

## 500V 15A 0.37Ω N-ch Power MOSFET

### Description

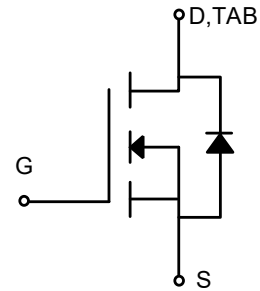
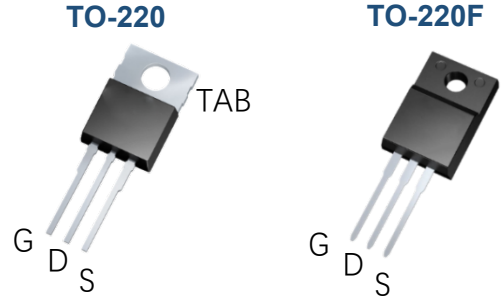
WMOS™ D1 is Wayon's 1<sup>st</sup> generation VDMOS family that is dramatic reduction in on-resistance and ultra-low gate charge for applications requiring high power density and high efficiency. And it is very robust and RoHS compliant.

### Features

- Typ. $R_{DS(on)}=0.37\Omega@V_{GS}=10V$
- 100% avalanche tested
- Pb-free, Halogen free

### Applications

- SMPS
- Charger
- DC-DC



### Absolute Maximum Ratings (T<sub>c</sub>=25°C)

Parameter	Symbol	WMK15N50D1B	WML15N50D1B	Unit
Drain-source voltage	V <sub>DSS</sub>	500		V
Gate-source voltage	V <sub>GS</sub>	±30		V
Continuous drain current	I <sub>D</sub>	15		A
Pulsed drain current <sup>1</sup>	I <sub>DM</sub>	60		A
Avalanche energy, single pulse <sup>2</sup>	E <sub>AS</sub>	1125		mJ
Power dissipation	P <sub>D</sub>	156	45	W
Derate above 25°C		1.3	0.4	W/°C
Operating junction temperature	T <sub>j</sub>	-55~150		°C
Storage temperature	T <sub>stg</sub>	-55~150		°C
Continuous diode forward current	I <sub>S</sub>	15		A
Diode pulse current	I <sub>Spulse</sub>	60		A

### Thermal Characteristic

Thermal resistance, junction-to-case	R <sub>θJC</sub>	0.8	2.8	°C/W
Thermal resistance, junction-to-ambient	R <sub>θJA</sub>	62.5	62.5	°C/W

## Electrical Characteristics of MOSFET

				Min.	Typ.	Max.	
Drain-source break down voltage	$BV_{DSS}$	$I_D=250\mu A, V_{GS}=0V$	$T_C=25^\circ C$	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	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	$T_J=25^\circ C$	-	-	1	$\mu A$
		$V_{DS}=400V, V_{GS}=0V$	$T_J=125^\circ C$	-	-	400	$\mu A$
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>	$R_{DS(ON)}$	$V_{GS}=10V, I_D=7.5A$	$T_J=25^\circ C$	-	0.37	0.45	$\Omega$
Transconductance <sup>3</sup>	$G_{fs}$	$V_{DS}=20V$	$T_J=25^\circ C$	-	18	-	S

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

				Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$f=1MHz, V_{DS}=25V, V_{GS}=0V$		-	2122	-	pF
Output capacitance	$C_{oss}$			-	195	-	pF
Reverse transfer capacitance	$C_{rss}$			-	19	-	pF
Gate to source charge	$Q_{gs}$	$V_{DD}=400V$		-	13	-	nC
Gate to drain charge	$Q_{gd}$	$I_D=15A$		-	12	-	nC
Total gate charge	$Q_g$	$V_{GS}=0$ to 10V		-	43	-	nC

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

				Min.	Typ.	Max.	
Turn-on delay time	$t_{d on}$	$V_{DS}=250V, I_D=15A,$ $R_C=25\Omega, V_{GS}=0$ to 10V		-	13	-	ns
Rise time	$t_r$			-	11	-	ns
Turn-off delay time	$t_{d off}$			-	34	-	ns
Fall time	$t_f$			-	10	-	ns

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

				Min.	Typ.	Max.	
Forward voltage	$V_{SD}$	$I_{SD}=15A, V_{GS}=0V$		-	-	1.5	V
Reverse recovery time	$t_{rr}$	$I_S=15A, V_{GS}=10V$ $-di/dt=100A/\mu s$		-	362	-	ns
Reverse recovery current	$I_{rr}$			-	29	-	A
Recovery charge	$Q_{rr}$			-	5.3	-	$\mu C$

Notes:

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ C$ .
2. The EAS data shows Max. rating . The test condition is  $V_{DD}=50V, V_{GS}=10V, L=10mH, I_{AS}=15A, T_C=25^\circ C$ .
3. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .

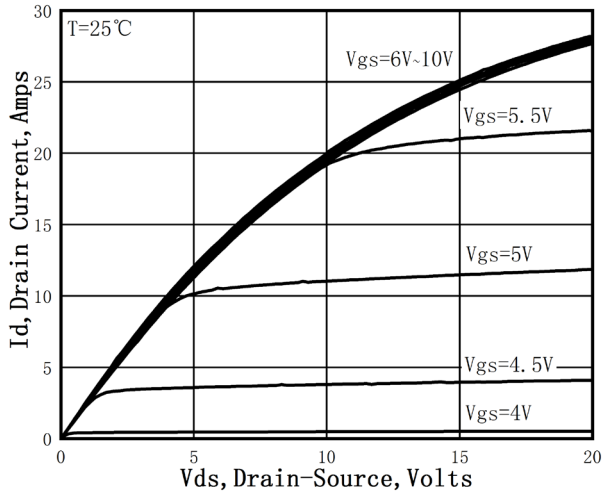


Figure 1. On-Region Characteristics

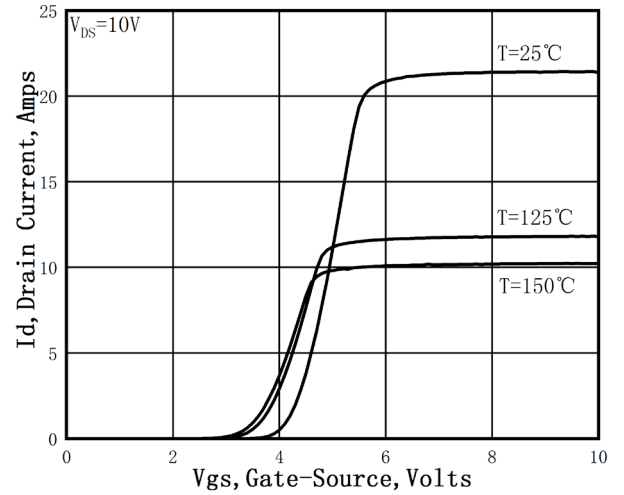


Figure 2. Transfer Characteristics

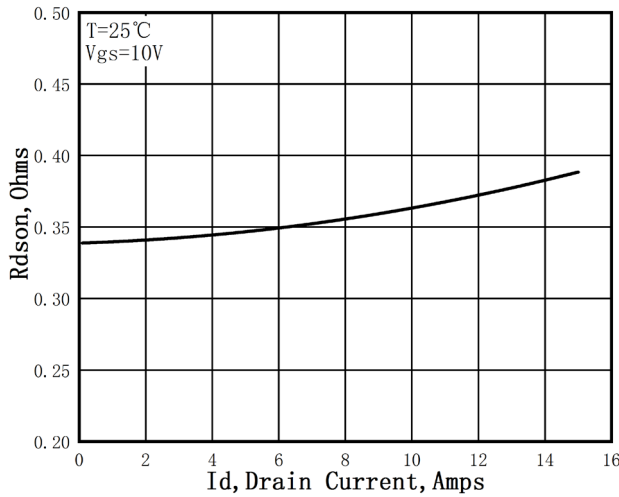


Figure 3. Static Drain-Source On Resistance

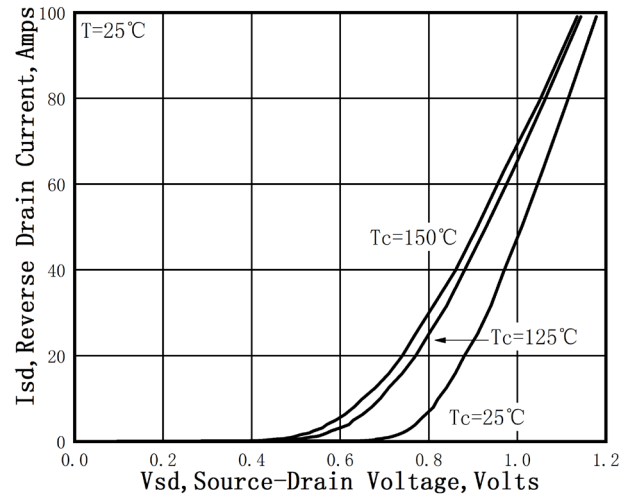


Figure 4. Typical Body Diode Transfer Characteristics

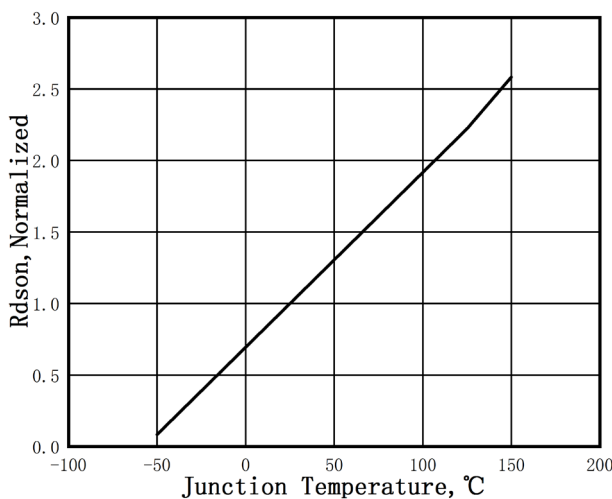


Figure 5. Normalized  $R_{DS(on)}$  vs. Temperature

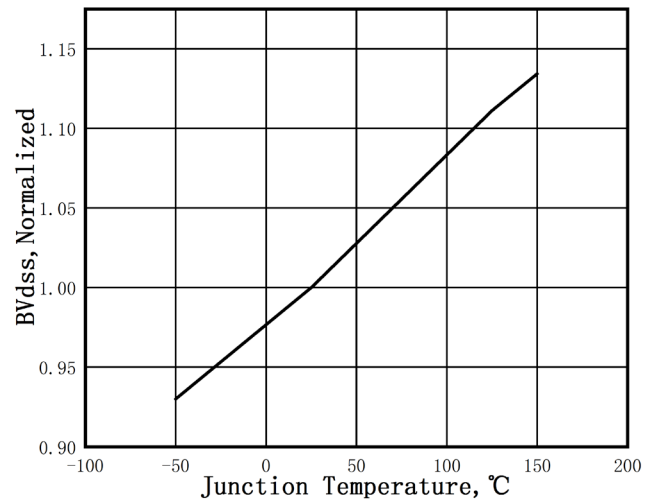


Figure 6. Normalized  $BV_{DSS}$  vs. Temperature

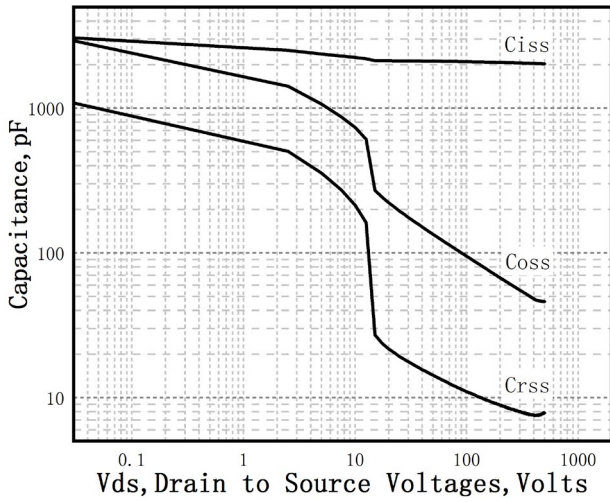


Figure 7. Capacitance Characteristics

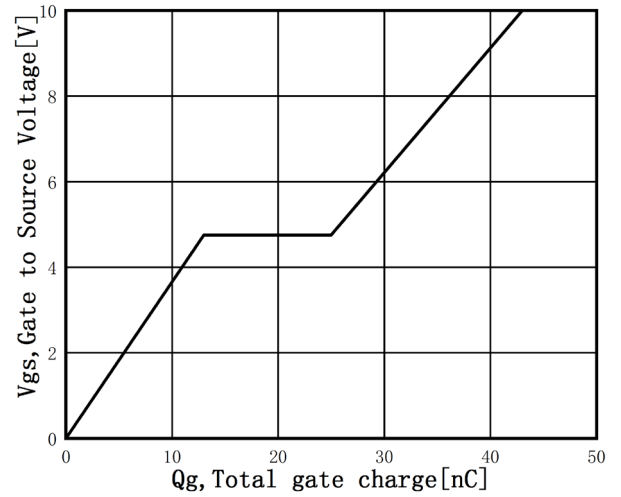


Figure 8. Gate Charge Characteristics

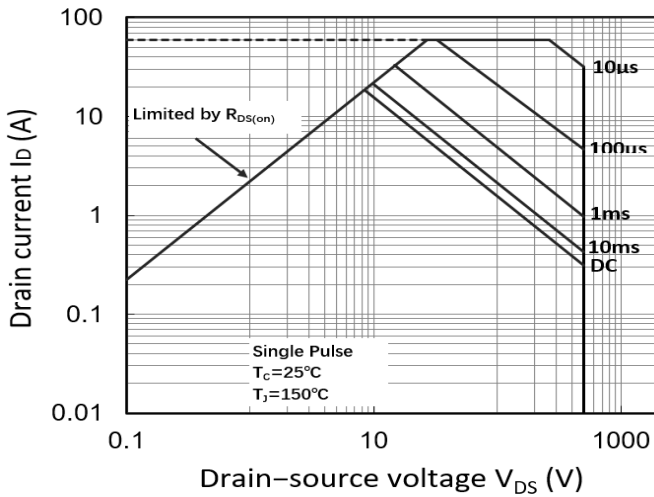


Figure 9. Maximum Safe Operating Area (TO-220)

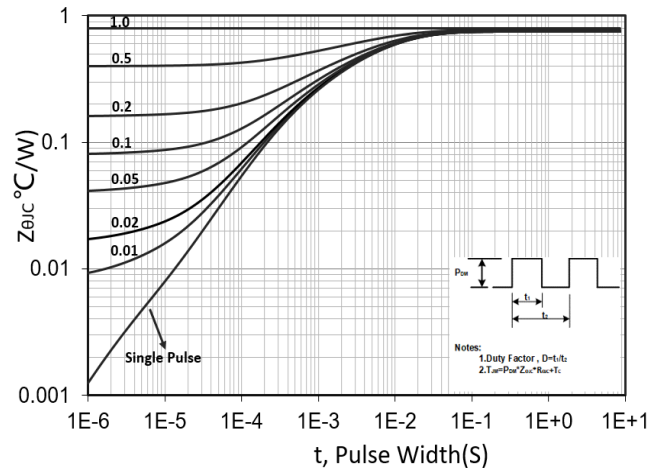


Figure 10. Transient Thermal Response Curve (TO-220)

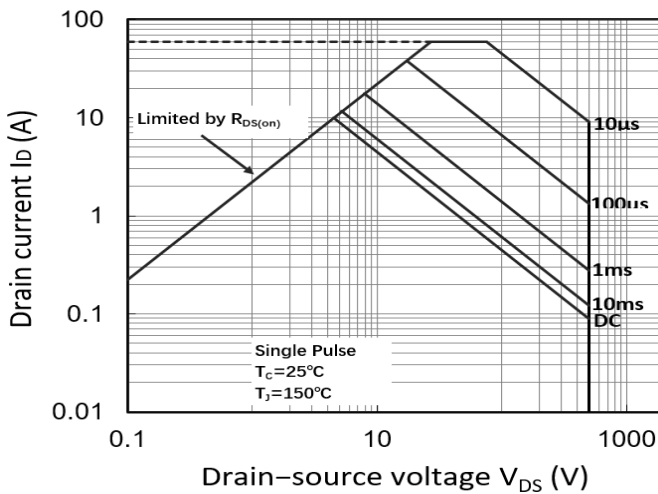


Figure 11. Maximum Safe Operating Area (TO-220F)

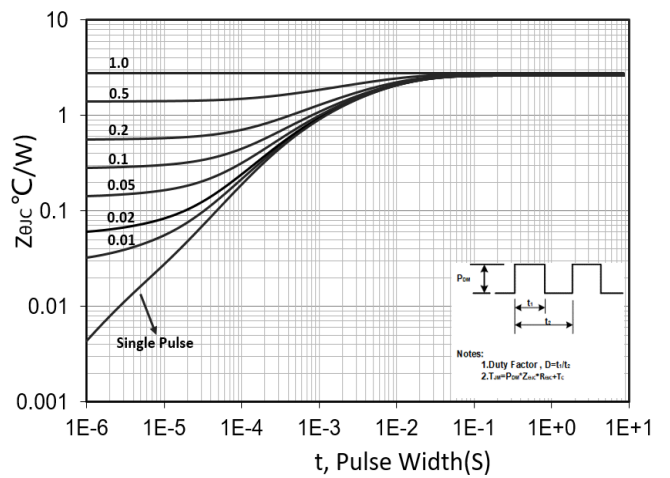
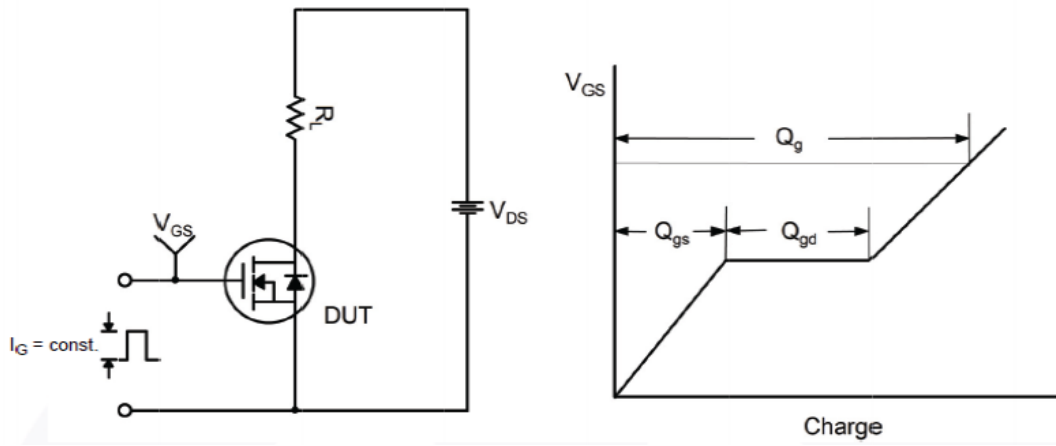
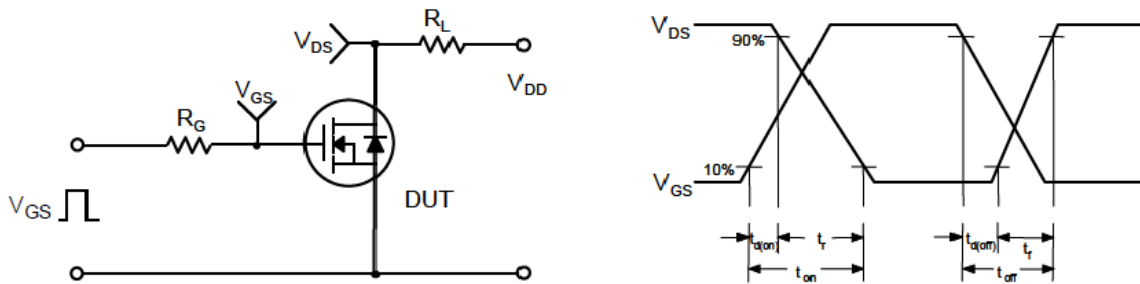


Figure 12. Transient Thermal Response Curve (TO-220F)

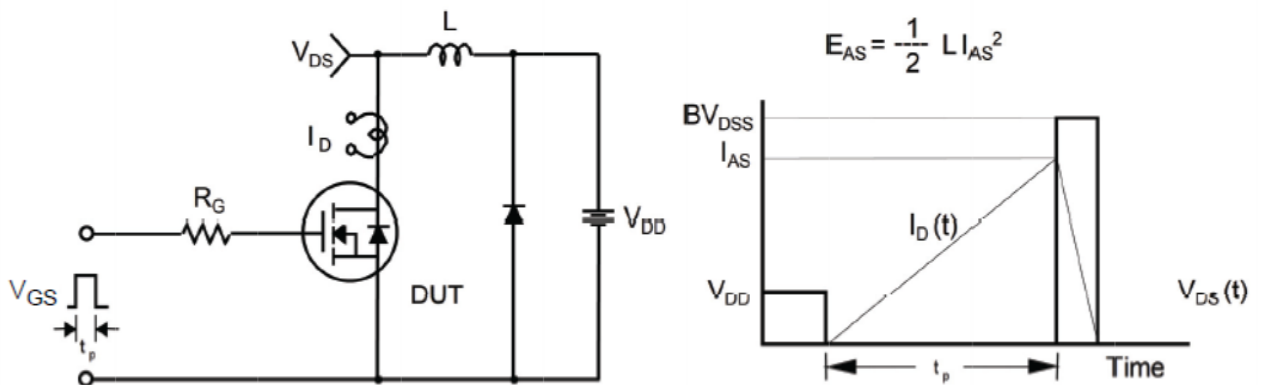
Gate Charge Test Circuit & Waveform



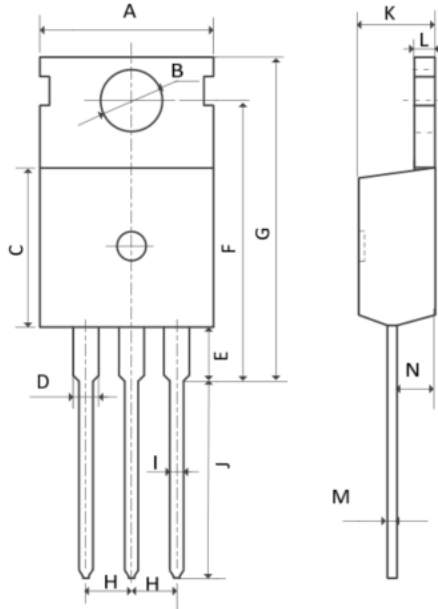
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



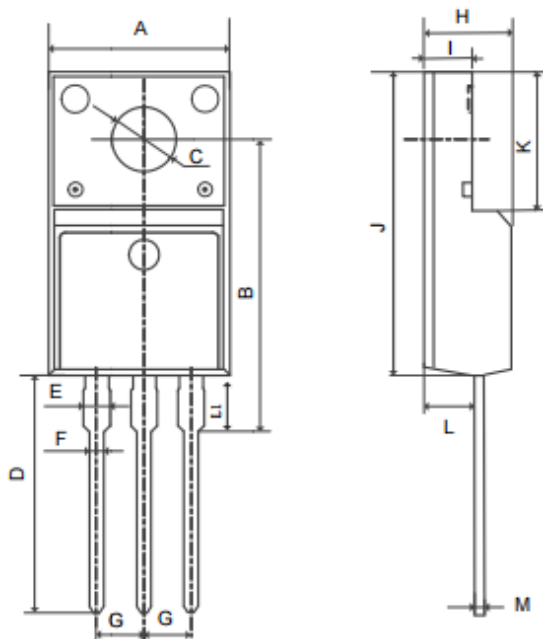
### Mechanical Dimensions for TO-220



#### COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.70	10.20
B	3.40	3.80
C	8.90	9.40
D	1.17	1.47
E	2.60	3.40
F	15.10	16.70
G	19.55MAX	
H	2.54REF	
I	0.70	0.95
J	9.35	11.00
K	4.30	4.77
L	1.20	1.45
M	0.40	0.65
N	2.20	2.60

### Mechanical Dimensions for TO-220F



#### COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.96	10.36
B	15.10	16.10
C	3.03	3.38
D	12.64	13.28
E	1.18	1.58
F	0.70	0.95
G	2.54REF	
H	4.50	4.90
I	2.34	2.74
J	15.57	16.17
K	6.70REF	
L	2.56	2.96
M	0.40	0.65
L1	2.85	3.45

## Ordering Information

Part	Package	Marking	Packing method
WMK15N50D1B	TO-220	WMK15N50D1B	Tube
WML15N50D1B	TO-220F	WML15N50D1B	Tube


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