

## 700V 20A 0.42Ω 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

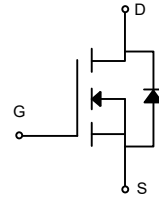
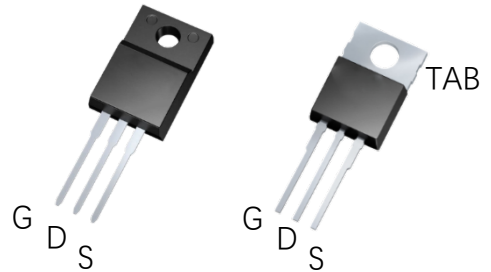
- Typ. $R_{DS(on)}=0.42\Omega@V_{GS}=10V$
- 100% avalanche tested
- Pb-free, Halogen free

### Applications

- SMPS
- Charger
- DC-DC

TO-220F

TO-220



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

Parameter	Symbol	WML20N70D1	WMK20N70D1	Unit
Drain-source voltage	$V_{DSS}$	700		V
Gate-source voltage	$V_{GS}$	$\pm 30$		V
Continuous drain current	$I_D$	20		A
Pulsed drain current <sup>1</sup>	$I_{DM}$	80		A
Avalanche energy, single pulse <sup>2</sup>	$E_{AS}$	696		mJ
Power dissipation	$P_D$	45	156	W
Derate above 25°C		0.4	1.3	W/°C
Operating junction temperature	$T_j$	-55~150		°C
Storage temperature	$T_{stg}$	-55~150		°C
Continuous diode forward current	$I_S$	20		A
Diode pulse current	$I_{Spulse}$	80		A

### Thermal Characteristic

Parameter	Symbol	WML20N70D1	WMK20N70D1	Unit
Thermal resistance, junction-to-case	$R_{\theta JC}$	2.78	0.8	°C/W
Thermal resistance, junction-to-ambient	$R_{\theta JA}$	62.5	62.5	°C/W

## Electrical Characteristics of MOSFET

				Min.	Typ.	Max.	
Drain-source break down voltage	$BV_{DSS}$	$I_D=250\mu A, V_{GS}=0V$	$T_C=25^\circ C$	700	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	$T_J=25^\circ C$	2.0	3.3	4.0	V
Drain-source leakage current	$I_{DSS}$	$V_{DS}=700V, V_{GS}=0V$	$T_J=25^\circ C$	-	-	1	$\mu A$
		$V_{DS}=560V, V_{GS}=0V$	$T_J=125^\circ C$	-	-	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>	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$	$T_J=25^\circ C$	-	0.42	0.55	$\Omega$

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

				Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$f=1MHz, V_{DS}=25V, V_{GS}=0V$		-	3182	-	pF
Output capacitance	$C_{oss}$			-	230	-	pF
Reverse transfer capacitance	$C_{rss}$			-	8	-	pF
Gate to source charge	$Q_{gs}$	$V_{DD}=350V$		-	29	-	nC
Gate to drain charge	$Q_{gd}$	$I_D=20A$		-	12	-	nC
Total gate charge	$Q_g$	$V_{GS}=0$ to 10V		-	66	-	nC

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

				Min.	Typ.	Max.	
Turn-on delay time	$t_{d on}$	$V_{DS}=350V, I_D=20A,$ $R_G=25\Omega, V_{GS}=0$ to 10V		-	205	-	ns
Rise time	$t_r$			-	190	-	ns
Turn-off delay time	$t_{d off}$			-	290	-	ns
Fall time	$t_f$			-	110	-	ns

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

				Min.	Typ.	Max.	
Forward voltage	$V_{SD}$	$I_{SD}=20A, V_{GS}=0V$		-	-	1.5	V
Reverse recovery time	$t_{rr}$	$V_{DS}=350V, I_S=20A, V_{GS}=10V$ $-di/dt=100A/\mu s$		-	476	-	ns
Reverse recovery current	$I_{rr}$			-	30	-	A
Recovery charge	$Q_{rr}$			-	7	-	$\mu C$

### 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  $V_{DD}=50V, V_{GS}=10V, L=10mH, I_{AS}=11.8A, T_C=25^\circ C$ .
3. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .

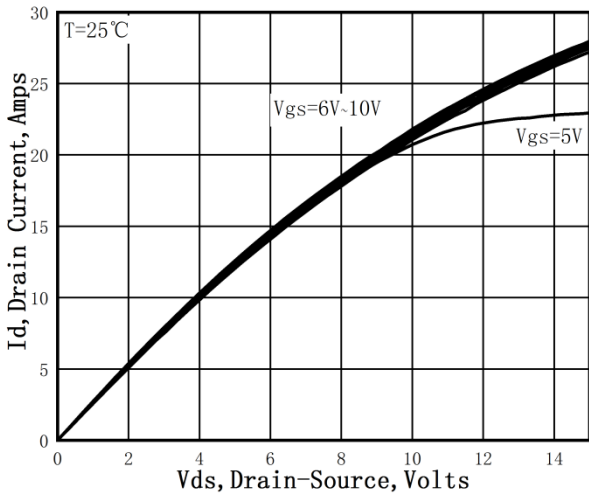


Figure 1. On-Region Characteristics

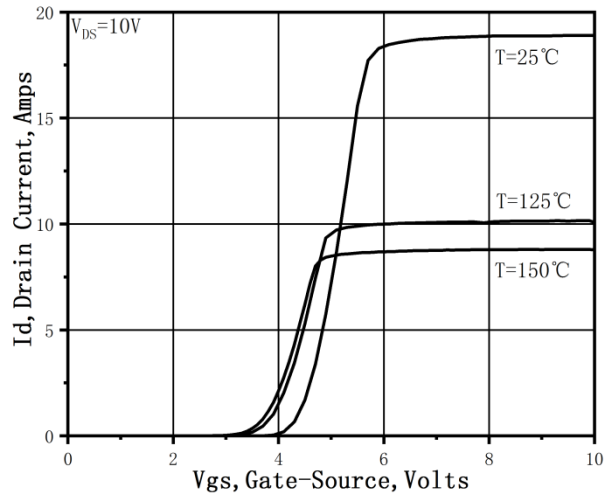


Figure 2. Transfer Characteristics

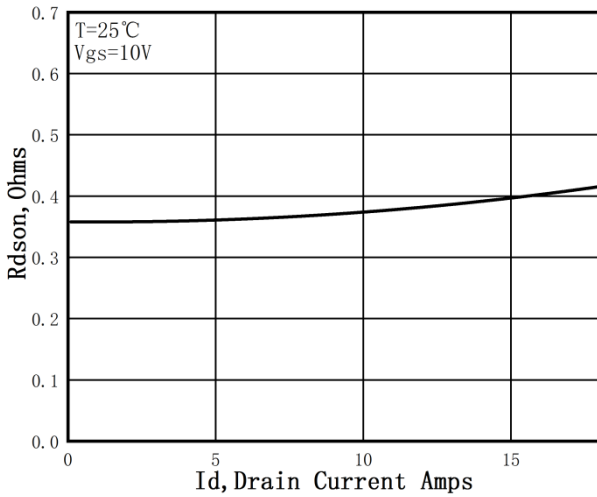


Figure 3. Static Drain-Source On Resistance

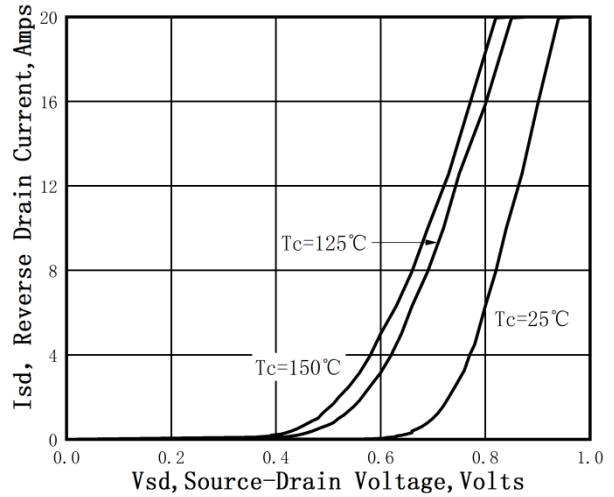


Figure 4. Typical Body Diode Transfer Characteristics

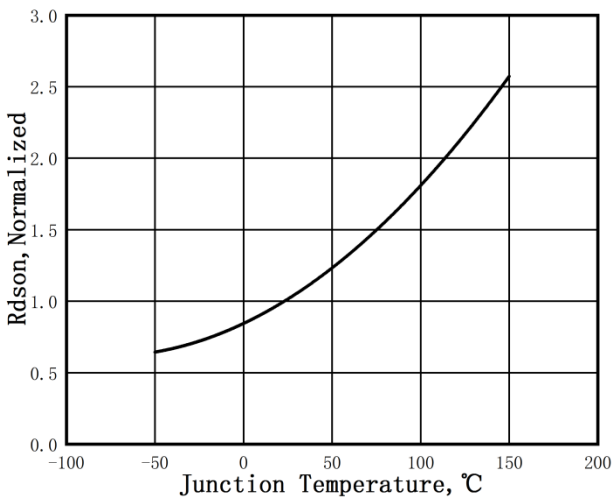


Figure 5. Normalized  $R_{DS(on)}$  vs. Temperature

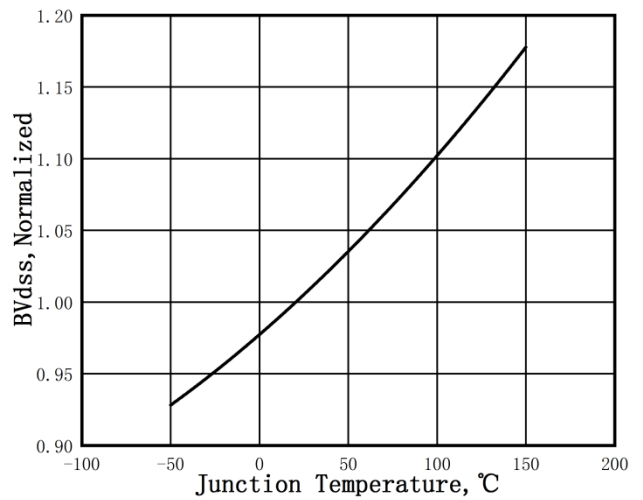


Figure 6. Normalized  $BV_{DSS}$  vs. Temperature

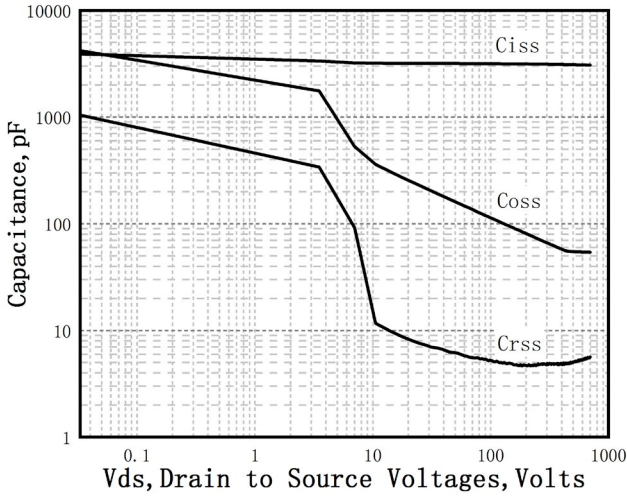


Figure 7. Capacitance Characteristics

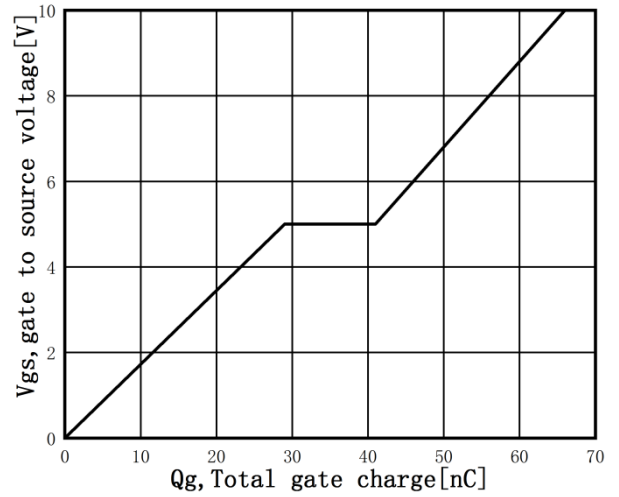


Figure 8. Gate Charge Characteristics

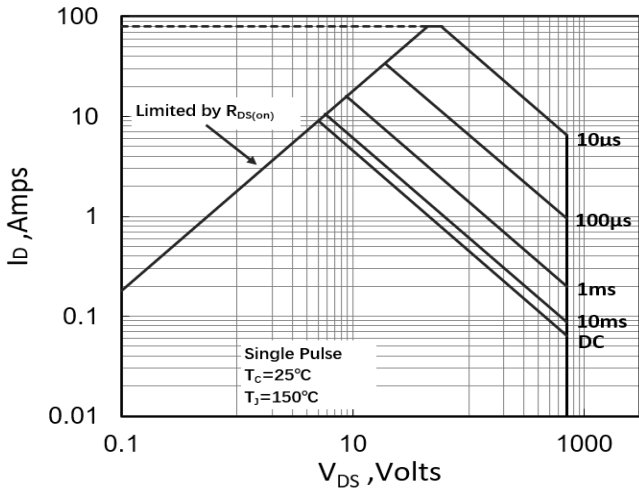


Figure 9. Maximum Safe Operating Area (TO-220F)

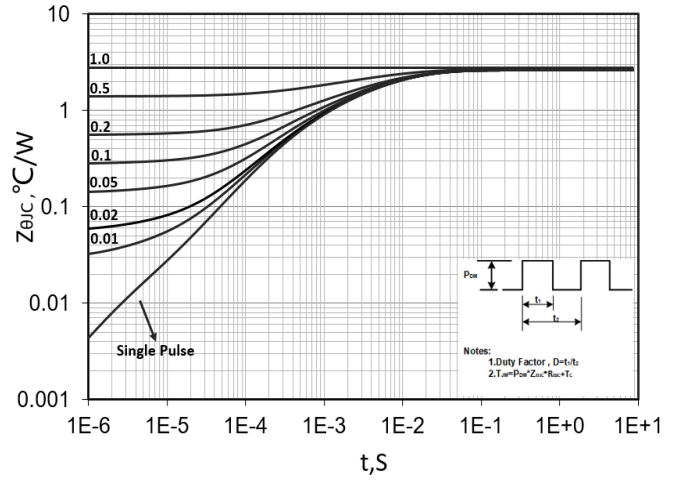


Figure 10. Transient Thermal Response Curve (TO-220F)

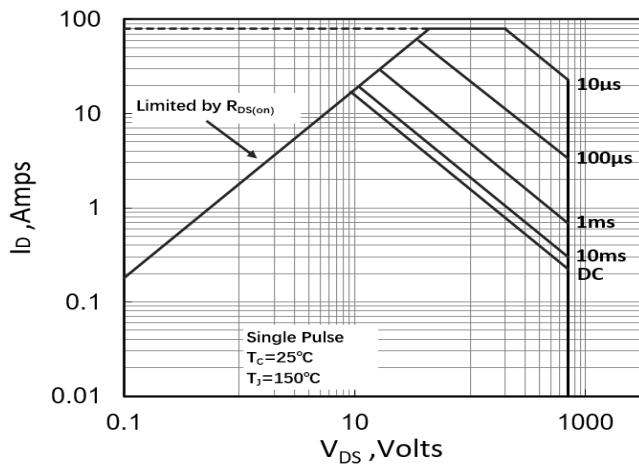


Figure 11. Maximum Safe Operating Area (TO-220)

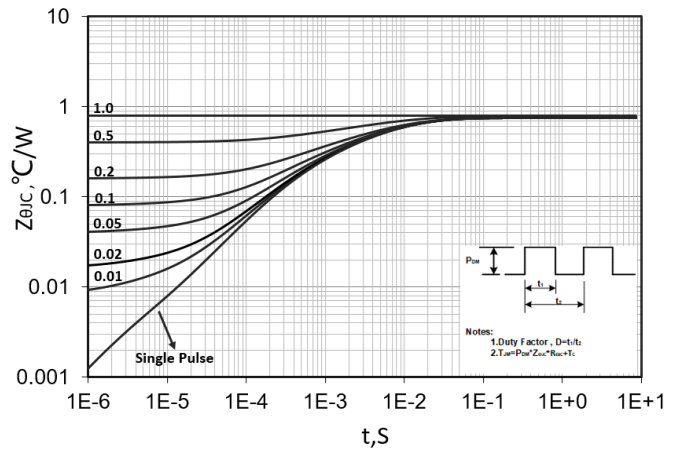
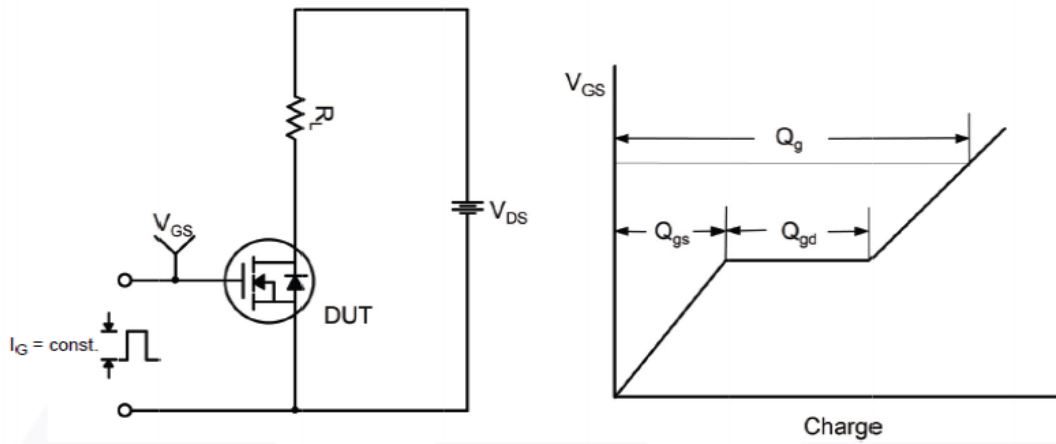
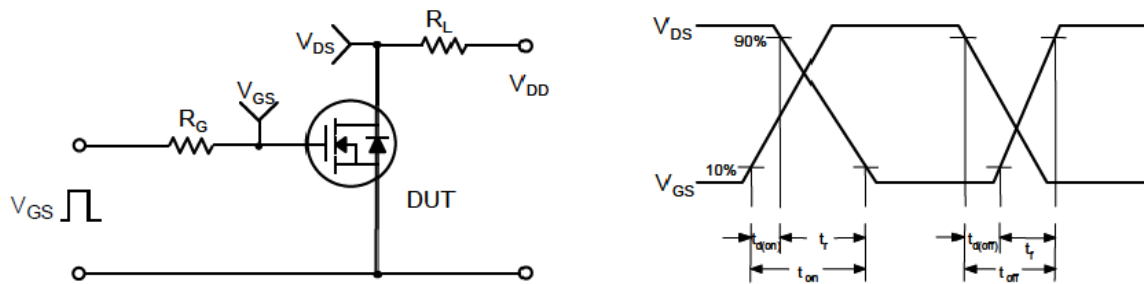


Figure 12. Transient Thermal Response Curve (TO-220)

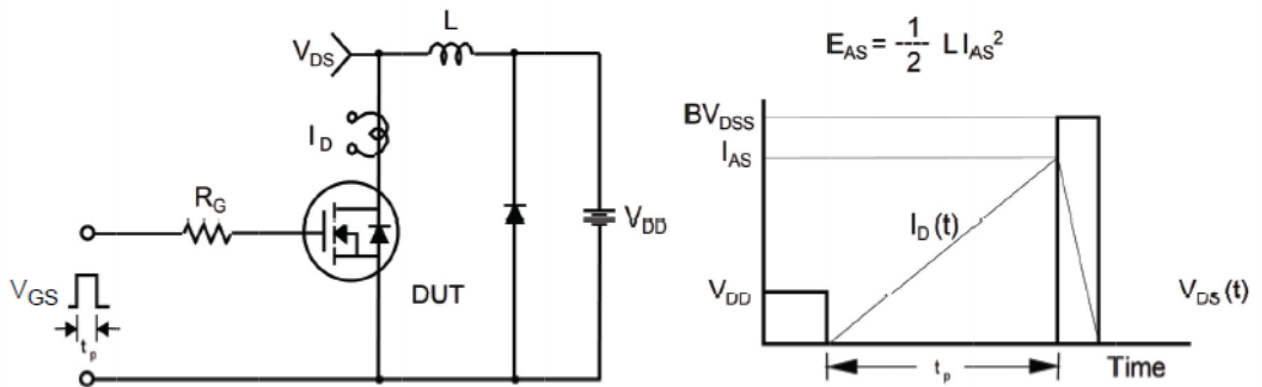
Gate Charge Test Circuit & Waveform



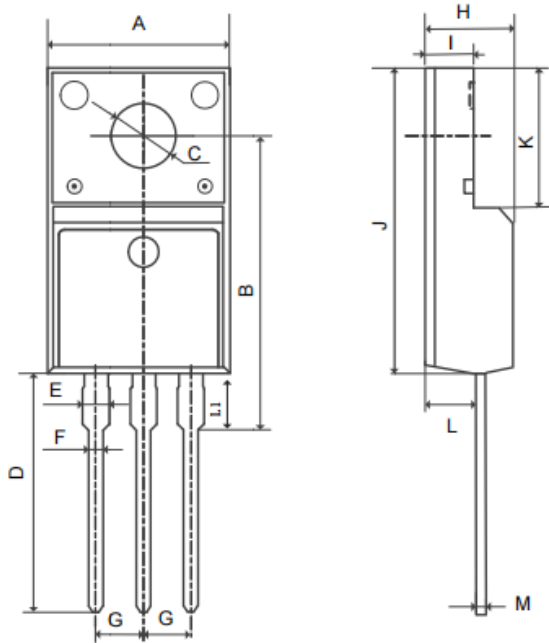
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



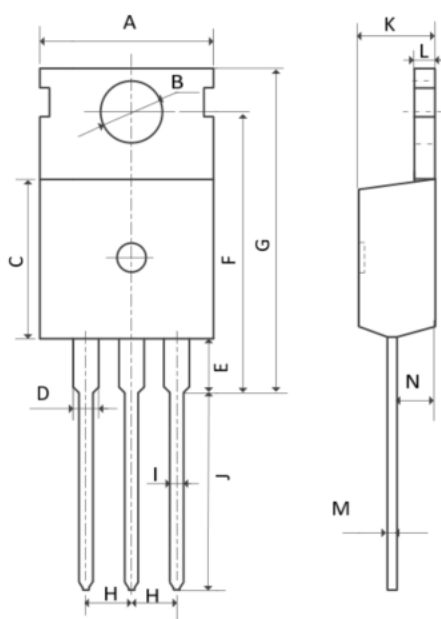
### Mechanical Dimensions for TO-220F



#### 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

### 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

## Ordering Information

Part	Package	Marking	Packing method
WML20N70D1	TO-220F	WML20N70D1	Tube
WMK20N70D1	TO-220	WMK20N70D1	Tube


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