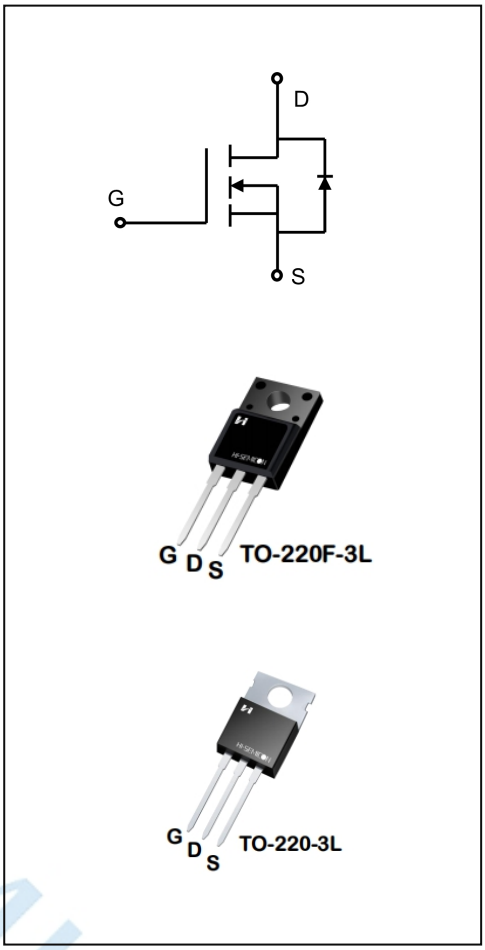
20A, 600V N-CHANNEL POWER MOSFET



GENERAL DESCRIPTION

These N-Channel enhancement mode power field effect transistors are produced using Hi-semicon's proprietary, 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, electronic lamp ballasts based on half bridge topology.

Features

- ◆V_{DS}(V)=600V, I_D=20A
- ◆$R_{DS(ON)}$
  TYP:0.32Ω@V_{GS}=10V I_D=10A
  MAX:0.4Ω

Applications

- ◆Power faction correction (PFC)
- ◆Switched mode power supplies (SMPS)
- ◆Uninterruptible power supply (UPS)
- ◆LED lighting power

ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SFF20N60	TO-220F-3L	SFF20N60	Pb free	Tube
SFP20N60	TO-220-3L	SFP20N60	Pb free	Tube

ABSOLUTE MAXIMUM RATINGS (T_J=25°C unless otherwise noted)

Characteristics		Symbol	Ratings		Unit
			SFF20N60	SFP20N60	
Drain-Source Voltage		V_{DS}	600		V
Gate-Source Voltage		V_{GS}	±30		V
Drain Current	T_C = 25°C	I_D	20		A
	T_C = 100°C		15		
Drain Current Pulsed (Note 1)		I_{DM}	80		A
Power Dissipation(T_C=25°C)		P_D	76	232	W
-Derate above 25°C			0.58	2.03	W/°C
Single Pulsed Avalanche Energy (Note 2)		E_{AS}	384		mJ
Operation Junction Temperature Range		T_J	-55～+150		°C
Storage Temperature Range		T_{stg}	-55～+150		°C
Maximum lead temperature for soldering purposes,1/8" from case for 5 seconds		TL	300		°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	MAX		Unit
		SFF20N60	SFP20N60	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.68	0.51	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	62.5	°C/W

ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B_{VDSS}	V_{GS}=0V, I_D=250μA	600	650	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=600V, V_{GS}=0V	--	4.8	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=30V, V_{DS}=0V	--	1.9	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=-30V, V_{DS}=0V	--	-0.2	-100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}= V_{DS}, I_D=250μA	2	3.01	4.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=10A	--	0.32	0.4	Ω
Forward Transconductance	g_{FS}	V_{DS}=10V, I_D=20A	--	31	--	S
Dynamic Characteristics						
Gate Resistance	Rg	V_{GS}=0V; f=1.0MHZ	1	3.0	10	Ω
Input Capacitance	C_{iss}	V_{DS}=25V V_{GS}=0V f=1.0MHZ	--	3200	--	pF
Output Capacitance	C_{oss}		--	256.6	--	
Reverse Transfer Capacitance	C_{rss}		--	9.7	--	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=300V; V_{GS}=10V R_G=25Ω; I_D=20A (Note 3.4)	--	24.3	--	ns
Turn-on Rise Time	t_r		--	39.5	--	

Turn-off Delay Time	$t_{d(off)}$	V_{DD}=300V; V_{GS}=10V	--	76.5	--	ns
Turn-off Fall Time	t_f	R_G=25Ω; I_D=20A (Note 3.4)	--	45.1	--	
Total Gate Charge	Q_g	V_{DS}=480V, I_D=20A	--	55.8	--	nc
Gate-Source Charge	Q_{gs}	V_{GS}=10V	--	11.8	--	
Gate-Drain Charge	Q_{gd}	(Note 3.4)	--	21.8	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	20	A
Pulsed Source Current	I_{SM}		--	--	80	
Diode Forward Voltage	V_{SD}	I_S=20A,V_{GS}=0V	--	0.85	1.4	V
Reverse Recovery Time	T_{rr}	I_F=20A,V_R=520V, dIF/dt=100A/μS	--	586	--	ns
Reverse Recovery Charge	Q_{rr}		--	7.56	--	μC

1.Pluse width limited by maximum junction temperature

2.L=10mH, I_{AS}=8A, V_{DD}=100V, V_G=10V, R_G=25Ω, starting T_J=25°C

3.Pulse Test: Pulse width ≤300μs, Duty cycle≤2%

4.Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

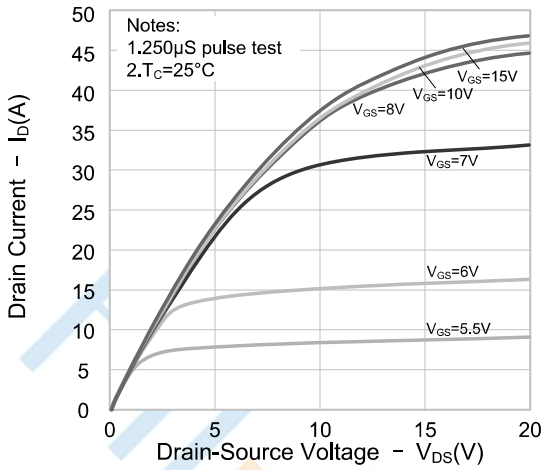


Figure 2. Transfer Characteristics

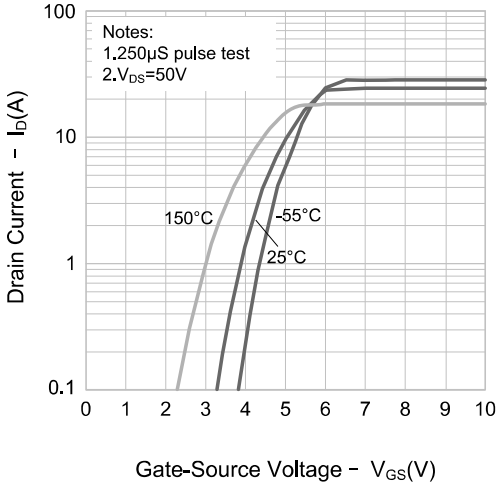


Figure 3. On-Resitance Variation vs. Drain Current and Gate Voltage

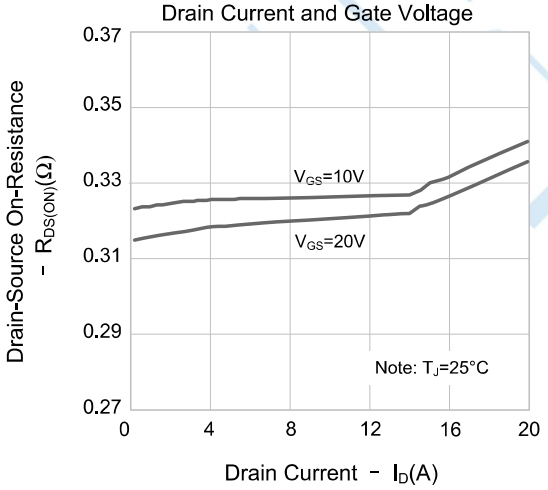


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

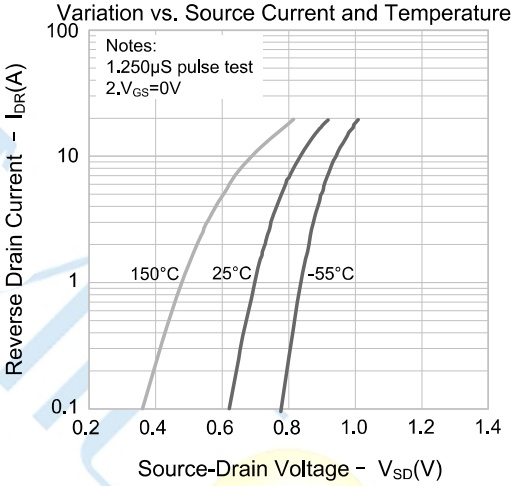


Figure 5. Capacitance Characteristics

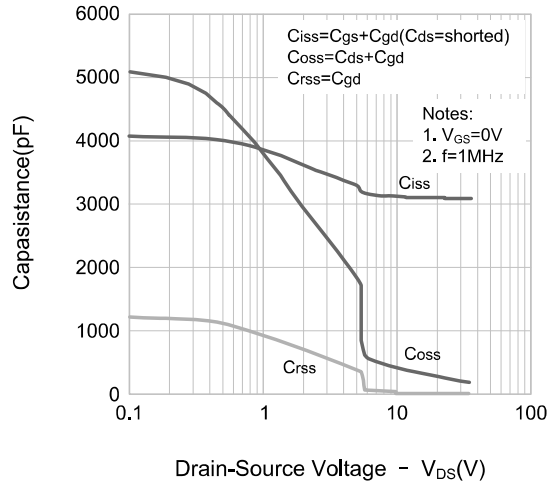
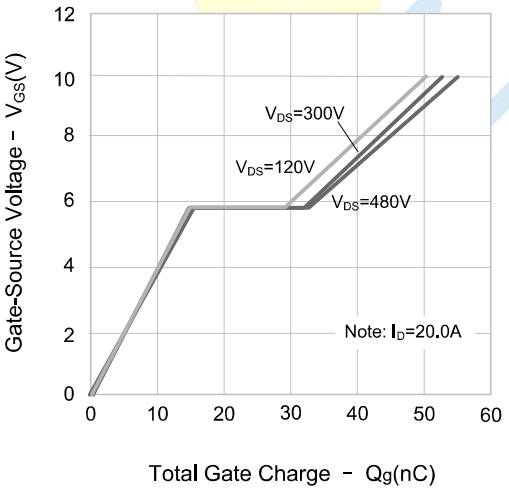


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

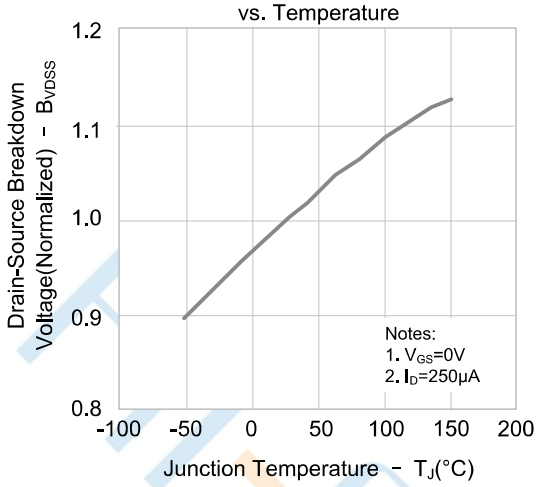


Figure 8. On-resistance Variation vs. Temperature

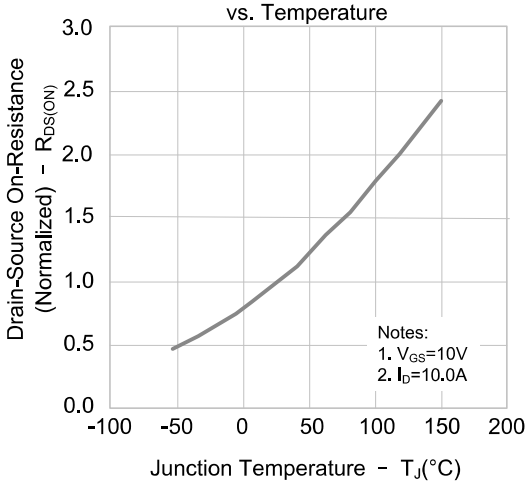


Figure 9-1. Max. Safe Operating Area(SFF20N60)

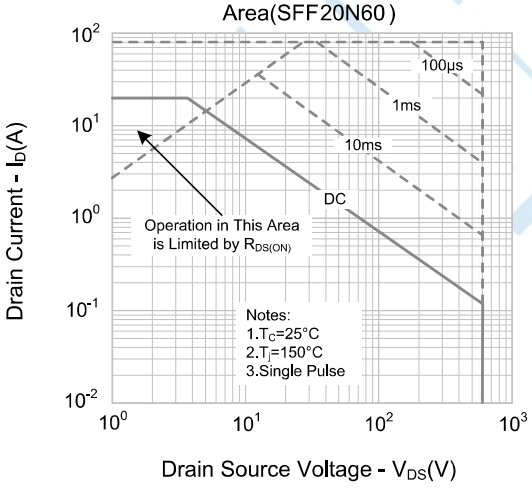


Figure 9-2. Max. Safe Operating Area(SFP20N60)

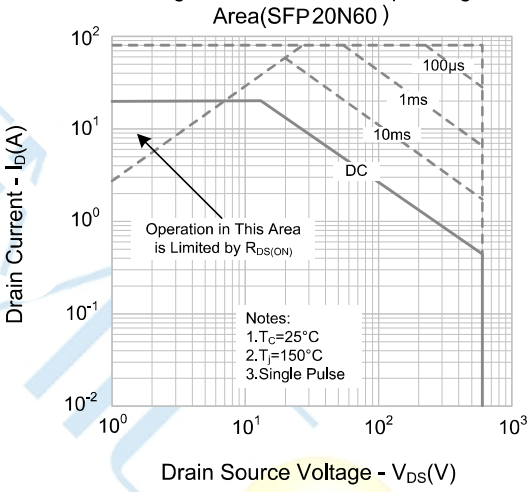
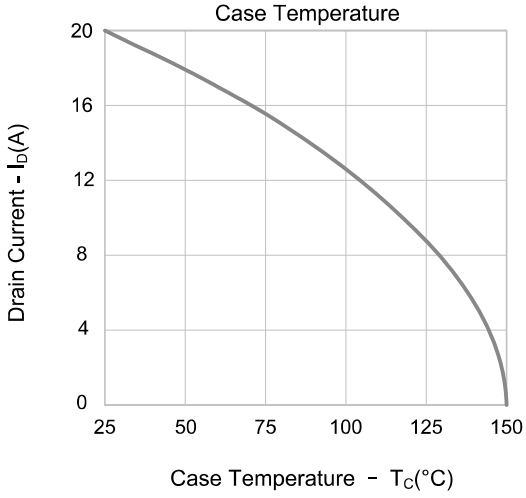
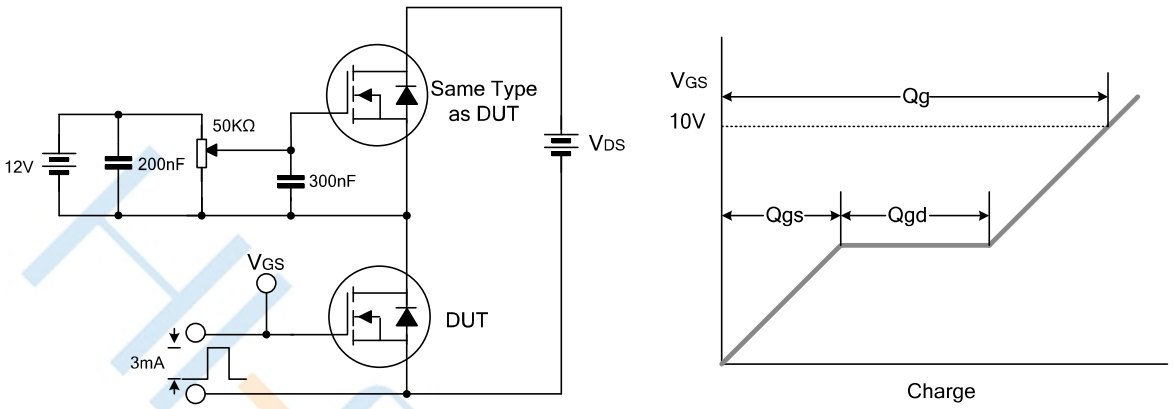


Figure 10. Maximum Drain Current vs. Case Temperature

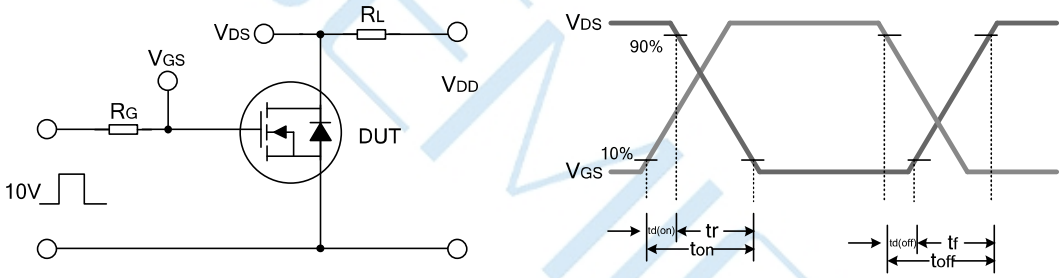


Test Circuit

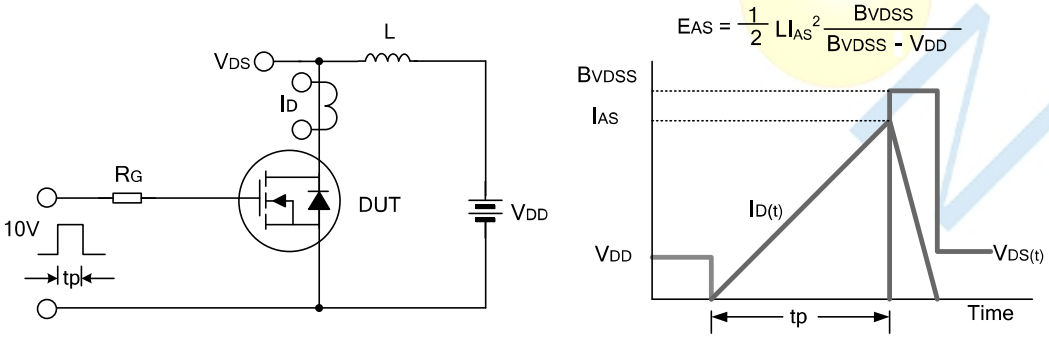
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform

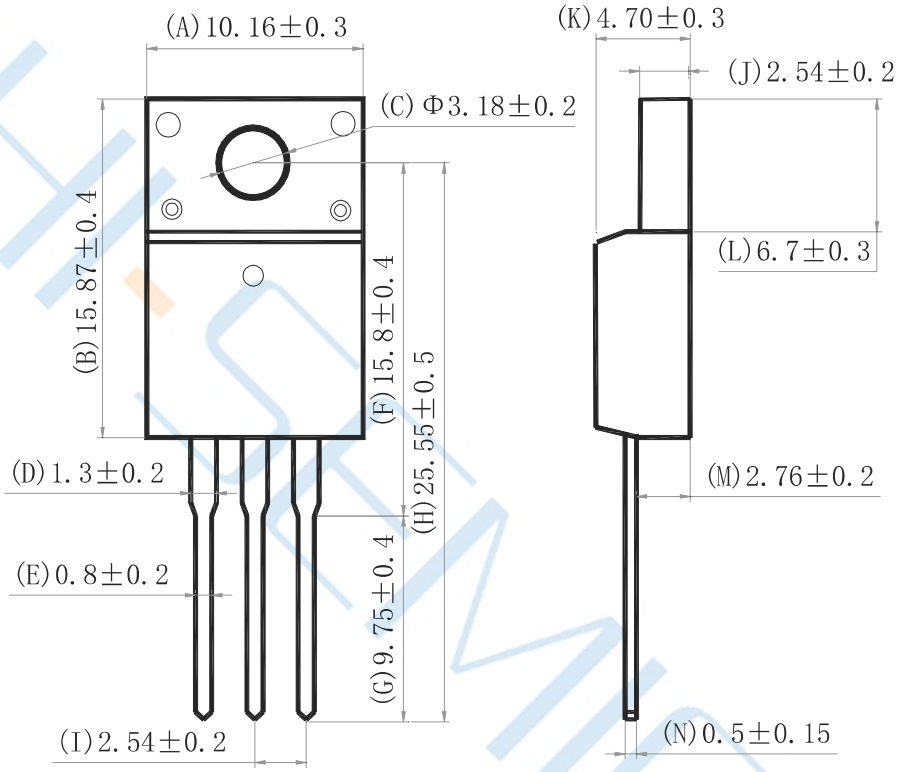


Unclamped Inductive Switching Test Circuit & Waveform



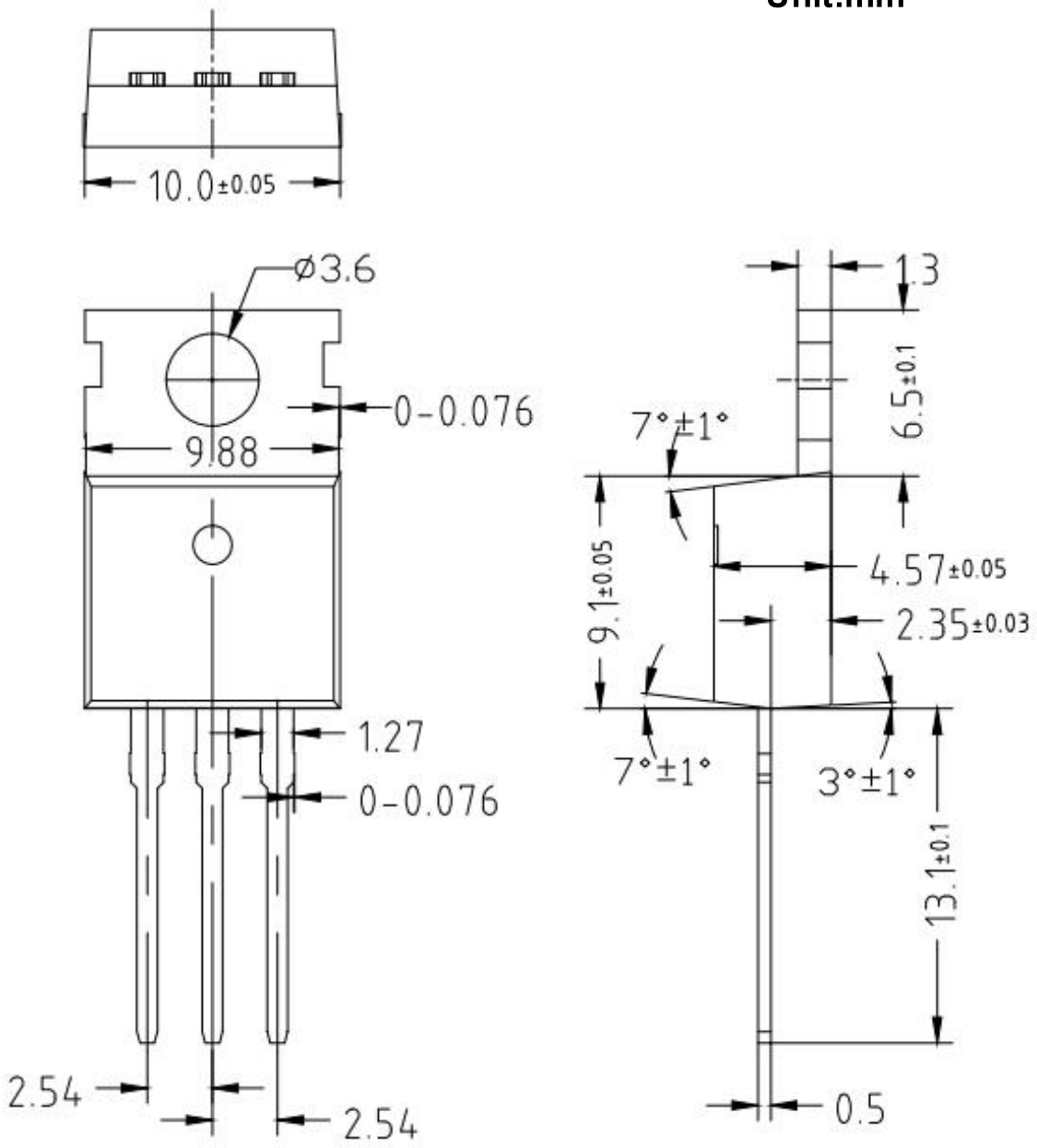
Package Dimensions of TO-220F-3L

Unit:mm



Package Dimensions of TO-220-3L

Unit:mm



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