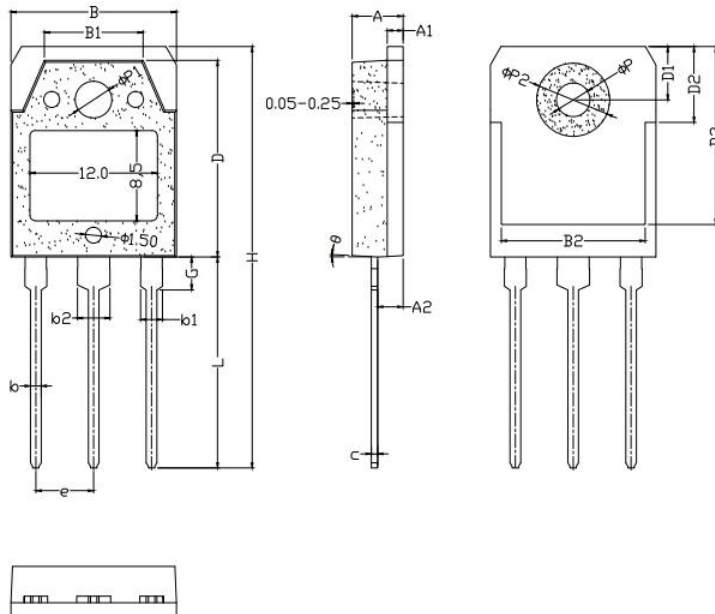
Mechanical Dimensions for TO-247



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.11	1.36
b2	1.91	2.21
b4	2.91	3.21
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	5.44BSC	
L	19.62	20.22
L1	—	4.30
ØP	3.40	3.80
ØP1	—	7.30
S	6.15BSC	

Mechanical Dimensions for TO-3PN

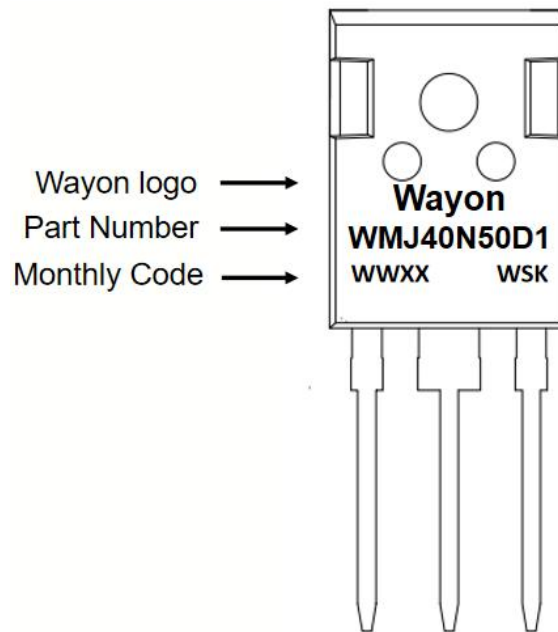


SYMBOL	mm		
	MIN	NOM	MAX
*A	4.65	4.80	4.95
*A1	1.40	1.50	1.60
*A2	2.20	2.40	2.60
*b	0.85	1.00	1.15
*b1	1.90	2.07	2.20
*b2	2.90	3.10	3.30
*B	15.40	15.60	15.80
B1	9.10	9.30	9.50
B2	13.35	13.55	13.75
*c	0.50	0.60	0.70
*D	18.30	18.50	18.70
D1	4.80	5.00	5.20
D2	6.94	7.14	7.34
D3	16.45	16.75	17.05
G	2.90	3.10	3.25
*L	19.40	19.70	20.00
*H	39.35	39.65	39.95
*ΦP	3.00	3.20	3.40
ΦP1	3.25	3.45	3.65
ΦP2	6.60	6.90	7.20
θ1	2°	5°	9°

Ordering Information

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

Marking Information




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