

900V 4A 1.85Ω N-ch Power MOSFET

Description

WMOS 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.

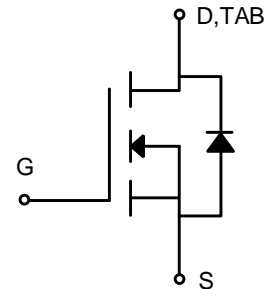


Features

- Typ. $R_{DS(on)}=1.85\Omega@V_{GS}=10V$
- 100% avalanche tested
- RoHS Compliant

Applications

- SMPS
- Charger
- DC-DC



Absolute Maximum Ratings ($T_c=25^\circ C$)

Parameter	Symbol	WMK4N90D1B	WML4N90D1B	WMM4N90D1B	Unit
Drain-source voltage	V_{DSS}	900			V
Gate-source voltage	V_{GS}	± 30			V
Continuous drain current	I_D	4			A
Pulsed drain current ¹	I_{DM}	16			A
Avalanche energy, single pulse ²	E_{AS}	111			mJ
Power dissipation	P_D	63	45	63	W
Derate above 25°C		0.5	0.4	0.5	W/°C
Operating junction temperature	T_j	-55~150			°C
Storage temperature	T_{stg}	-55~150			°C
Continuous diode forward current	I_S	4			A
Diode pulse current	I_{Spulse}^1	16			A

Thermal Characteristic

Thermal resistance, junction-to-case	$R_{\theta JC}$	2	2.8	2	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62.5	62.5	62.5	°C/W

Electrical Characteristics of MOSFET

				Min.	Typ.	Max.	
Drain-source break down voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0V$	$T_C=25^\circ C$	900	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	$T_J=25^\circ C$	3.0	-	4.5	V
Drain-source leakage current	I_{DSS}	$V_{DS}=900V, V_{GS}=0V$	$T_J=25^\circ C$	-	-	1	μA
		$V_{DS}=720V, V_{GS}=0V$	$T_J=125^\circ C$	-	-	100	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 ³	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2A$	$T_J=25^\circ C$	-	1.85	2.3	Ω
Transconductance ³	G_{fs}	$V_{DS}=20V$	$T_J=25^\circ C$	-	6.7	-	S

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

				Min.	Typ.	Max.	
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=25V, V_{GS}=0V$		-	1409	-	pF
Output capacitance	C_{oss}			-	116	-	pF
Reverse transfer capacitance	C_{rss}			-	6.2	-	pF
Gate to source charge	Q_{gs}	$V_{DD}=450V, I_D=4A, V_{GS}=0 \text{ to } 10V$		-	12	-	nC
Gate to drain charge	Q_{gd}			-	9	-	nC
Total gate charge	Q_g			-	34	-	nC

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

				Min.	Typ.	Max.	
Turn-on delay time	$t_{d on}$	$V_{DS}=450V, I_D=4A, R_G=25\Omega, V_{GS}=0 \text{ to } 10V$		-	29	-	ns
Rise time	t_r			-	55	-	ns
Turn-off delay time	$t_{d off}$			-	63	-	ns
Fall time	t_f			-	37	-	ns

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

				Min.	Typ.	Max.	
Forward voltage	V_{SD}	$I_{SD}=4A, V_{GS}=0V$		-	-	1.4	V
Reverse recovery time	t_{rr}	$V_{DS}=450V, I_S=4A, V_{GS}=0V, di/dt=100A/\mu s$		-	360	-	ns
Reverse recovery current	I_{rr}			-	16	-	A
Recovery charge	Q_{rr}			-	2.9	-	μC

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 $V_{DD}=50V, V_{GS}=10V, L=10mH, I_{AS}=4.7A, T_C=25^\circ C$.
3. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS

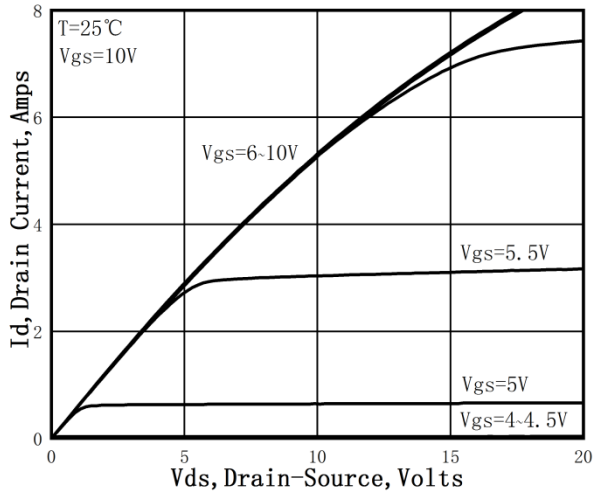


Figure 1. On-Region Characteristics

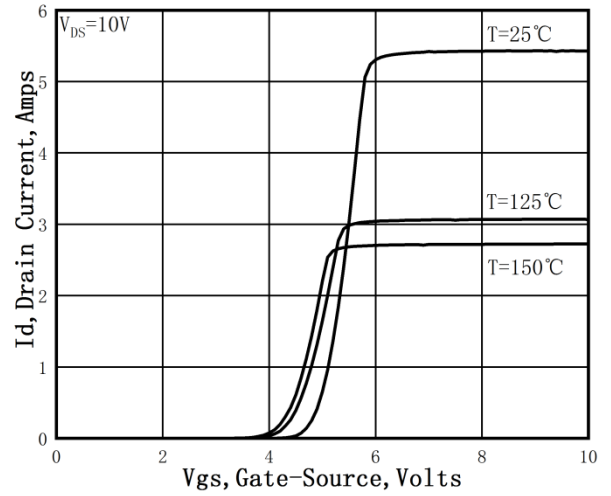


Figure 2. Transfer Characteristics

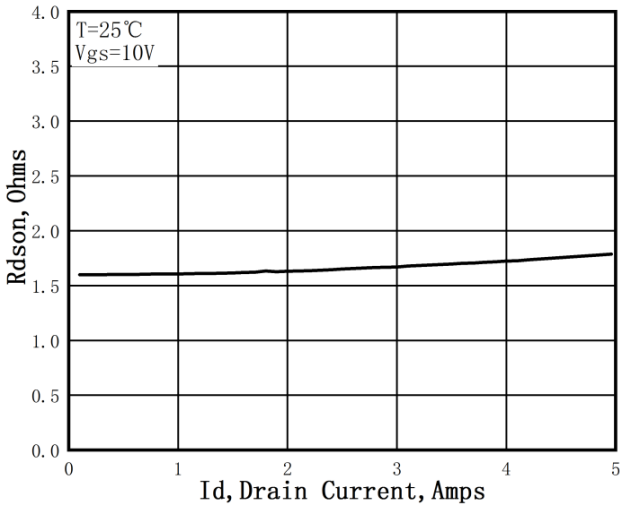


Figure 3. Static Drain-Source On Resistance

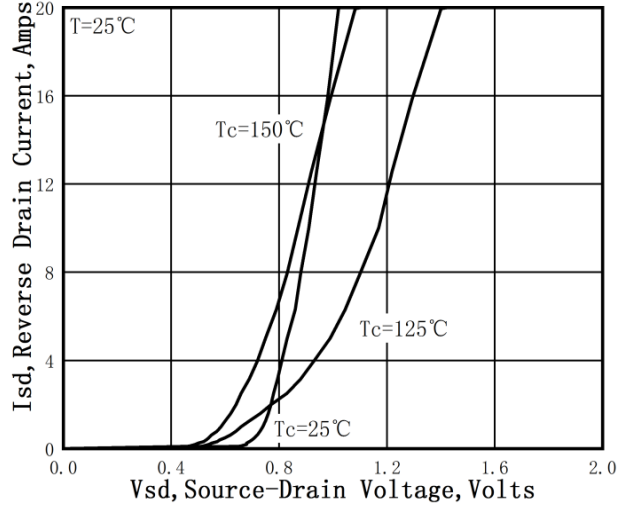


Figure 4. Typical Body Diode Transfer Characteristics

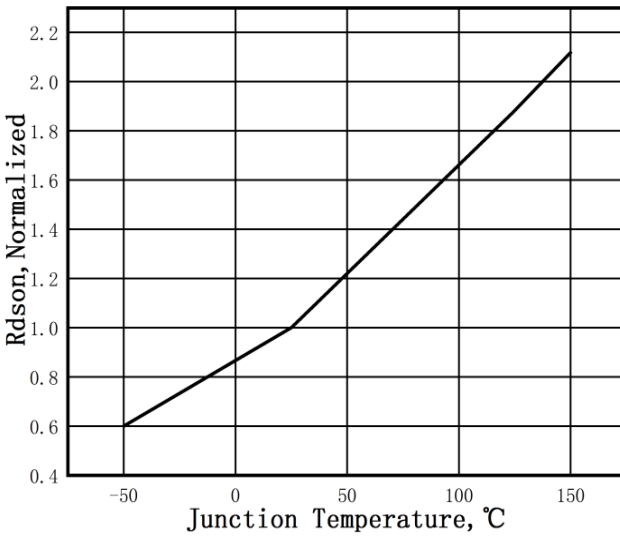


Figure 5. Normalized $R_{DS(on)}$ vs. Temperature

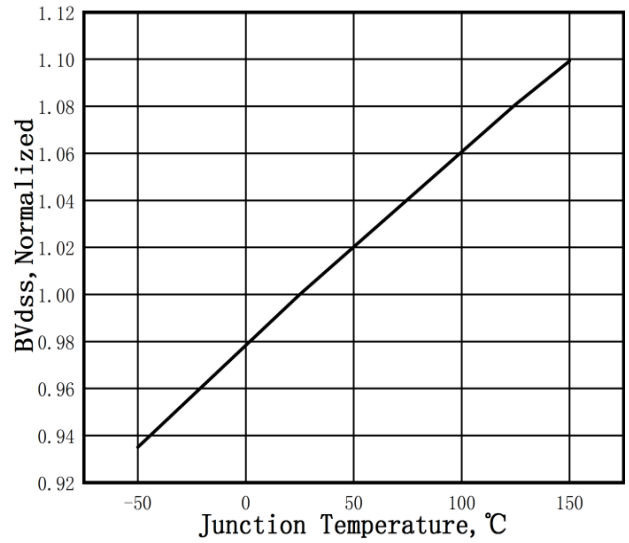


Figure 6. Normalized BV_{DSS} vs. Temperature

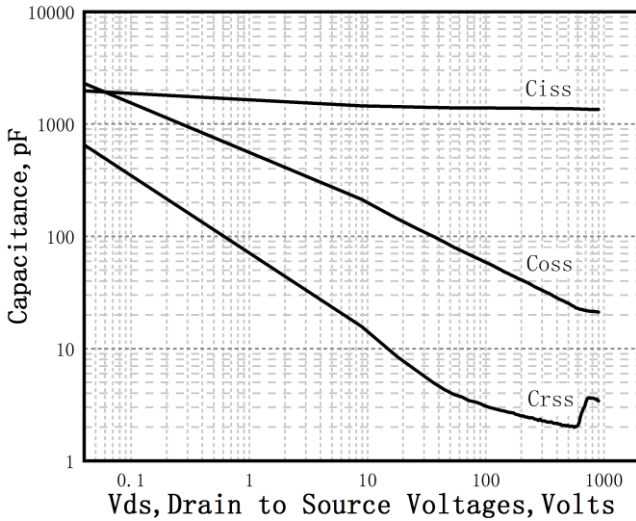


Figure 7. Capacitance Characteristics

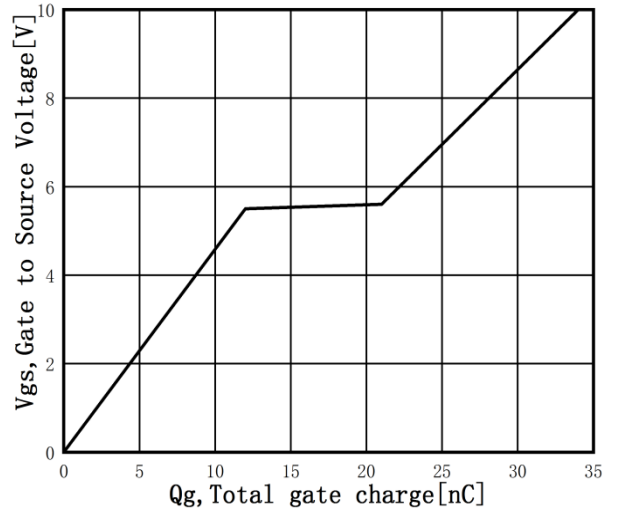


Figure 8. Gate Charge Characteristics

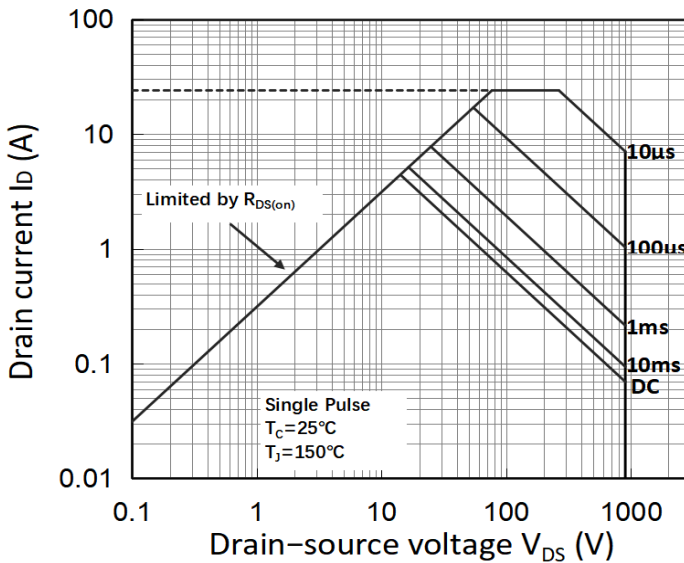


Figure 9. Maximum Safe Operating Area (TO-220/TO-263)

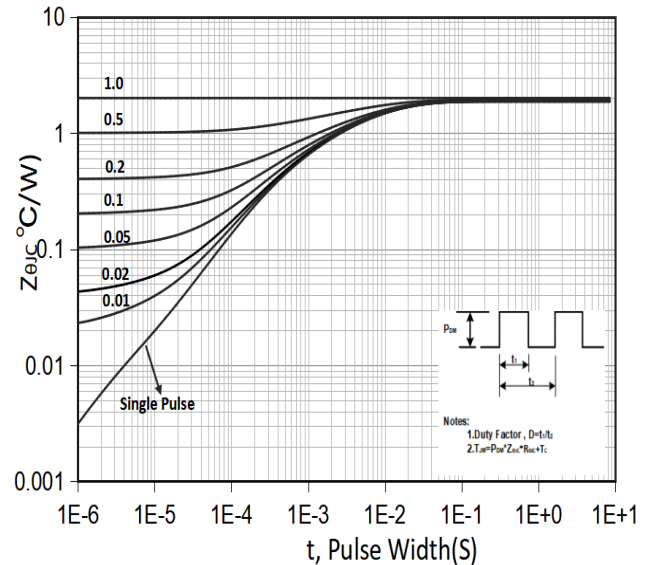


Figure 10. Transient Thermal Response Curve (TO-220/TO-263)

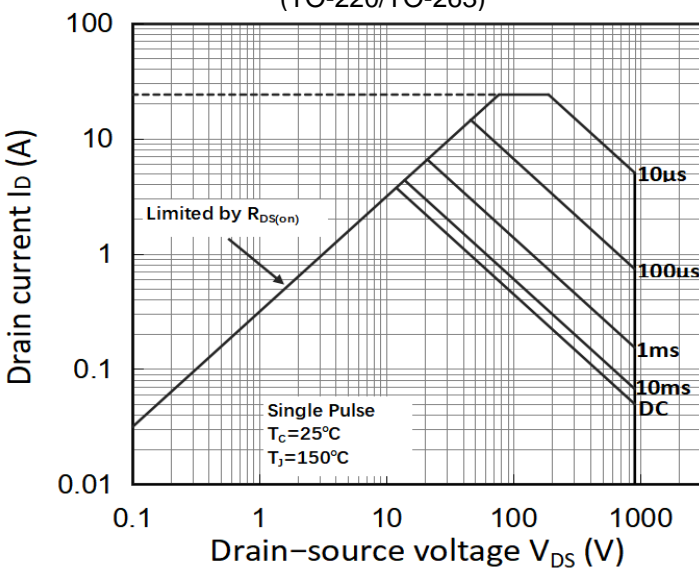


Figure 11. Maximum Safe Operating Area (TO-220F)

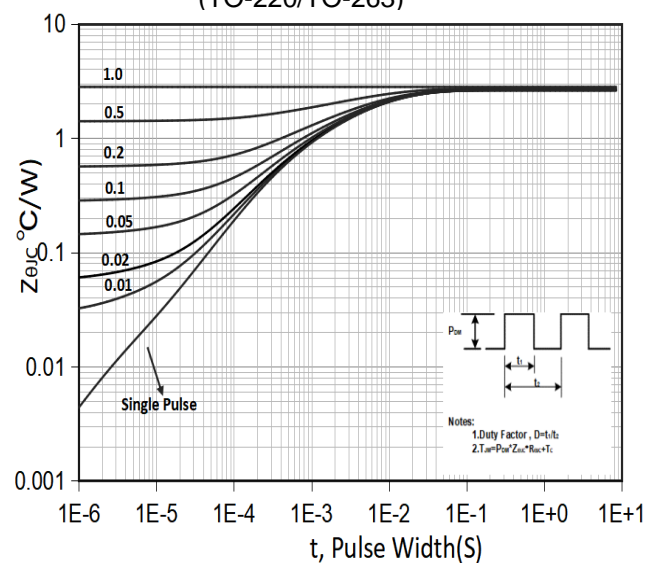
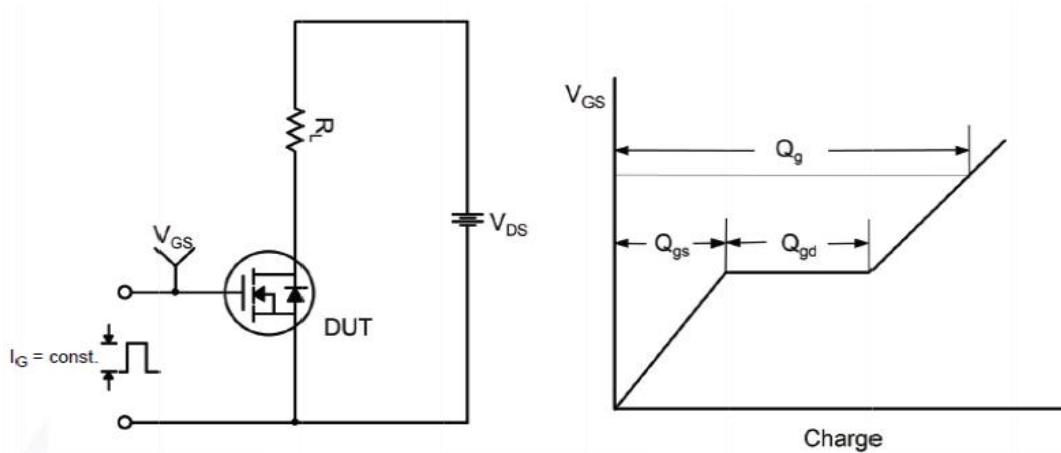


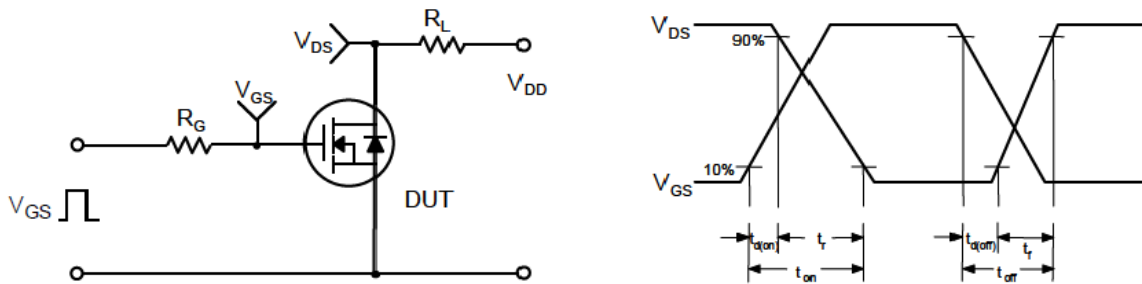
Figure 12. Transient Thermal Response Curve (TO-220F)

Test Circuit

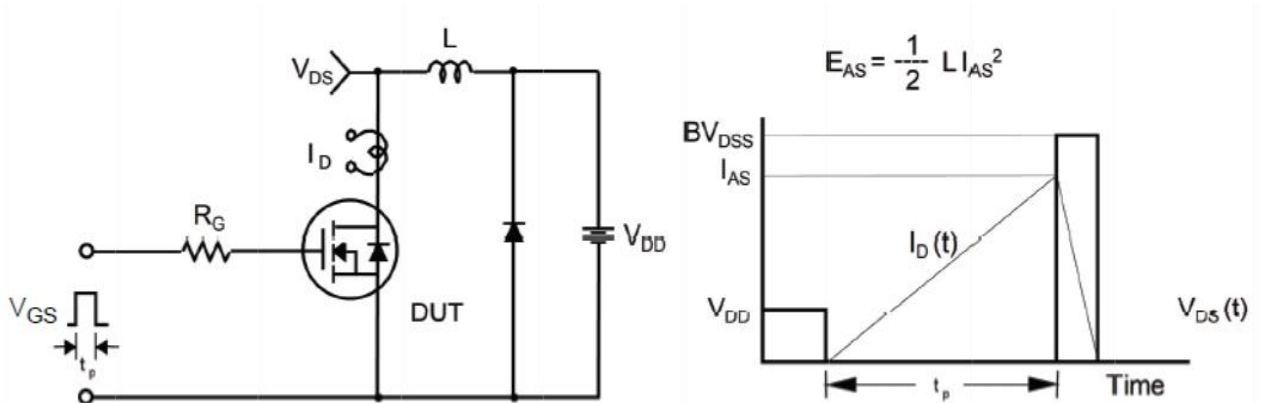
Gate Charge Test Circuit & Waveform



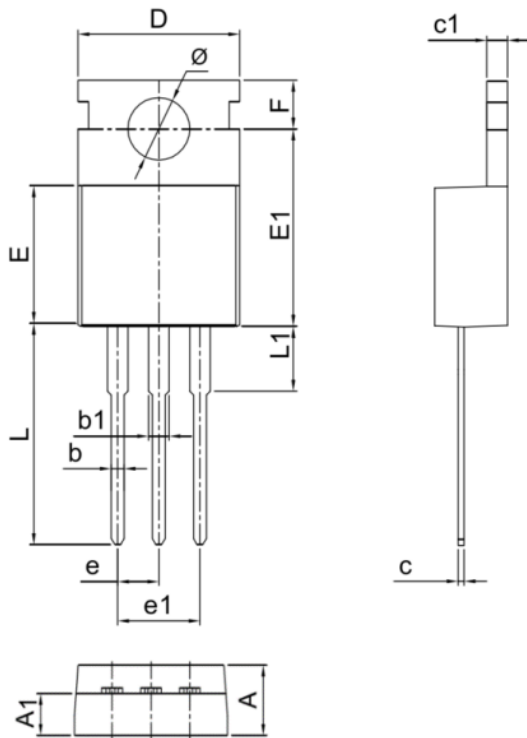
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



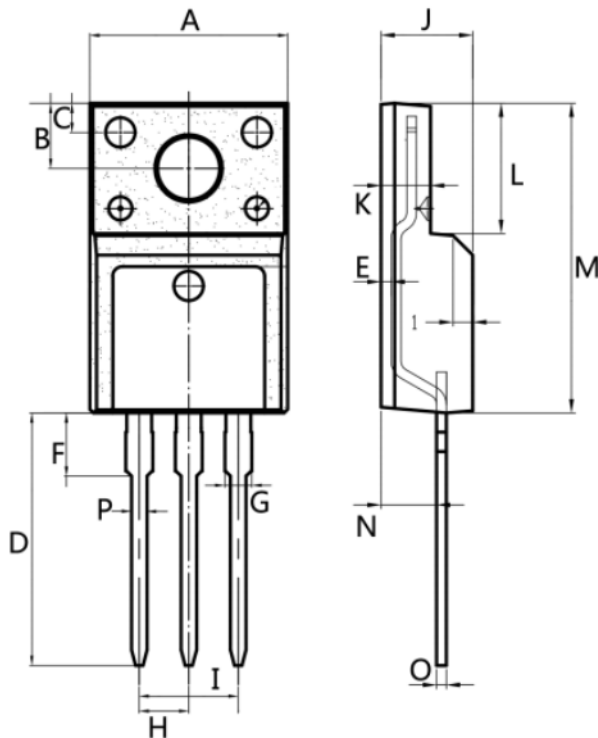
Mechanical Dimensions for TO-220



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.30	4.70
A1	2.30	2.82
b	0.70	0.94
b1	1.17	1.41
c	0.30	0.64
c1	1.17	1.44
D	9.70	10.20
E	8.50	9.30
E1	12.00	12.50
e	2.44	2.64
e1	4.88	5.26
F	2.60	2.94
L	13.00	14.00
L1	3.385	4.20
ϕ	3.74	3.95

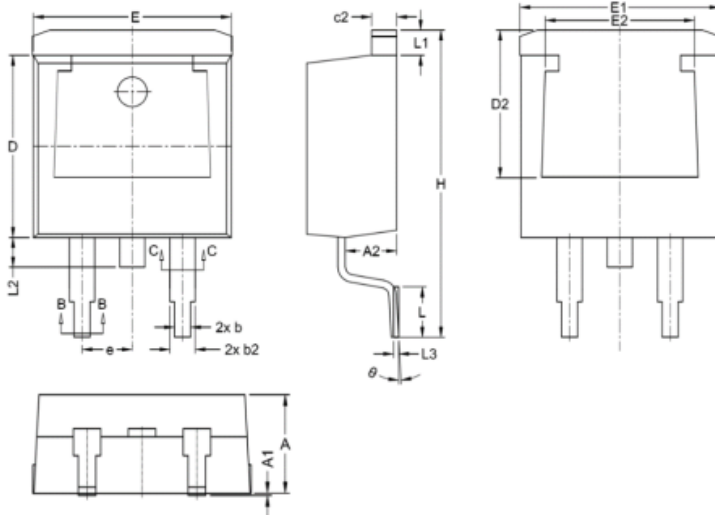
Mechanical Dimensions for TO-220F



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.95	10.36
B	2.95	3.55
C	1.25	1.6
D	12.64	13.5
E	0.40	0.60
F	2.80	3.80
G	1.14	1.58
H	2.44	2.64
I	4.88	5.26
J	4.50	4.90
K	2.34	2.80
L	6.48	6.90
M	15.40	16.07
N	2.66	3.50
O	0.40	0.64
P	0.70	0.94

Mechanical Dimensions for TO-263



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.45	4.65
A1	0	0.15
A2	2.50	2.70
b	0.75	0.96
b1	0.71	0.92
b2	1.21	1.41
b3	1.17	1.37
c	0.33	0.52
c1	0.28	0.48
c2	1.21	1.41
D	9.10	9.30
D2	7.21	7.62
E	9.90	10.10
E1	9.90	10.30
E2	7.34	7.74
e	2.50	2.60
H	15.30	15.70
L	2.34	2.74
L1	1.06	1.47
L2	1.40	1.60
L3	0.25	0.26

Ordering Information

Part	Package	Marking	Packing method
WMK4N90D1B	TO-220	WMK4N90D1B	Tube
WML4N90D1B	TO-220F	WML4N90D1B	Tube
WMM4N90D1B	TO-263	WMM4N90D1B	Tape and reel


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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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