烜芯微 XUANXINWEI

General Description：

16N60 , the silicon N-channel Enhanced VDMOSFETs, is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-220F, which accords with the RoHS standard.
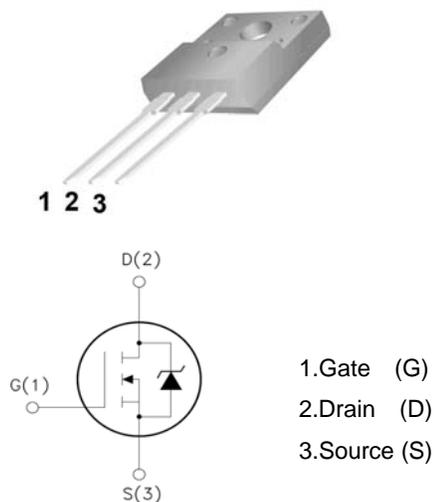
Features：

l **Fast Switching**

l **Low ON Resistance(Rdson≤0.5Ω)**

l **Low Gate Charge** **(Typical Data: 49.3nC)**

l **Low Reverse transfer capacitances(Typical: 10.5pF)**

l **100% Single Pulse avalanche energy Test**

Applications：

Power switch circuit of adaptor and charger.

V_{DSS}	600	V
I_D	16	A
$P_D(T_C=25℃)$	42.8	W
$R_{DS(ON)Typ}$	0.4	Ω

TO-220F

1 2 3

D(2)

G(1)

S(3)

1.Gate   (G)
2.Drain   (D)
3.Source (S)

Absolute（Tj= 25℃ unless otherwise specified）：

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current T_C = 25 °C	16	A
	Continuous Drain Current T_C = 100 °C	10	A
I_{DM} [a1]	Pulsed Drain Current T_C = 25 °C	64	A
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS} [a2]	Single Pulse Avalanche Energy	973	mJ
dv/dt [a3]	Peak Diode Recovery dv/dt	5.0	V/ns
P_D	Power Dissipation T_C = 25 °C	42.8	W
	Derating Factor above 25°C	0.34	W/℃
T_J，T_{stg}	Operating Junction and Storage Temperature Range	150，−55 to 150	℃
T_L	Maximum Temperature for Soldering	300	℃

Electrical Characteristics（Tj= 25℃ unless otherwise specified）：

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=250µA	600	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	ID=250uA,Reference25℃	--	0.65	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS} =600V, V_{GS}= 0V, Tj = 25℃	--	--	1	µA
		V_{DS} =480V, V_{GS}= 0V, Tj = 125℃	--	--	100	µA
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS} =+30V	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS} =-30V	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=10V,I_D=8A	--	0.4	0.5	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, I_D = 250µA	2.0	--	4.0	V
Pulse width tp≤300µs,δ≤2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g_{fs}	Forward Transconductance	V_{DS}=15V, I_D =8A	--	14.5	--	S
R_g	Gate resistance	f = 1.0MHz	--	2.9	--	Ω
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1.0MHz	--	2502	--	PF
C_{oss}	Output Capacitance		--	210	--	
C_{rss}	Reverse Transfer Capacitance		--	10.5	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =16.0A V_{DD} = 300V V_{GS} = 10V R_G =10Ω	--	28	--	ns
tr	Rise Time		--	45.2	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	72	--	
t_f	Fall Time		--	48.8	--	
Q_g	Total Gate Charge	I_D =16.0A V_{DD} =480V V_{GS} = 10V	--	49.3	--	nC
Q_{gs}	Gate to Source Charge		--	11.7	--	
Q_{gd}	Gate to Drain ("Miller")Charge		--	19.3	--	

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)	$T_C = 25\ °C$	--	--	16	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	64	A
V_{SD}	Diode Forward Voltage	$I_S=16.0A, V_{GS}=0V$	--	--	1.5	V
T_{rr}	Reverse Recovery Time	$I_S=16.0A, T_j = 25°C$ $dI_F/dt=100A/us,$ $V_{GS}=0V$	--	513	--	ns
Q_{rr}	Reverse Recovery Charge		--	5579	--	nC
I_{rrm}	Reverse Recovery Current		--	21.8	--	A

Pulse width tp≤300μs,δ≤2%

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Case	2.92	℃/W
$R_{\theta JA}$	Junction-to-Ambient	62.5	℃/W

[a1]：Repetitive rating; pulse width limited by maximum junction temperature

[a2]：L=10mH, I_D=14A, Start T_J=25℃

[a3]：I_{SD} =16A,di/dt ≤100A/us,V_{DD}≤$BV_{DS,}$ Start T_J=25℃

Characteristics Curve：
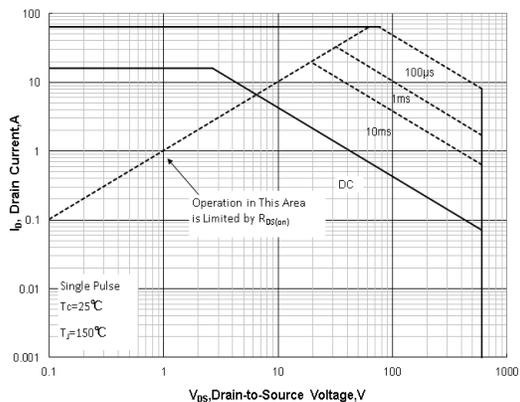
Figure 1   Maximum Forward Bias Safe Operating Area
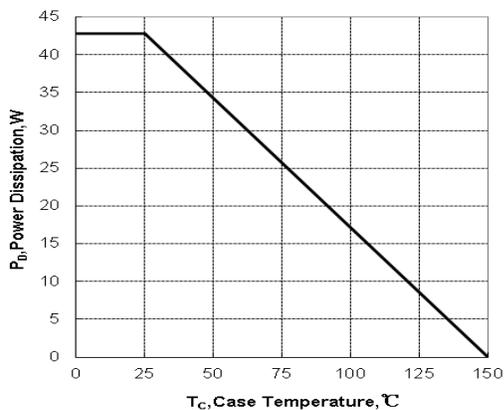
Figure 2   Maximum Power dissipation vs Case Temperature
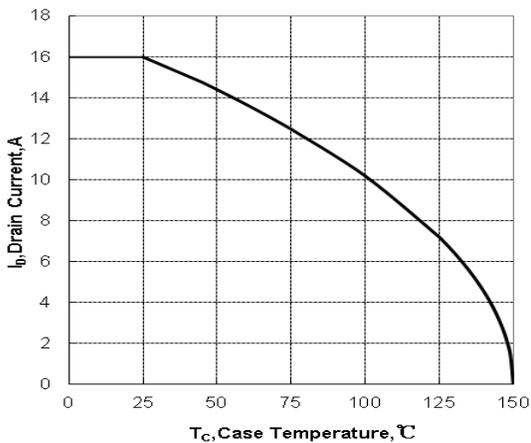
Figure 3   Maximum Continuous Drain Current vs Case Temperature
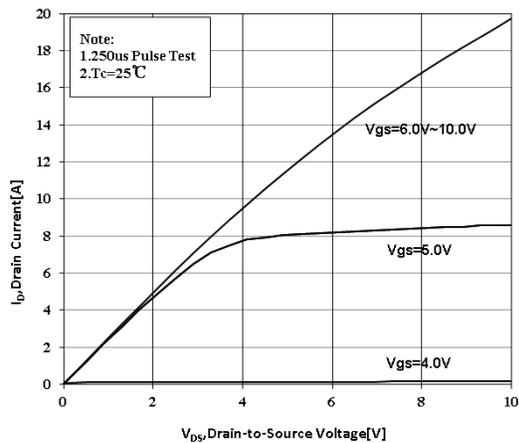
Figure   4   Typical Output Characteristics
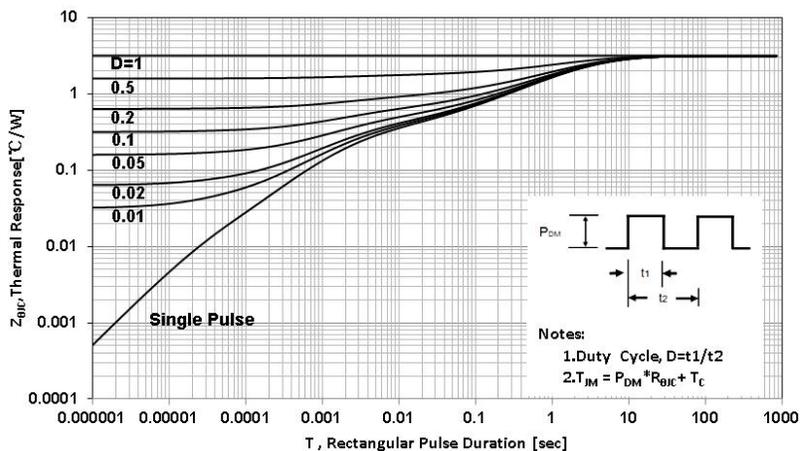
Figure   5   Maximum Effective Thermal Impedance , Junction to Case
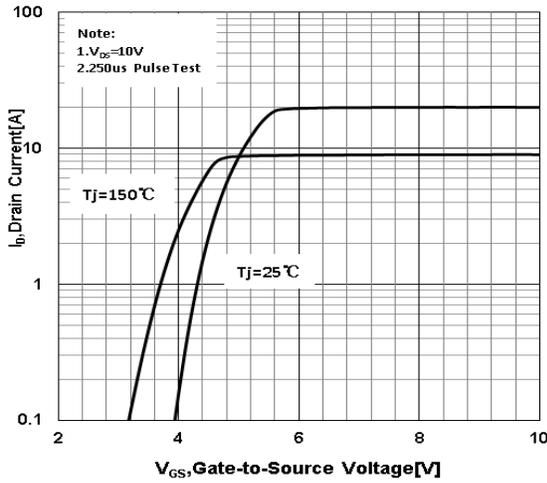
Figure   6   Typical Transfer Characteristics
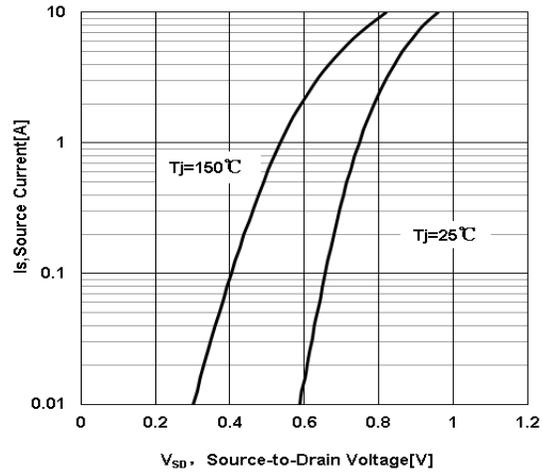

Figure   7   Typical Body Diode Transfer Characteristics
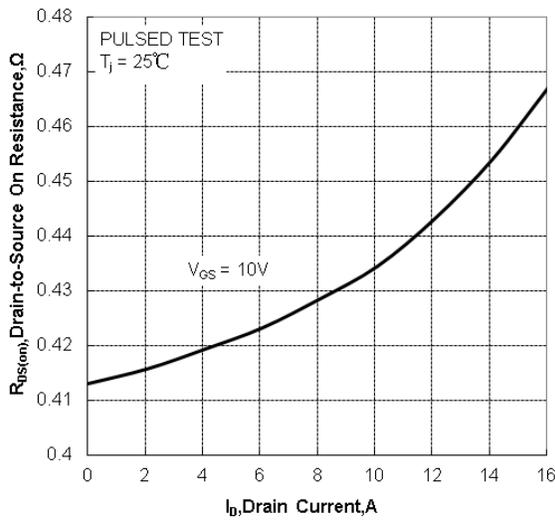
Figure   8   Typical Drain to Source ON Resistance
vs Drain Current
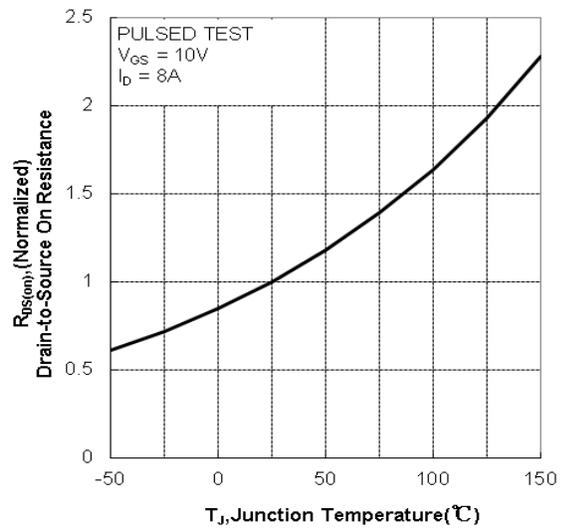
Figure   9   Typical Drian to Source on Resistance
vs Junction Temperature
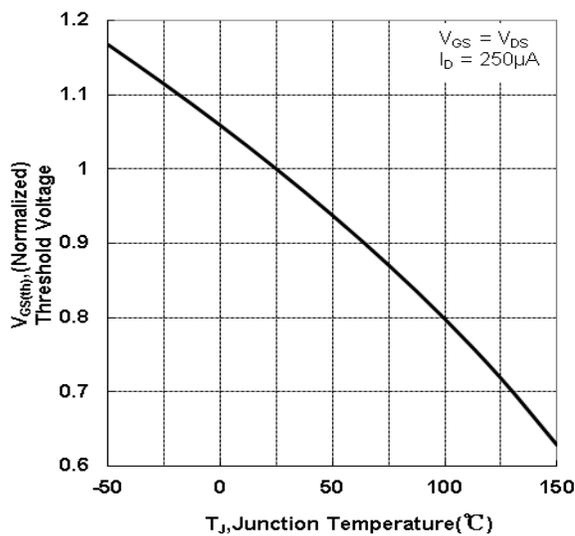
Figure 10   Typical Theshold Voltage vs Junction Temperature
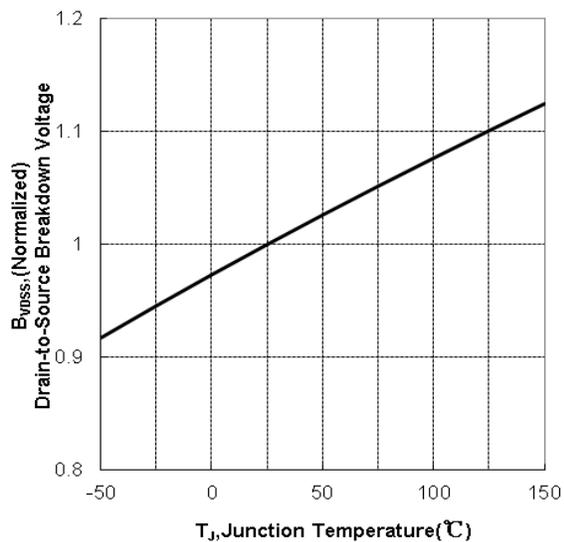
Figure 11   Typical Breakdown Voltage vs Junction Temperature
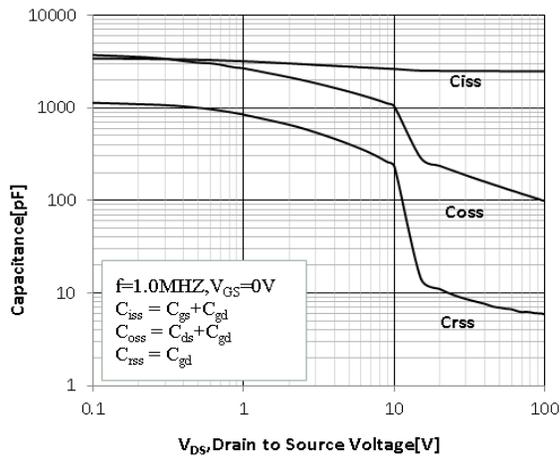
Figure 12   Typical Capacitance vs Drain to Source Voltage
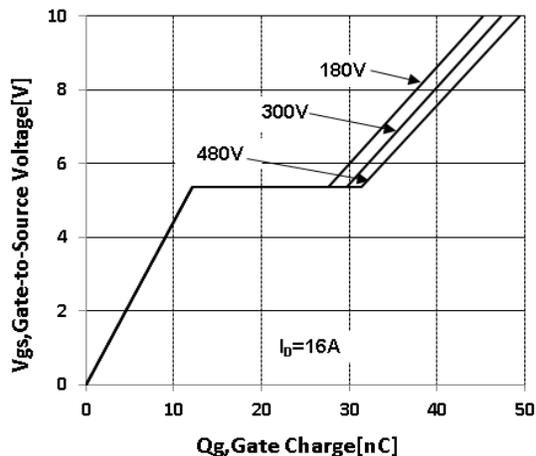
Figure 13   Typical Gate Charge vs Gate to Source Voltage

Test Circuit and Waveform
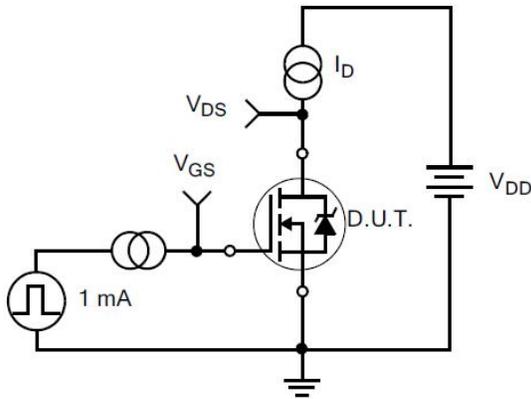

Figure 14. Gate Charge Test Circuit
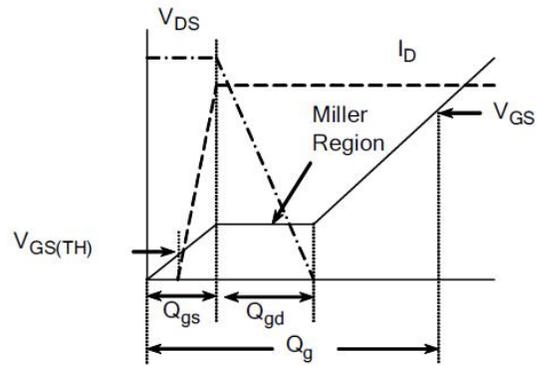
Figure 15. Gate Charge Waveforms
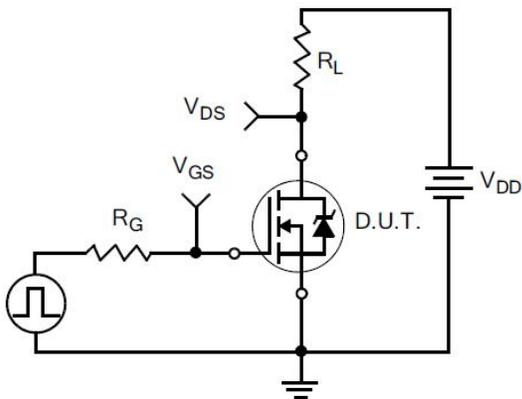
Figure 16. Resistive Switching Test Circuit
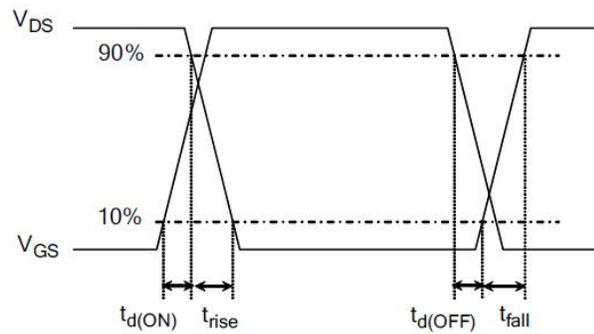
Figure 17. Resistive Switching Waveforms
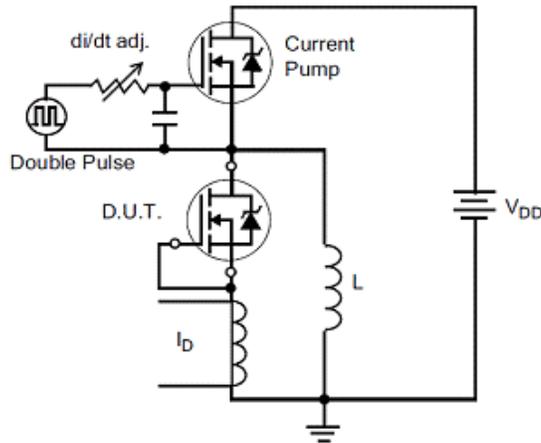
**Figure 18. Diode Reverse Recovery Test Circuit**
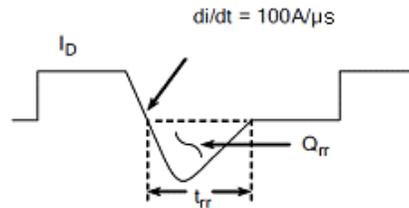
Figure 19. Diode Reverse Recovery Waveform
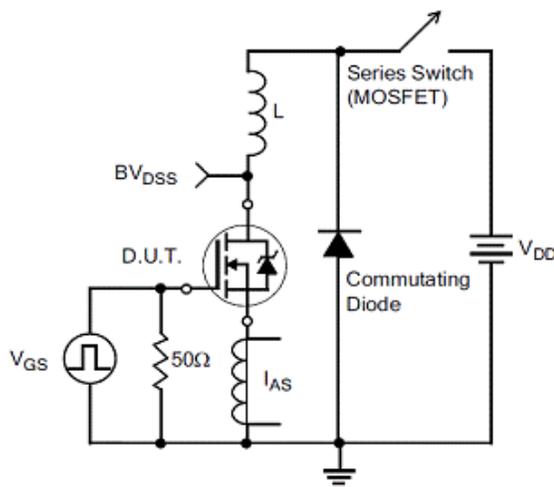
**Figure20.Unclamped Inductive Switching Test Circuit**
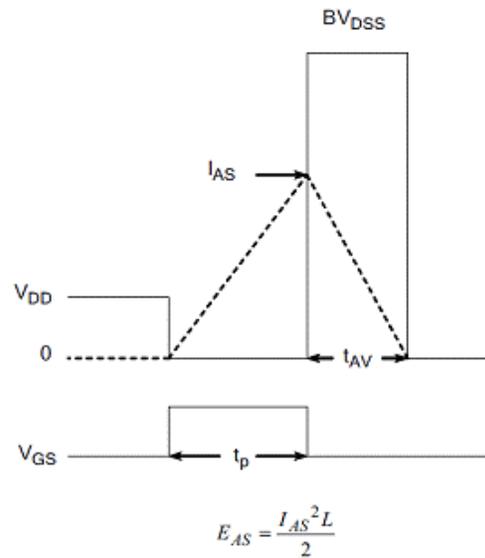
Figure21.Unclamped Inductive Switching Waveform

$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Package Information：
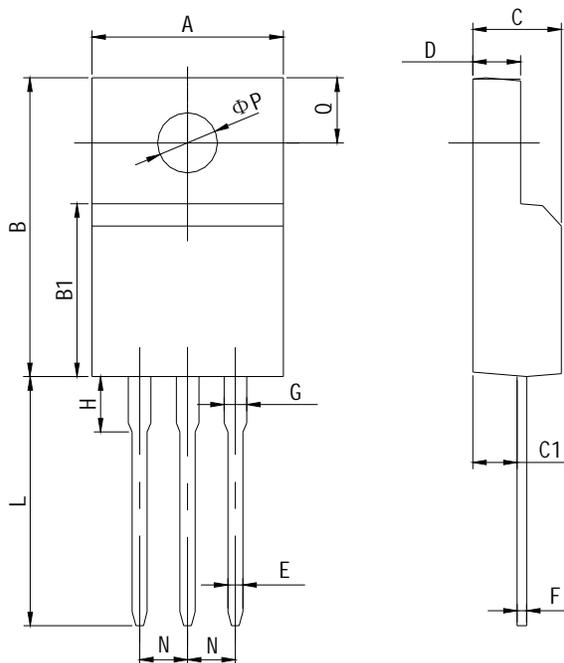
Items	Values(mm)	
	MIN	MAX
A	9.60	10.4
B	15.4	16.2
B1	8.90	9.50
C	4.30	4.90
C1	2.10	3.00
D	2.40	3.00
E	0.60	1.00
F	0.30	0.60
G	1.12	1.42
H	3.40	3.80
L*	12.0	14.0
N	2.34	2.74
Q	3.15	3.55
ϕP	2.90	3.30

*adjustable

TO-220F Package