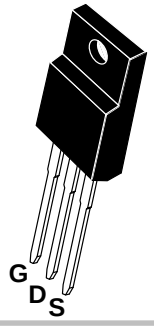
First Semiconductor

FIR18N65FG

650V N-Channel MOSFET-D .

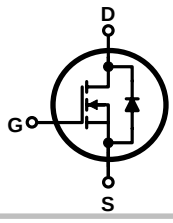
PIN Connection TO-220F

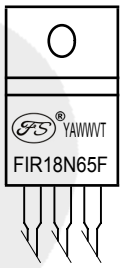


Features

- 18A, 650V, RDS(on) = 380mΩ @VGS = 10 V
- Low gate charge (typical 38nC)
- Low Crss (typical 6.2pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

Schematic diagram





Marking Diagram

Y	= Year
A	= Assembly Location
WW	= Work Week
VT	= Version & Thickness
FIR18N65F	= Specific Device Code

General Description

This Power MOSFET is produced by HSDQ using its own advanced planar stripe DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current - Continuous (TC= 25°C)	18	A
	- Continuous (TC= 100°C)	11.7*	A
I_{DM}	Drain Current - Pulsed (Note 1)	72*	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	340	mJ
I_{AR}	Avalanche Current (Note 1)	18	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	48	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5	V/ns
P_D	Power Dissipation (TC = 25°C)	35.0	W
	- Derate above 25°C	0.28	W/°C
T_j , T_{stg}	Operating and Storage Temperature Range	-55 to +150	°C
T_L	Maximum lead temperature for soldering purposes,1/8" from case for 5 seconds	300	°C

* Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.55	°C/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	--	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	43.2	°C/W

Electrical Characteristics TC = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	650			V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C		0.61		V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 670 V, V_{GS} = 0 V			1	μA
		V_{DS} = 400 V, TC = 125°C			10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V			-100	nA
On Characteristics						
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D =250 uA	3.0		5.0	V
$R_{DS(On)}$	Drain-Source On-state Resistance	V_{GS}=10 V, I_D =9 A, T_J = 25°C		380	480	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 9 A (Note 4)		17		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz		2150		pF
C_{oss}	Output Capacitance			265		pF
C_{rss}	Reverse Transfer Capacitance			6.2		pF
Switching Characteristics						
$t_{d(on)}$	Turn On Delay Time	V_{DD} = 335 V, ID = 18 A, R_G = 25 Ω (Note 4, 5)		36		ns
t_r	Rising Time			51		ns
$t_{d(off)}$	Turn Off Delay Time			80		ns
t_f	Fall Time			44		ns
Q_g	Total Gate Charge	V_{DS} = 335 V, ID = 18 A, V_{GS} = 10 V (Note 4, 5)		38		nC
Q_{gs}	Gate-Source Charge			12		nC
Q_{gd}	Gate-Drain Charge			13		nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current				18	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current				72	A
V_{SD}	Diode Forward Voltage	V_{GS}= 0 V, I_S = 18 A			1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 18 A, dI_F / dt = 100 A/μs Note 4)		456		ns
Q_{rr}	Reverse Recovery Charge			5.9		μC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L =2.1 mH, IAS = 18A, VDD = 50V, RG = 25Ω, Starting TJ = 25°C
3. ISD≤20A, di/dt ≤200A/us, VDD ≤ BVDSS, Starting TJ = 25°C
4. Pulse Test : Pulse width ≤ 300us, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

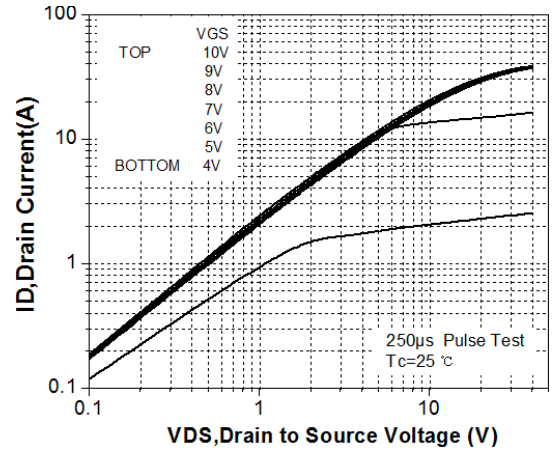


Figure 1. On-Region Characteristics

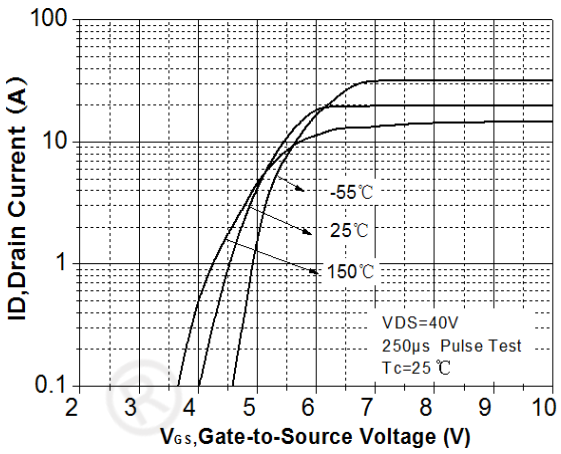


Figure 2. Transfer Characteristics

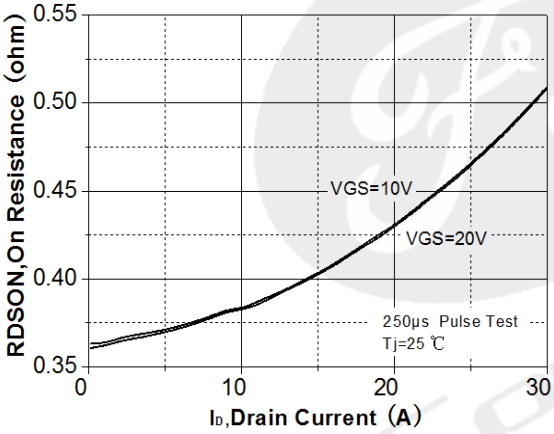


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

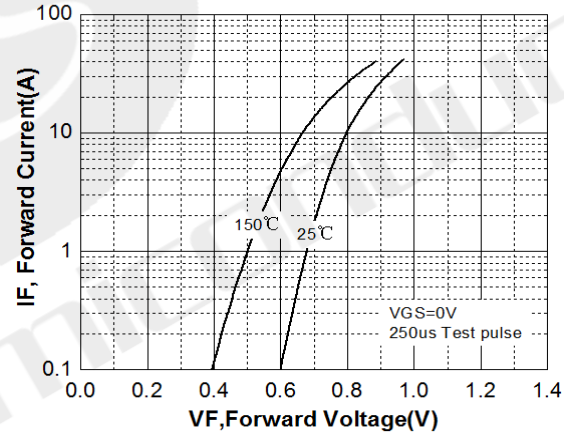


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

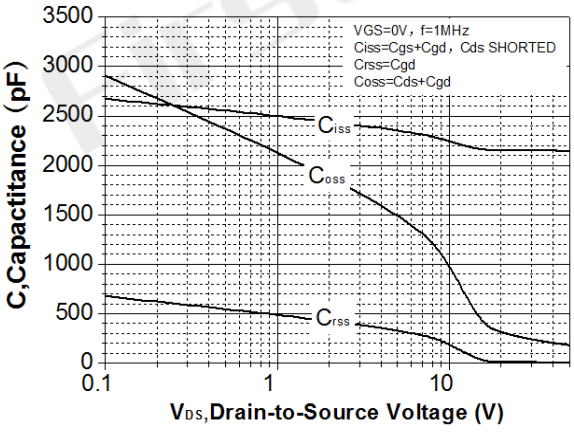


Figure 5. Capacitance Characteristics

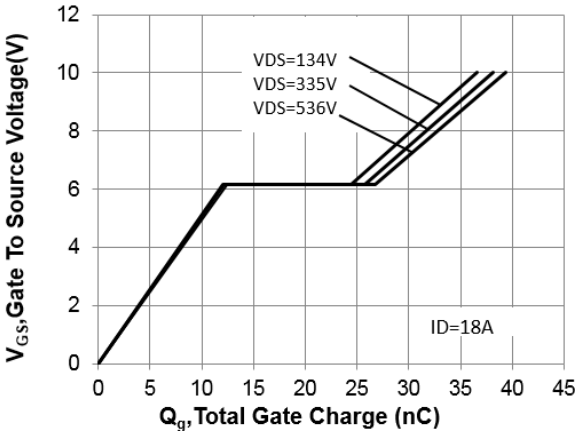


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

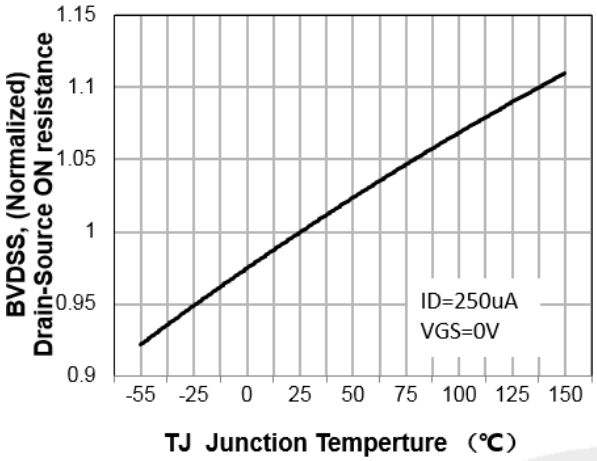


Figure 7. Breakdown Voltage Variation vs Temperature

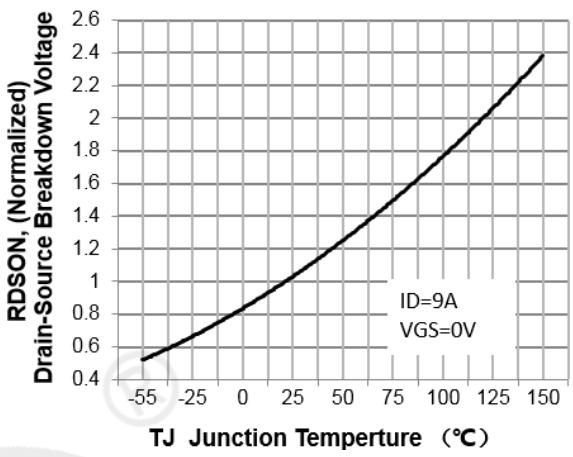


Figure 8. On-Resistance Variation vs Temperature

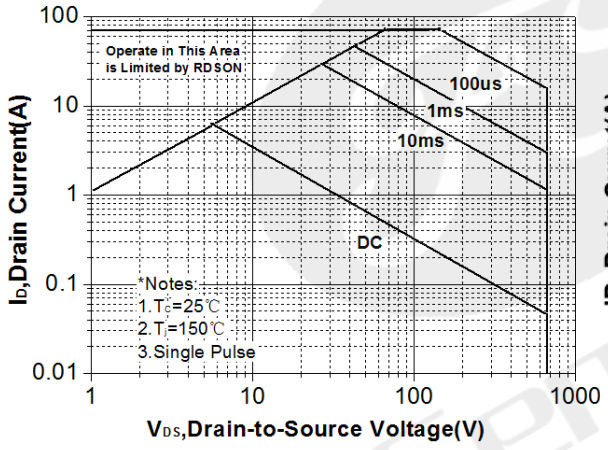


Figure 9. Maximum Safe Operating Area

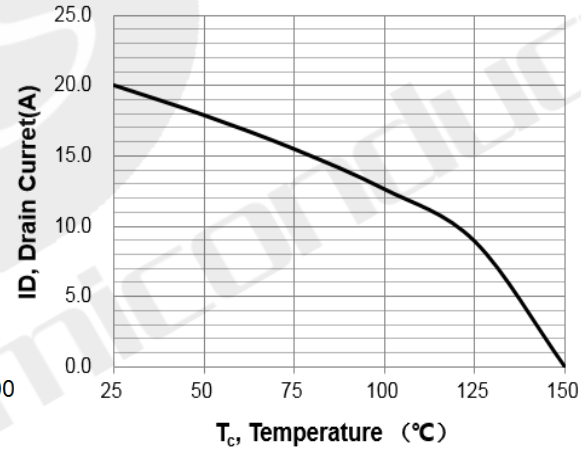


Figure 10. Maximum Drain Current vs Case Temperature

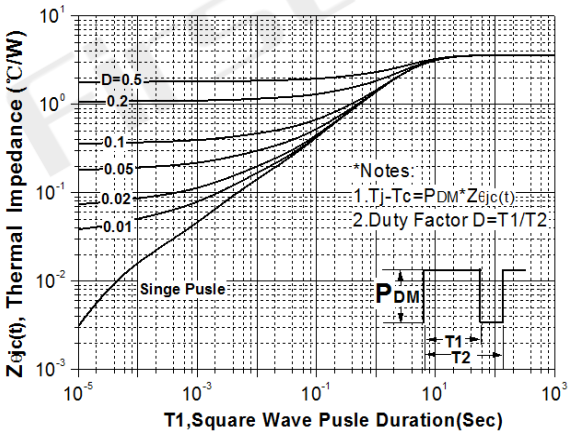
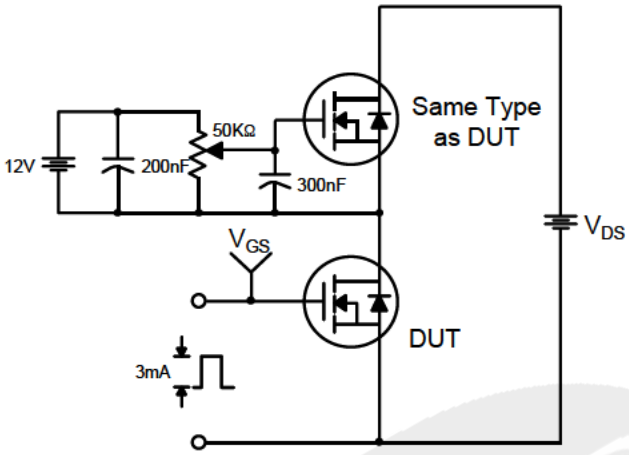
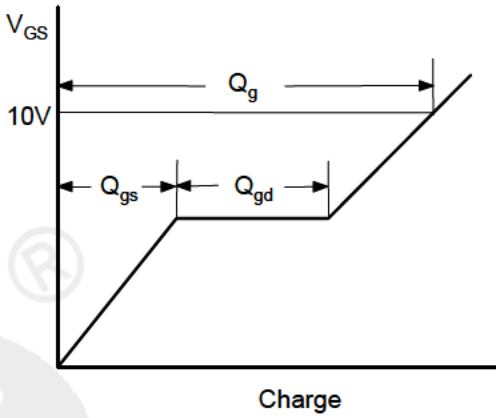


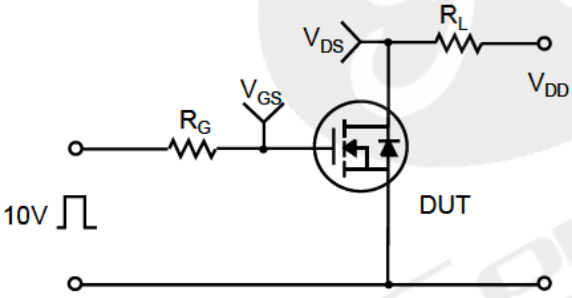
Figure 11. Transient Thermal Response Curve

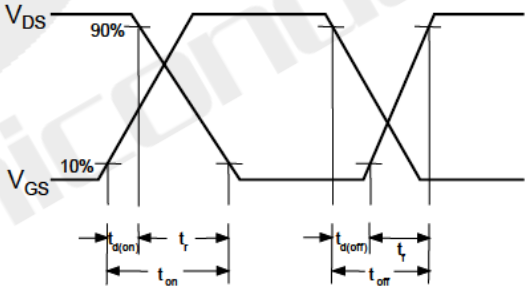
Gate Charge Test Circuit & Waveform



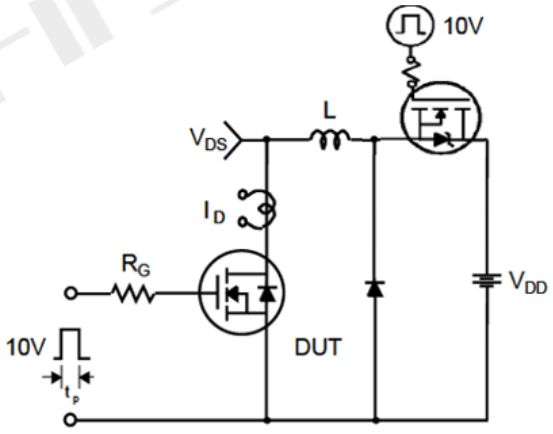


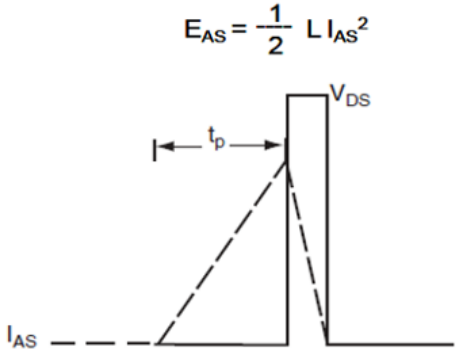
Resistive Switching Test Circuit & Waveforms



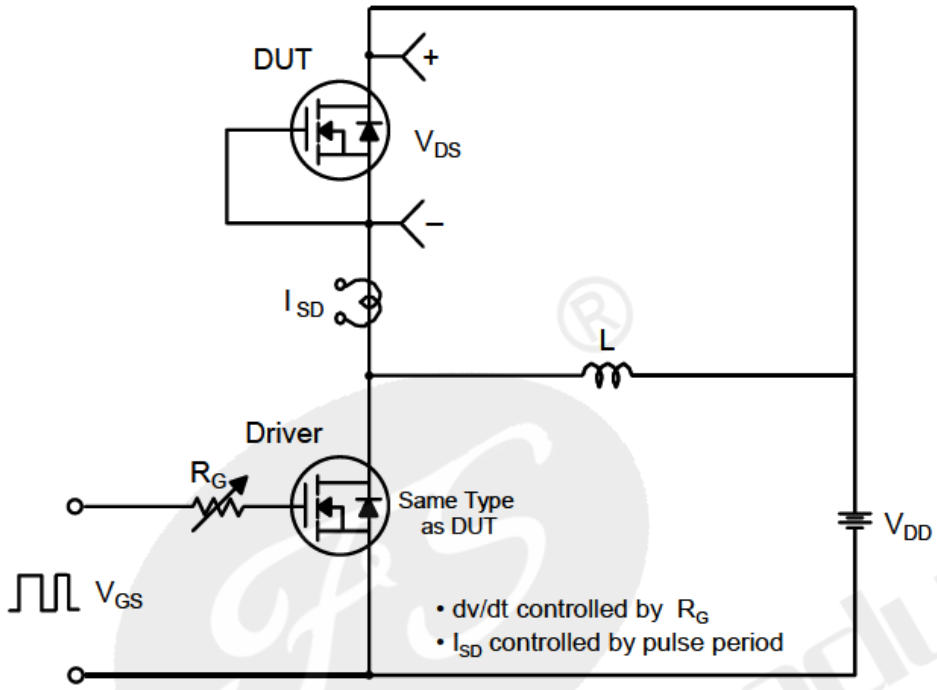


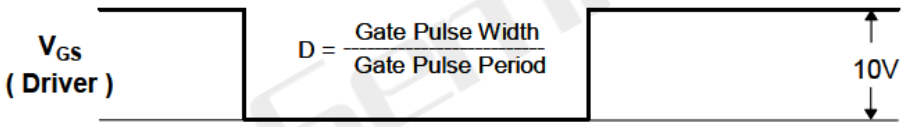
Unclamped Inductive Switching Test Circuit & Waveforms

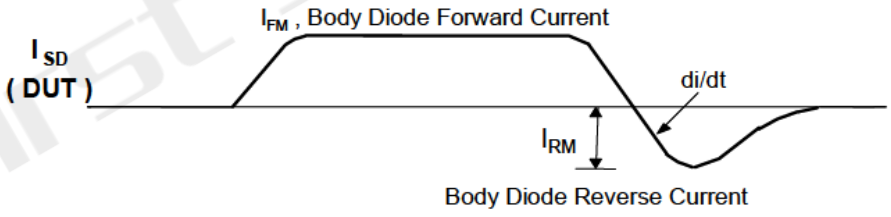


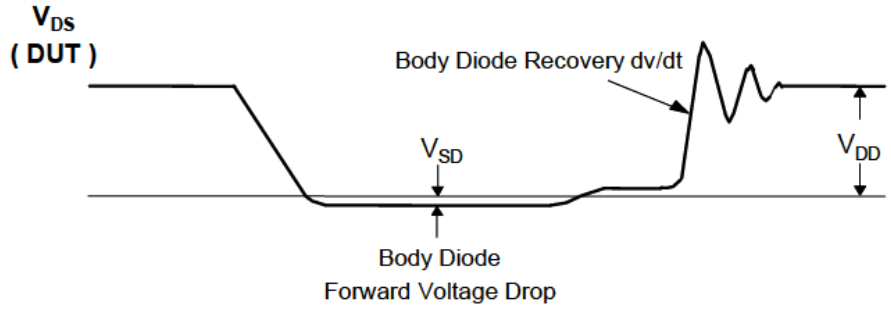


Peak Diode Recovery dv/dt Test Circuit & Waveforms



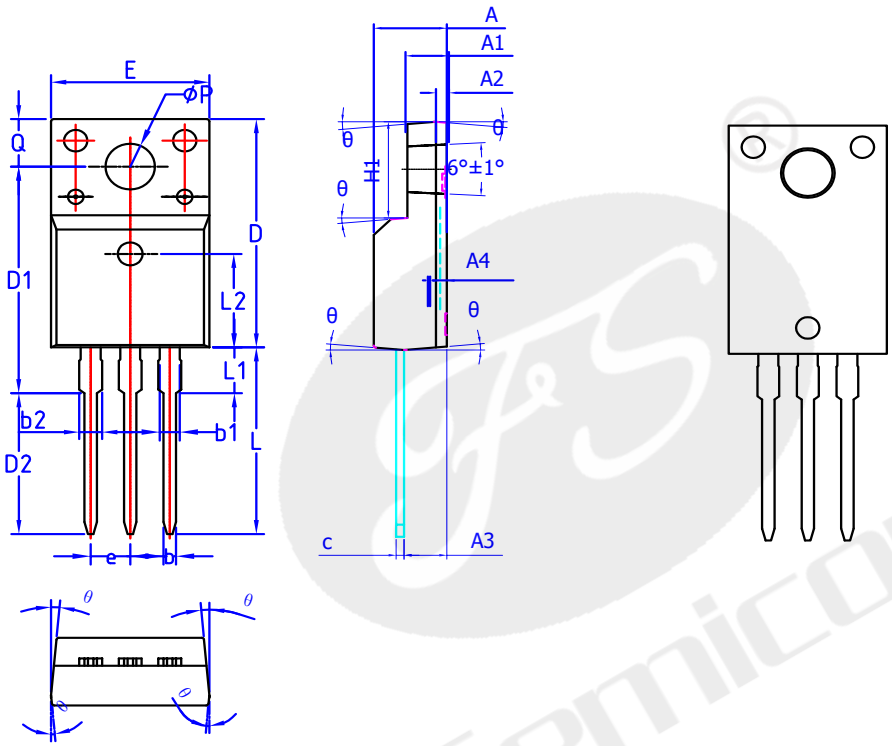






Package Information

TO-220F



Units: mm

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2		0.70 REF	
A3	2.56	2.76	2.96
b	0.70	0.80	0.90
b1	1.17	1.2	1.25
b2	1.17	1.2	1.25
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	10.0	10.2	10.4
E	9.96	10.16	10.36
e		2.54BSC	
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2		6.50REF	
ØP	3.08	3.18	3.28
Q	3.20	3.30	3.40
θ1	1°	3°	5°
A4	0.53	0.56	0.59

Declaration

- FIRST reserves the right to change the specifications, the same specifications of products due to different packaging line mold, the size of the appearance will be slightly different, shipped in kind, without notice! Customers should obtain the latest version information before ordering, and verify whether the relevant information is complete and up-to-date.
- Any semiconductor product under certain conditions has the possibility of failure or failure,The buyer has the responsibility to comply with safety standards and take safety measures when using FIRST products for system design and manufacturing,To avoid To avoid potential failure risks, which may cause personal injury or property damage!
- Product promotion endless, our company will wholeheartedly provide customers with better products!

ATTACHMENT

Revision History

Date	REV	Description	Page
2019.01.01	1.0	Initial release	