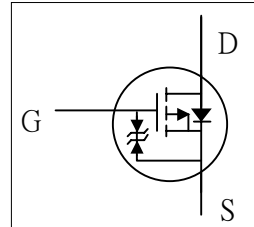


- ▼ 100% UIS Test
- ▼ Simple Drive Requirement
- ▼ Fast Switching Characteristic
- ▼ RoHS Compliant & Halogen-Free

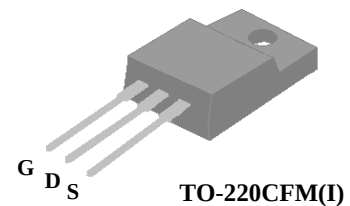


BV_{DSS}	-40V
$R_{DS(ON)}$	14.5mΩ
I_D	-40A

Description

XP4P013E series are innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.

The TO-220CFM package is widely preferred for all commercial-industrial through hole applications. The mold compound provides a high isolation voltage capability and low thermal resistance between the tab and the external heat-sink.



Absolute Maximum Ratings@ $T_J=25^{\circ}\text{C}$ (unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^{\circ}\text{C}$	Drain Current, V_{GS} @ 10V	-40	A
$I_D@T_C=100^{\circ}\text{C}$	Drain Current, V_{GS} @ 10V	-28.2	A
I_{DM}	Pulsed Drain Current ¹	-160	A
$P_D@T_C=25^{\circ}\text{C}$	Total Power Dissipation	37.5	W
$P_D@T_A=25^{\circ}\text{C}$	Total Power Dissipation	2.3	W
E_{AS}	Single Pulse Avalanche Energy ³	45	mJ
T_{STG}	Storage Temperature Range	-55 to 175	$^{\circ}\text{C}$
T_J	Operating Junction Temperature Range	-55 to 175	$^{\circ}\text{C}$

Thermal Data

Symbol	Parameter	Value	Units
R_{thj-c}	Maximum Thermal Resistance, Junction-case	4	$^{\circ}\text{C}/\text{W}$
R_{thj-a}	Maximum Thermal Resistance, Junction-ambient	65	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics@T_J=25°C(unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-40	-	-	V
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-24A	-	-	14.5	mΩ
		V _{GS} =-4.5V, I _D =-15A	-	-	20	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250uA	-1	-	-3	V
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-24A	-	50	-	S
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-32V, V _{GS} =0V	-	-	-10	uA
I _{GSS}	Gate-Source Leakage	V _{GS} = ±20V, V _{DS} =0V	-	-	±30	uA
Q _g (V _{GS} =-10V)	Total Gate Charge ⁴	I _D =-24A V _{DS} =-32V	-	89	142	nC
Q _g (V _{GS} =-4.5V)	Total Gate Charge ⁴		-	45	72	nC
Q _{gs}	Gate-Source Charge ⁴		-	14	-	nC
Q _{gd}	Gate-Drain ("Miller") Charge ⁴		-	18	-	nC
t _{d(on)}	Turn-on Delay Time ⁴	V _{DS} =-20V	-	53	-	ns
t _r	Rise Time ⁴	I _D =-24A	-	149	-	ns
t _{d(off)}	Turn-off Delay Time ⁴	R _G =3.3Ω	-	665	-	ns
t _f	Fall Time ⁴	V _{GS} =-10V	-	375	-	ns
C _{iss}	Input Capacitance ⁴	V _{GS} =0V	-	4600	7360	pF
C _{oss}	Output Capacitance ⁴	V _{DS} =-25V	-	370	-	pF
C _{rss}	Reverse Transfer Capacitance ⁴	f=1.0MHz	-	215	-	pF
R _g	Gate Resistance	f=1.0MHz	-	65	130	Ω

Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V _{SD}	Forward On Voltage ²	I _S =-24A, V _{GS} =0V	-	-	-1.2	V
t _{rr}	Reverse Recovery Time ⁴	I _S =-24A, V _{GS} =0V, dI/dt=-100A/μs	-	16	-	ns
Q _{rr}	Reverse Recovery Charge ⁴		-	6.5	-	nC

Notes:

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Starting T_J=25°C , V_{DD}= -30V , L=0.1mH , R_G=25Ω , V_{GS}= -10V , I_{AS}=-30A
- 4.Guaranteed by design.
- 5.These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175°C.

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT, AUTOMOTIVE OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

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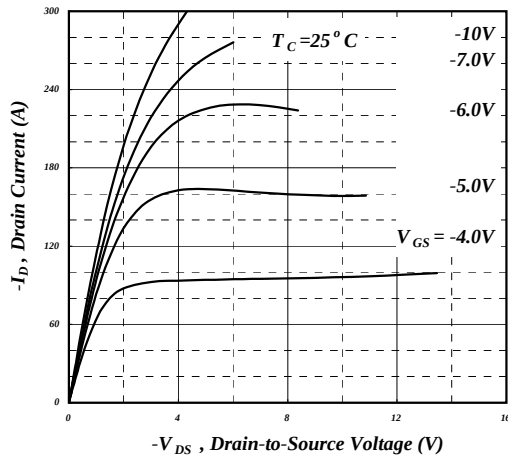


Fig 1. Typical Output Characteristics

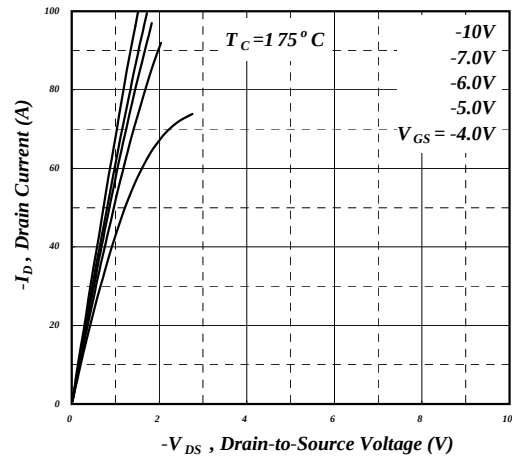


Fig 2. Typical Output Characteristics

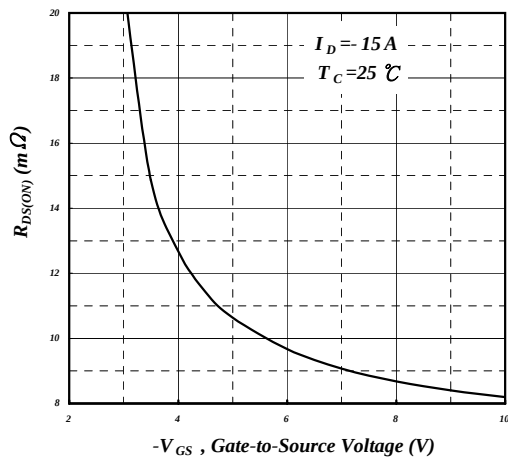
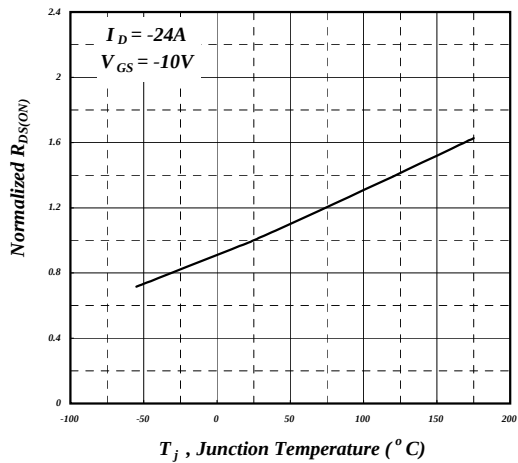
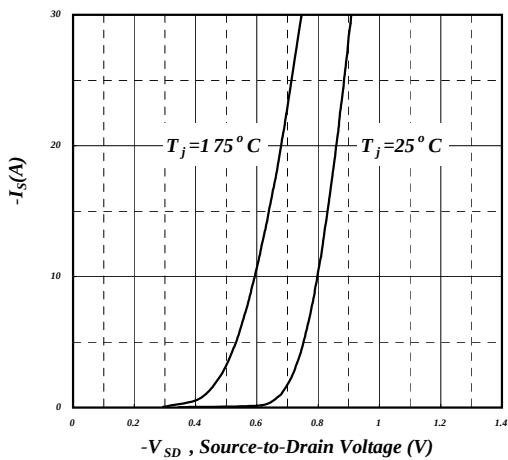


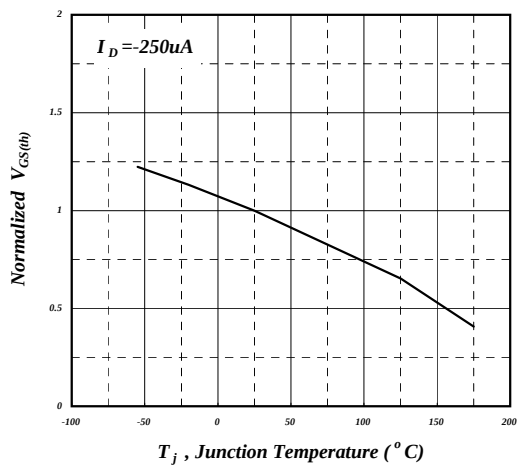
Fig 3. On-Resistance v.s. Gate Voltage



**Fig 4. Normalized On-Resistance
v.s. Junction Temperature**



**Fig 5. Forward Characteristic of
Reverse Diode**



**Fig 6. Gate Threshold Voltage v.s.
Junction Temperature**

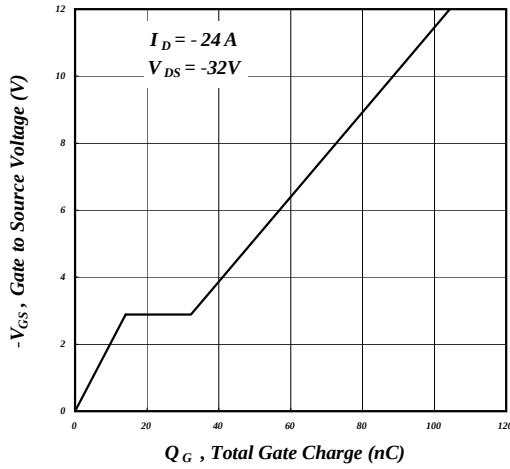


Fig 7. Gate Charge Characteristics

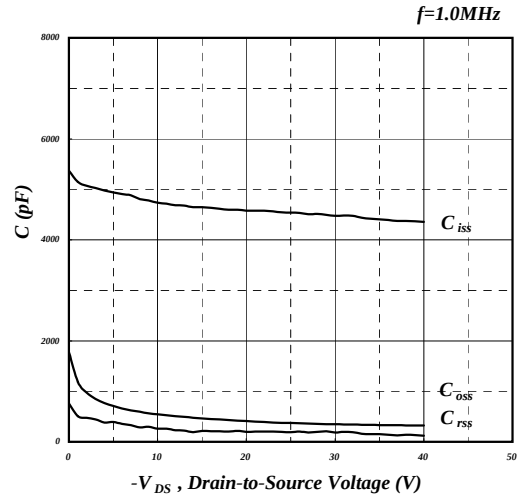


Fig 8. Typical Capacitance Characteristics

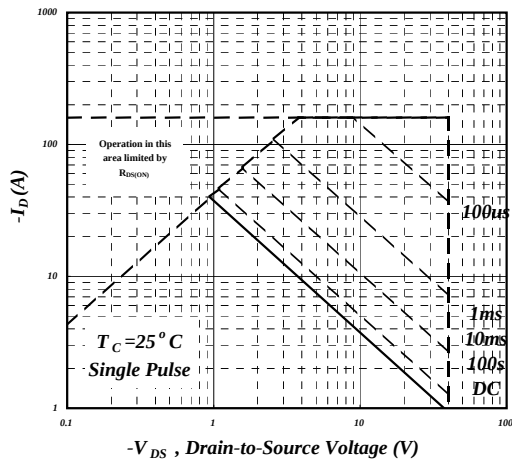


Fig 9. Maximum Safe Operating Area⁵

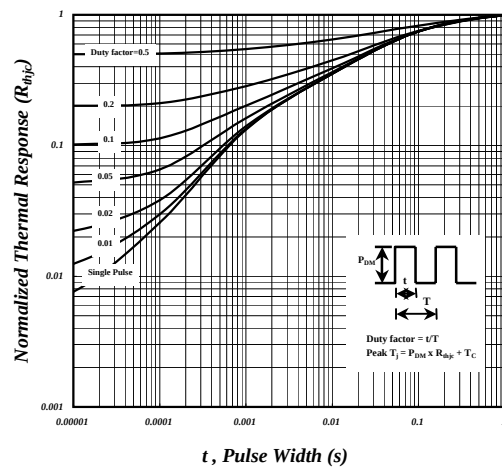


Fig 10. Effective Transient Thermal Impedance

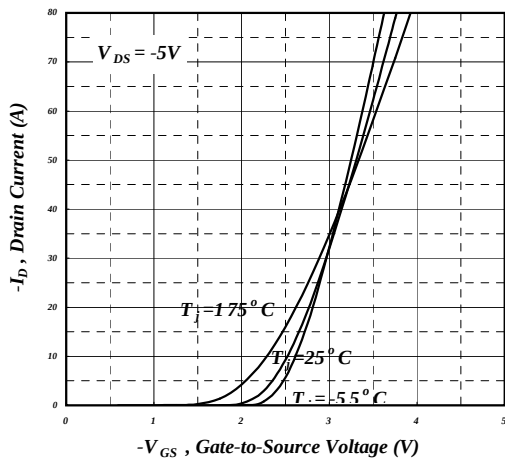


Fig 11. Transfer Characteristics

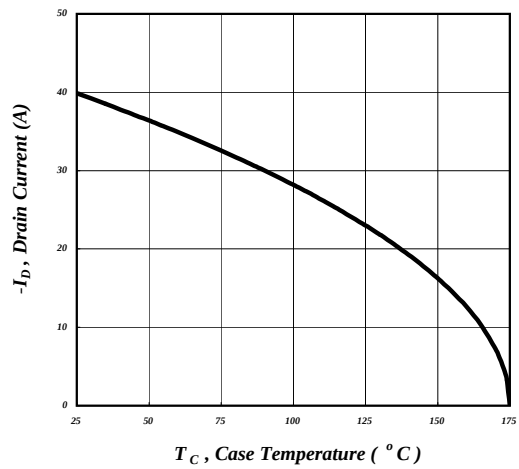


Fig 12. Drain Current v.s. Case Temperature

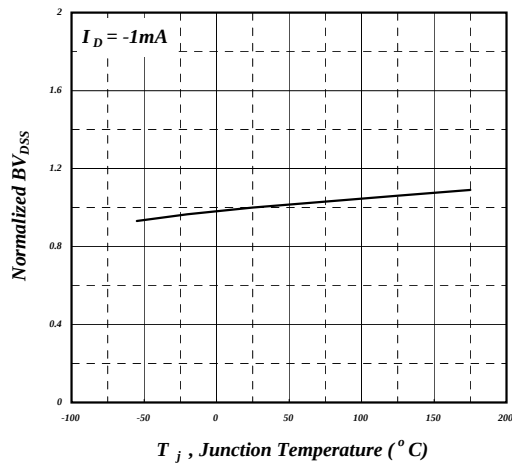


Fig 13. Normalized BV_{DSS} v.s. Junction Temperature

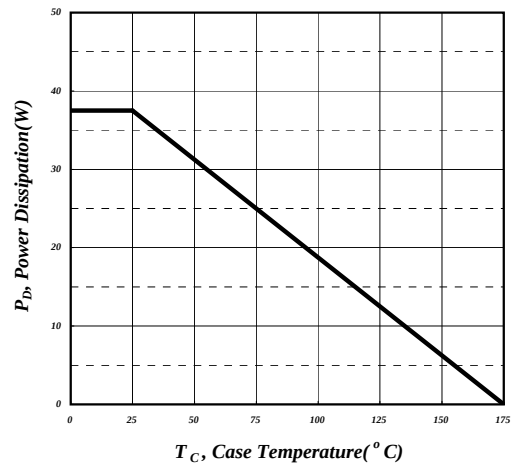


Fig 14. Total Power Dissipation

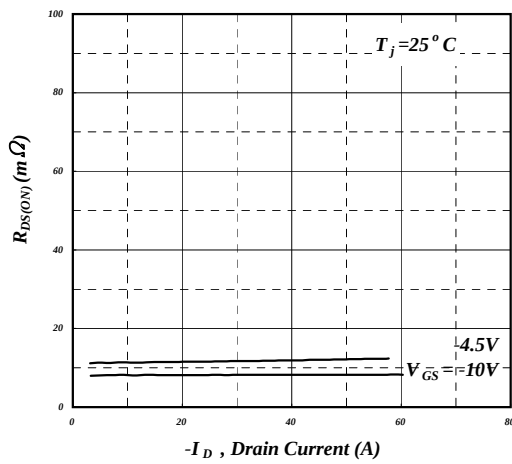
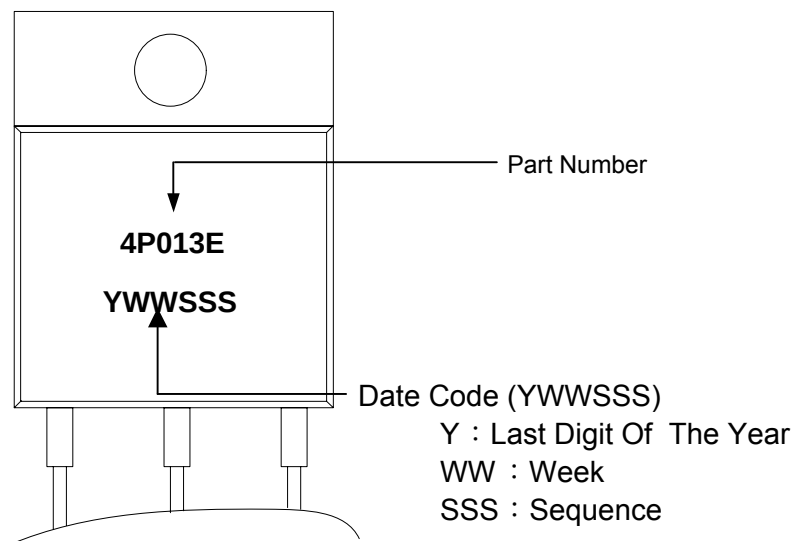
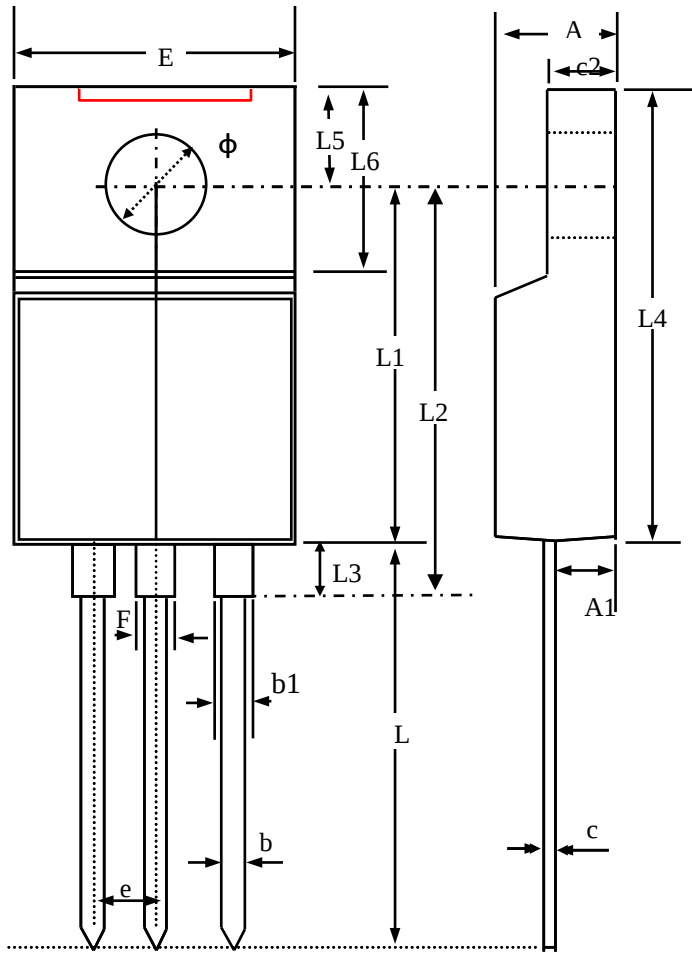


Fig 15. Typ. Drain-Source on State Resistance

MARKING INFORMATION

Package Outline : TO-220CFM

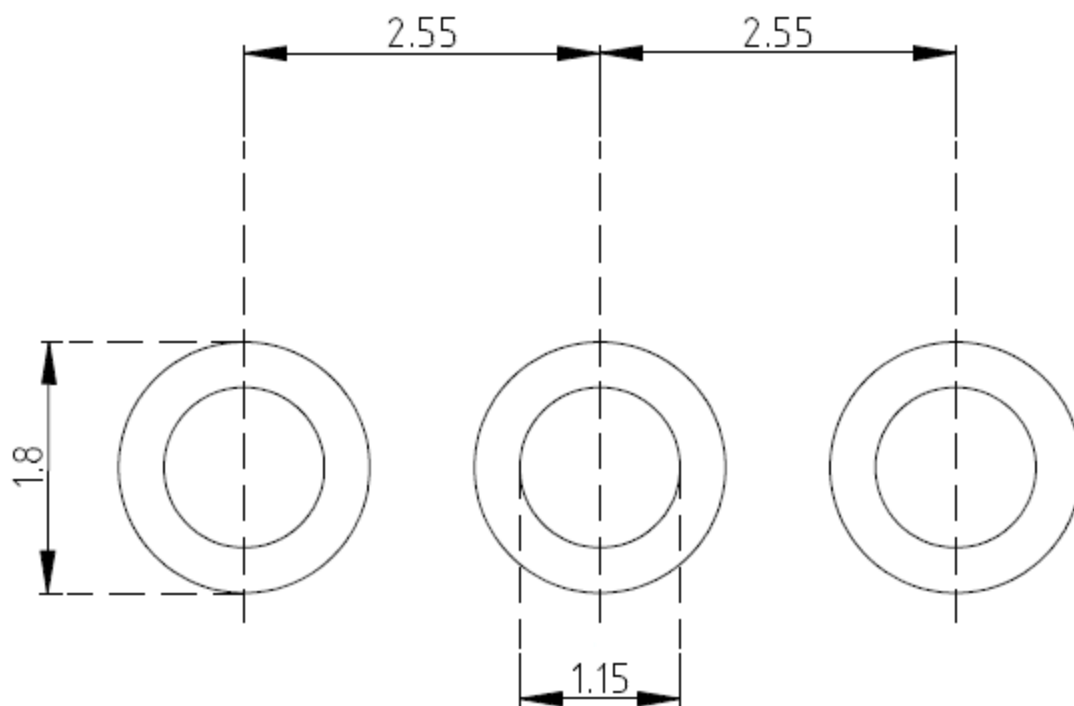


SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	4.40	4.65	4.90
A1	2.50	2.68	2.86
b	0.70	0.84	0.98
b1	1.10	1.30	1.50
c	0.45	0.54	0.63
c2	2.34	2.54	2.74
E	10.00	10.20	10.40
L	12.78	13.22	13.65
L1	12.45	12.70	12.95
L2	15.10	15.80	16.50
L3	2.83	3.22	3.60
L4	15.67	16.04	16.40
L5	3.20	3.30	3.40
L6	6.50	6.73	6.95
ϕ	3.00	3.14	3.28
e	2.40	2.55	2.70
F	1.15	1.33	1.50

1.All Dimensions Are in Millimeters.

2.Dimension Does Not Include Mold Protrusions.

TO-220CFM FOOTPRINT :



UNIT: mm