Alfa-MOS Technology

AFN12N65

650V / 12A N-Channel Enhancement Mode MOSFET

General Description

AFN12N65 is an N-channel enhancement mode Power MOSFET which is produced using VDMOS technology. The improved planar stripe cell and the improved guard ring terminal have 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 widely used in AC-DC power suppliers, DC-DC converters and H-bridge PWM motor drivers.

Features

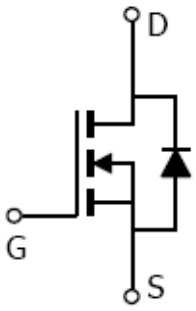
- 650V/6A,$R_{DS(ON)}$=0.8Ω(MAX)@V_{GS}=10V
- Low gate charge
- Low Crss
- Fast switching
- Improved dv/dt capability

Application

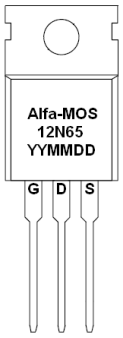
- AC-DC Power Supply
- LCD/LED/PDP TV
- Lighting
- Uninterruptible Power Supply

Pin Description

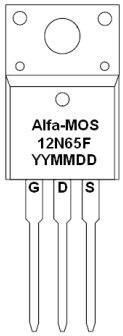
SYMBOL



TO-220-3L



TO-220F-3L



Absolute Maximum Ratings

(Tc=25℃ Unless otherwise noted)

Parameter		Symbol	Typical		Unit
			TO-220-3L	TO-220F-3L	
Drain-Source Voltage		V_{DSS}	650		V
Gate –Source Voltage		V_{GSS}	±30		V
Continuous Drain Current	Tc=25℃	I_D	12		A
	Tc=100℃		9		A
Pulsed Drain Current		I_{DM}	48		A
Single Pulsed Avalanche Energy L=30mH,I_{AS}=6.66A,V_{DD}=140V,R_G=25Ω, starting T_J=25℃		E_{AS}	786		mJ
Power Dissipation	Tc=25℃	P_D	225	51	W
Power Dissipation Derate			1.8	0.41	W /℃
Operating Junction Temperature		T_J	-55/150		℃
Storage Temperature Range		T_{STG}	-55/150		℃
Thermal Resistance-Junction to Case		$R_{\theta JC}$	0.56	2.44	℃/W
Thermal Resistance-Junction to Ambient		$R_{\theta JA}$	62.5	120	℃/W

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Pin Define

Pin	Symbol	Description
1	G	Gate
2	S	Source
3	D	Drain

Ordering Information

Part Ordering No.	Part Marking	Package	Material	Unit	Quantity
AFN12N65T220T	Alfa-MOS 12N65 YYMMDD	TO-220-3L	Pb Free	Tube	50 EA
AFN12N65T220FT	Alfa-MOS 12N65F YYYYMMDD	TO-220F-3L	Pb Free	Tube	50 EA

※ YYMMDD Date Code

Electrical Characteristics

(T_c25℃ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V,I_D=250uA	650			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250uA	2.0		4.0	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}=±30V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=650V,V_{GS}=0V			1.0	uA
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=6.0A		0.68	0.8	Ω
Continuous Source Current	I_S	Integral Reverse p-n Junction			12	A
Pulsed Source Current	I_{SM}	Diode in the MOSFET			48	A
Diode Forward Voltage	V_{SD}	I_S =12A,V_{GS}=0V			1.4	V
Reverse Recovery Time	T_{rr}	I_S =12A, V_{GS} =0V, dI_F/dt=100A/μs		450		ns
Reverse Recovery Charge	Q_{rr}	Pulse width ≤300μs,Duty cycle≤2%		4.2		uC
Dynamic						
Total Gate Charge	Q_g	V_{DS}=520V,V_{GS}=10V,I_D≡12A Pulse width ≤300μs,Duty cycle≤2%		24.15		nC
Gate-Source Charge	Q_{gs}			7.86		
Gate-Drain Charge	Q_{gd}			7.47		
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V f=1MHz		1450		pF
Output Capacitance	C_{oss}			155		
Reverse Transfer Capacitance	C_{rss}			3.71		
Turn-On Time	$t_{d(on)}$	V_{DD}=325V,I_D=12A, R_G=25Ω Pulse width ≤300μs,Duty cycle≤2%		37.67		ns
	t_r			61.67		
Turn-Off Time	$t_{d(off)}$			80.33		
	t_f			46.67		

Typical Characteristics

Figure 1. On-Region Characteristics

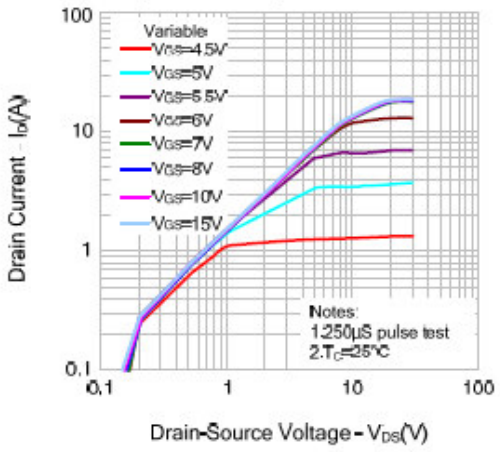


Figure 2. Transfer Characteristics

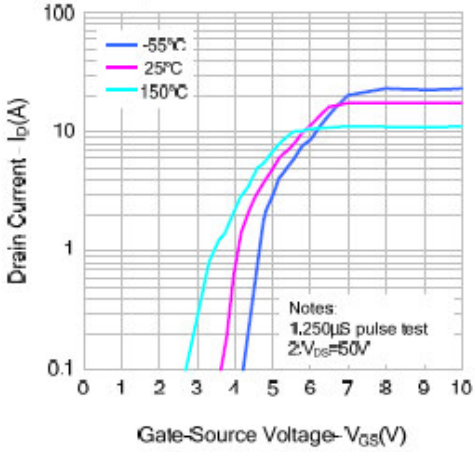


Figure 3. On-Resitance Variation vs. Drain Current and Gate Voltage

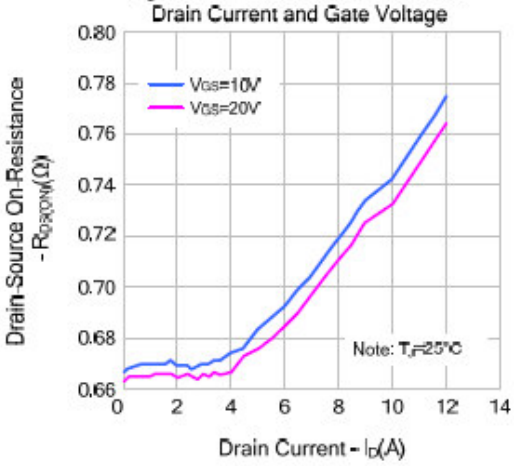


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

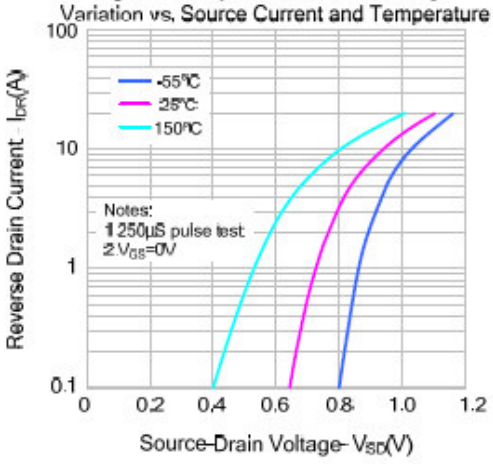


Figure 5. Capacitance Characteristics

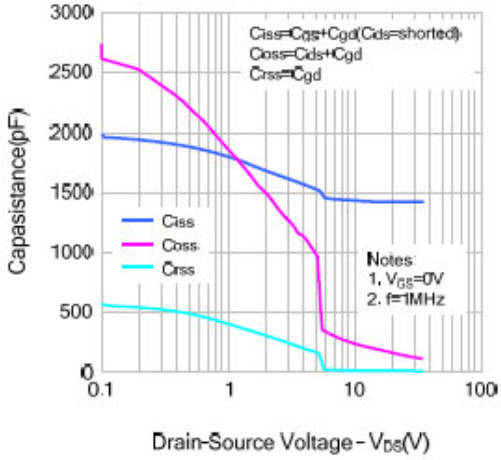
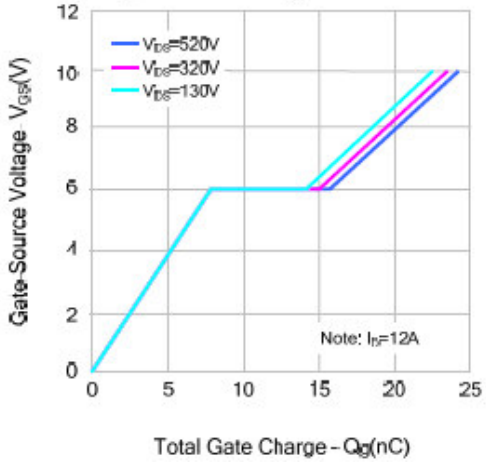


Figure 6. Gate Charge Characteristics



Typical Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

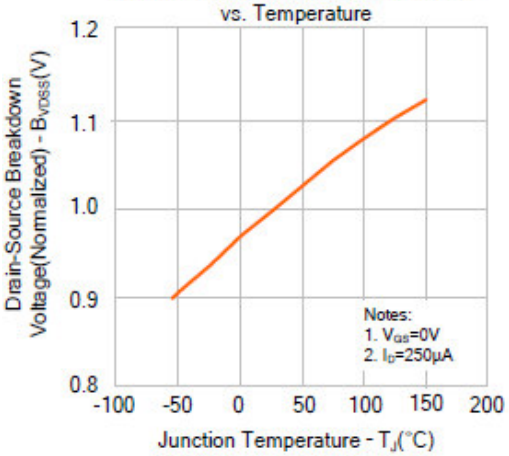


Figure 8. On-resistance Variation vs. Temperature

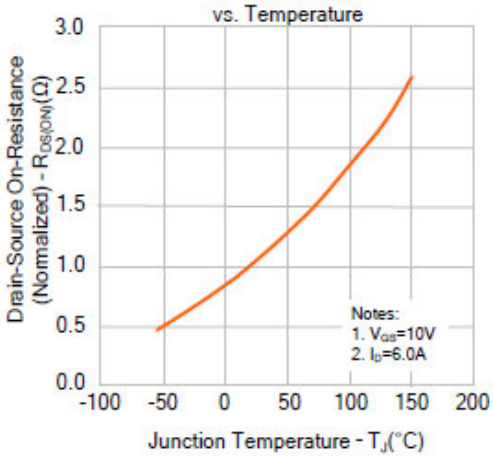


Figure 9-1. Max. Safe Operating Area(**AFN12N65**)

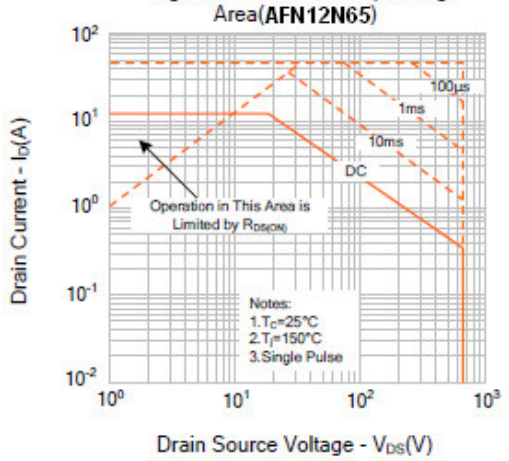


Figure 9-2. Max. Safe Operating Area(**AFN12N65F**)

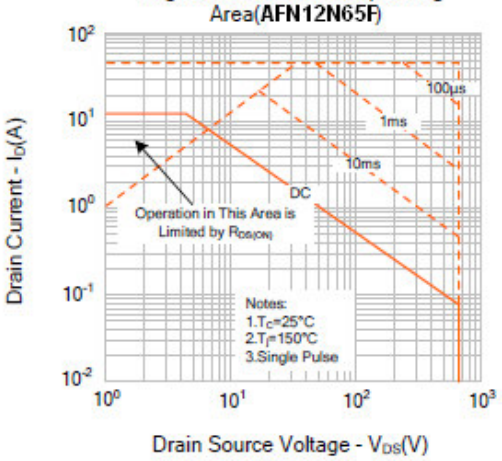
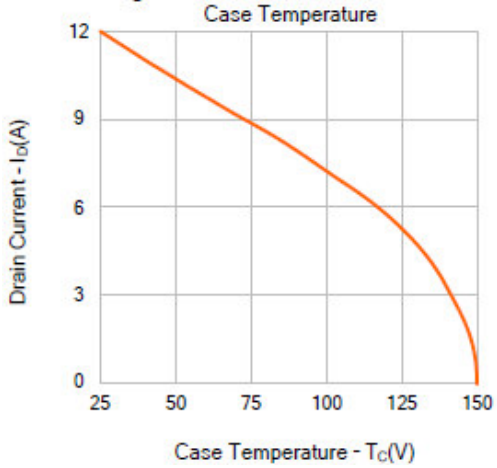
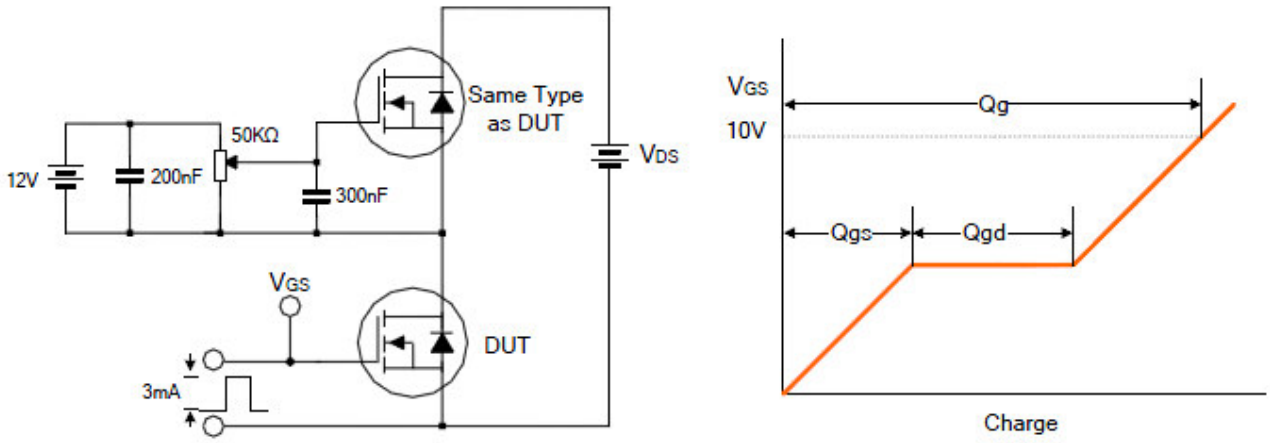


Figure 10. Maximum Drain Current vs. Case Temperature

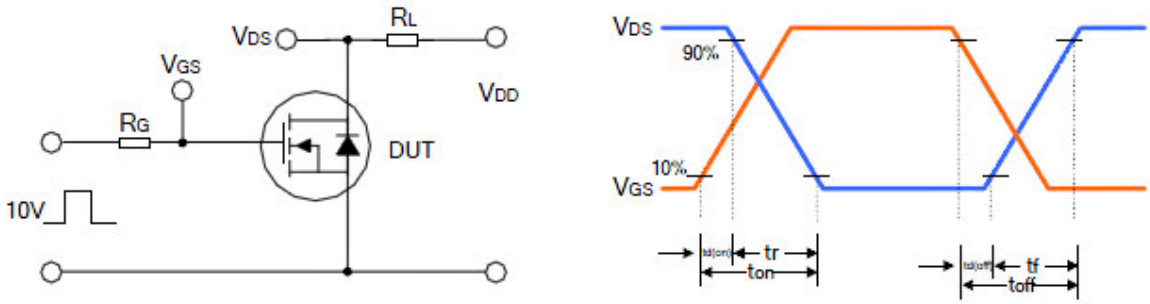


Typical Characteristics

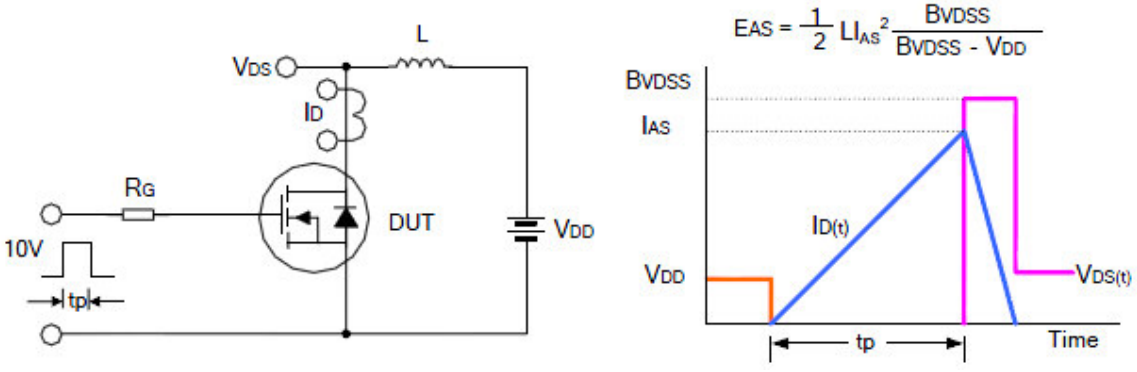
Gate Charge Test Circuit & Waveform



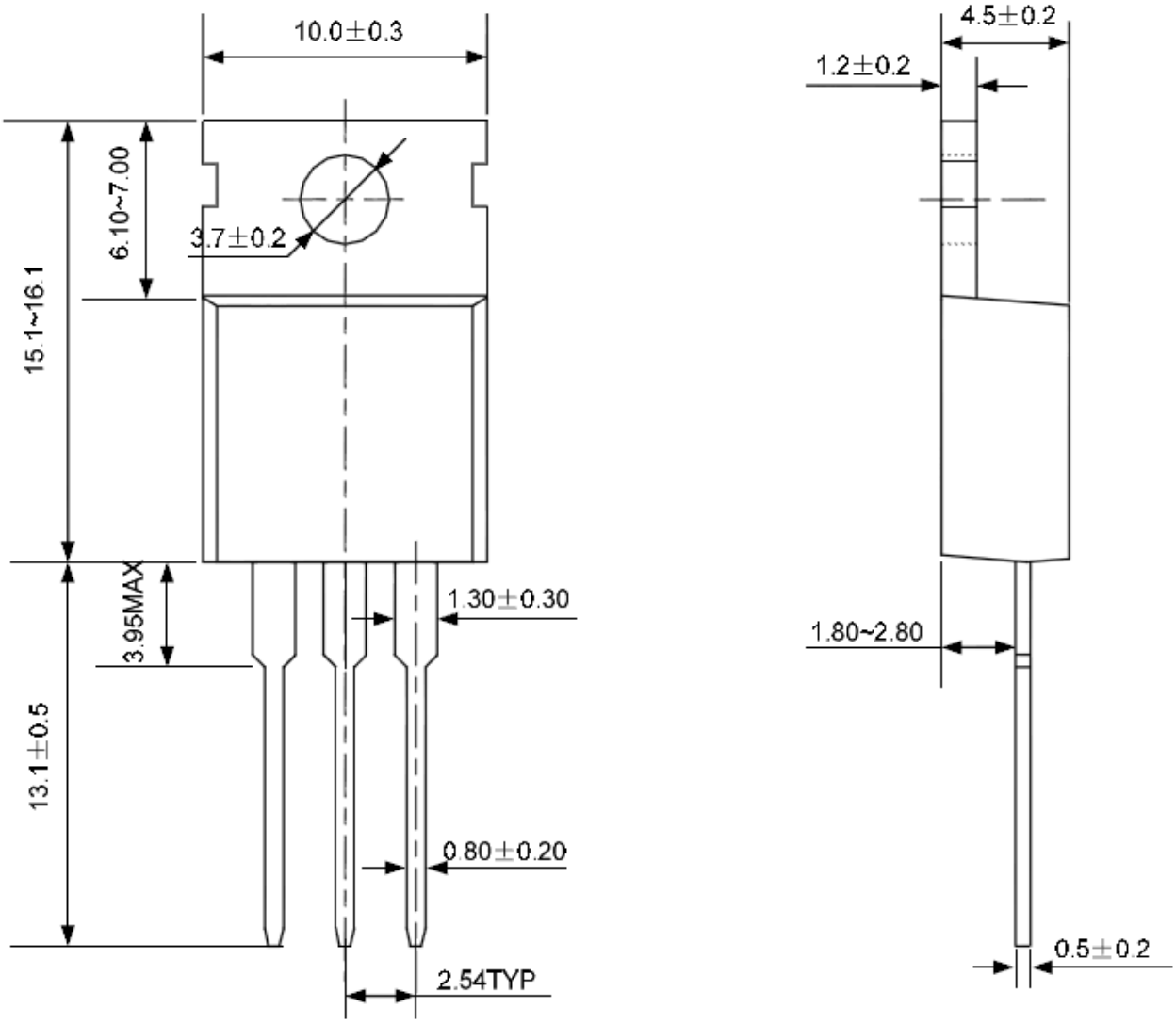
Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform



Package Information (TO-220-3L)



(Unit : mm)

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2F, No.80, Sec.1, Cheng Kung Rd., Nan Kang Dist., Taipei City 115, Taiwan (R.O.C.)
Tel : 886 2) 2651 3928
Fax : 886 2) 2786 8483
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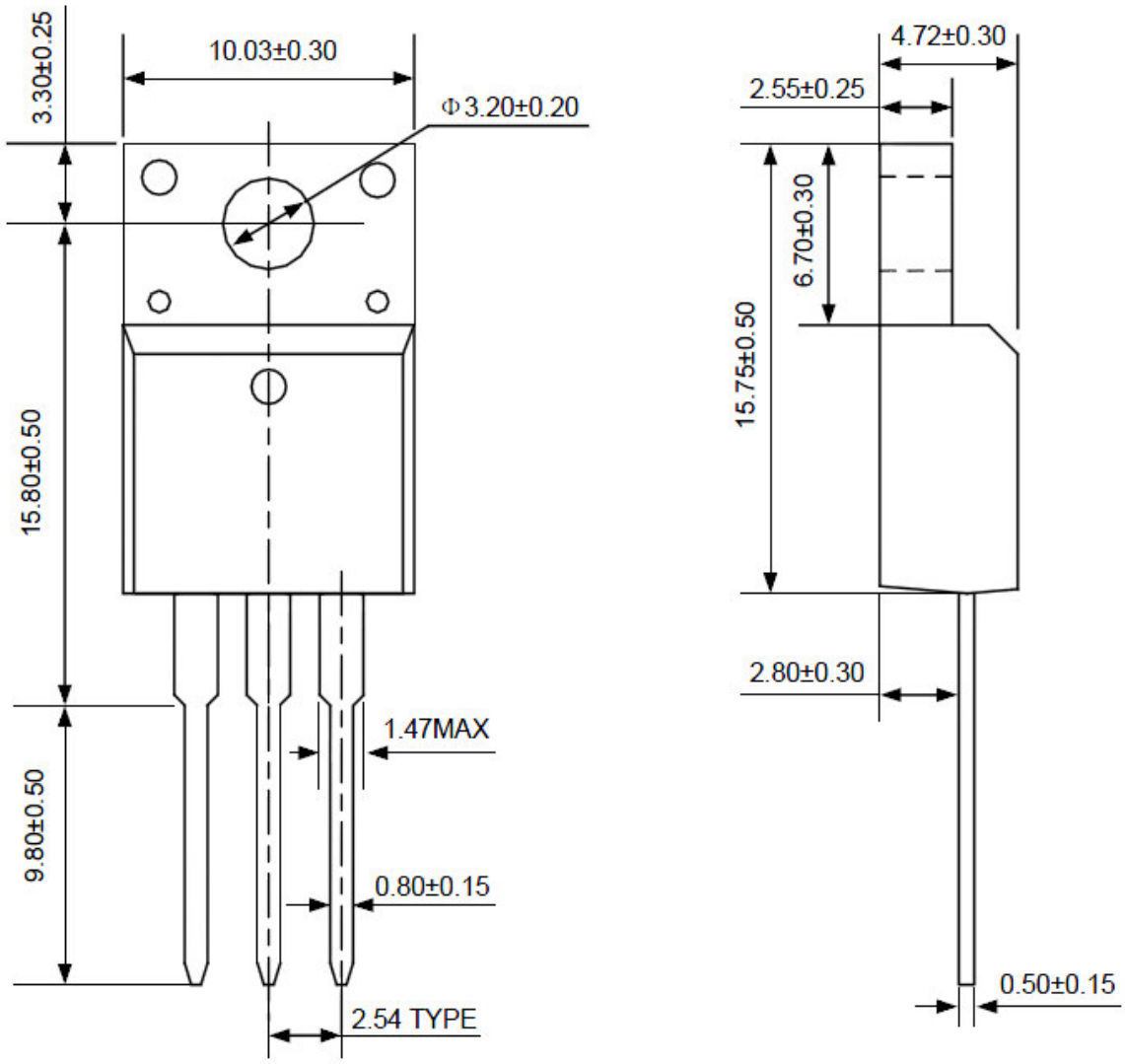
Package Information (TO-220F-3L)



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2F, No.80, Sec.1, Cheng Kung Rd., Nan Kang Dist., Taipei City 115, Taiwan (R.O.C.)
Tel : 886 2) 2651 3928
Fax : 886 2) 2786 8483
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