

-40V,-14A P-CHANNEL POWER MOSFET

GENERAL DESCRIPTION

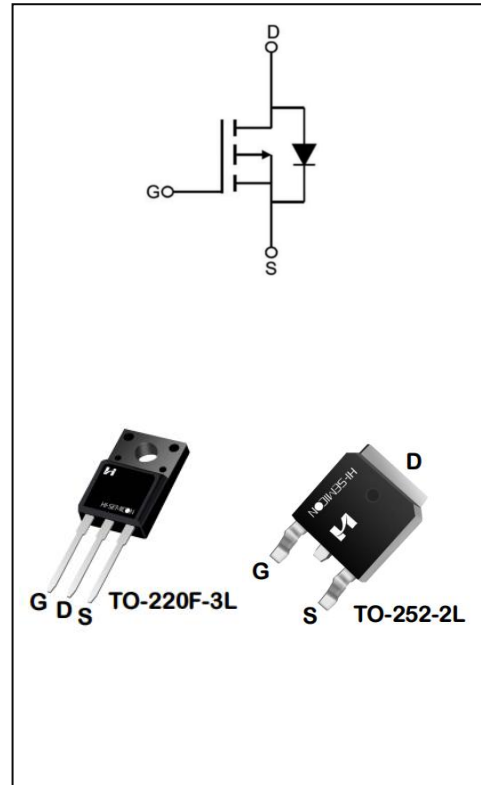
The SFX4001PT4 uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge. It can be used in a wide variety applications.

Features

- ◆ $V_{DS}=-40V, I_D=-14A$
- ◆ $R_{DS(on)}$
 TYP:33mΩ@ $V_{GS}=-10V$
 TYP:42mΩ@ $V_{GS}=-4.5V$

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
SFF4001PT4	TO-220F-3L	SFF4001PT4	Pb Free	Tube
SFD4001PT4	TO-252-2L	SFD4001PT4	Pb Free	Reel

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

Characteristics	Symbol	Ratings		Unit
		SFF4001PT4	SFD4001PT4	
Drain-Source Voltage	V _{DS}	-40		V
Gate-Source Voltage	V _{GS}	±20		V
Drain Current	I _D	T _C = 25°C		A
		T _C = 100°C		
Drain Current Pulsed(Note 1)	I _{DM}	-56		A
Power Dissipation(T _C =25°C) -Derate above 25°C	P _D	30	48	W
		0.36	0.52	W/°C
Single Pulsed Avalanche Energy (Note 2)	E _{AS}	128		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	260		°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	MAX		Unit
		SFF4001PT4	SFD4001PT4	
Thermal Resistance, Junction-to-Case	R _{θJC}	3.5	2.3	°C/W
Thermal Resistance, Junction-to-Ambient	R _{θJA}	62.5	62.5	°C/W

ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B _{VDS}	V _{GS} =0V, I _D =-250μA	-40	--	--	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =-40V, V _{GS} =0V	--	--	-1	uA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =20V, V _{DS} =0V	--	--	100	nA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =-20V, V _{DS} =0V	--	--	-100	
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{GS} = V _{DS} , I _D =-250μA	-1.0	-1.3	-2.0	V
Static Drain- Source On State Resistance	R _{DS(on)}	V _{GS} =-10V, I _D =-7A	--	33	45	mΩ
		V _{GS} =-4.5V, I _D =-5A	--	42	55	
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =-20V V _{GS} =0V f=1.0MHZ	--	1050	--	pF
Output Capacitance	C _{oss}		--	95	--	
Reverse Transfer Capacitance	C _{rss}		--	45	--	
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-20V, V _{GS} =-10V R _G =3.3Ω, I _D =-7A (Note 3.4)	--	9.6	--	ns
Turn-on Rise Time	t _r		--	8.7	--	
Turn-off Delay Time	t _{d(off)}		--	35.8	--	
Turn-off Fall Time	t _f		--	8.5	--	

Total Gate Charge	Q_g	$V_{DS}=-20V, I_D=-7A$ $V_{GS}=-10V$ (Note 3.4)	--	23.5	--	nc
Gate-Source Charge	Q_{gs}		--	6.3	--	
Gate-Drain Charge	Q_{gd}		--	8.5	--	

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	--	--	-14	A
Pulsed Source Current	I_{SM}		--	--	-56	
Diode Forward Voltage	V_{SD}	$I_S=-10A, V_{GS}=0V$	--	-0.87	-1.2	V
Reverse Recovery Time	T_{rr}	$I_F=-10A$ $dI_F/dt=100A/\mu S$	--	56	--	ns
Reverse Recovery Charge	Q_{rr}		--	28	--	nC

1. Pulse width limited by maximum junction temperature
2. $L=1mH, V_{DD}=-20V, V_G=-10V, R_G=25\Omega$, starting $T_J=25^\circ C$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
4. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. Output Characteristics

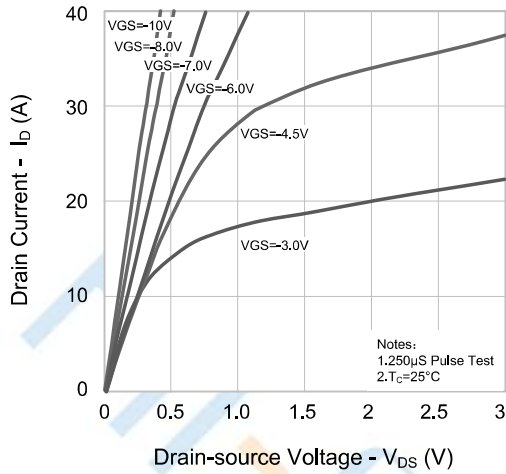


Figure 2. Transfer Characteristics

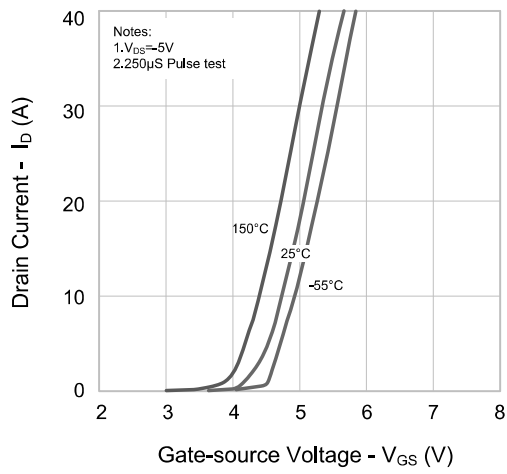


Figure 3. On-resistance vs. Drain Current

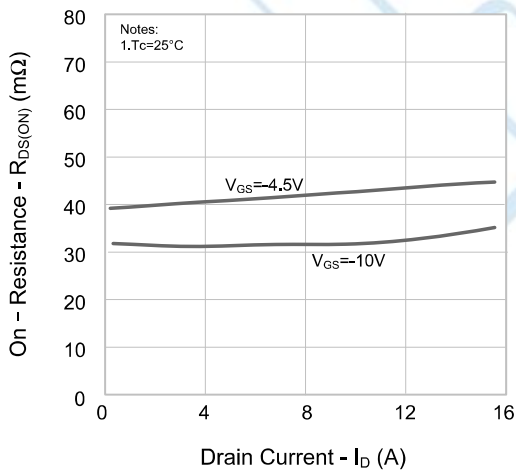


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

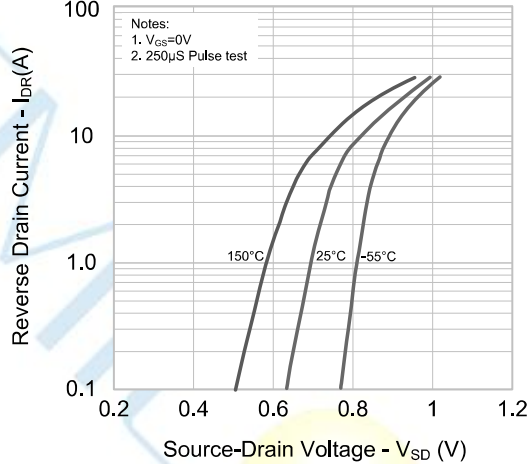


Figure 5. Capacitance Characteristics

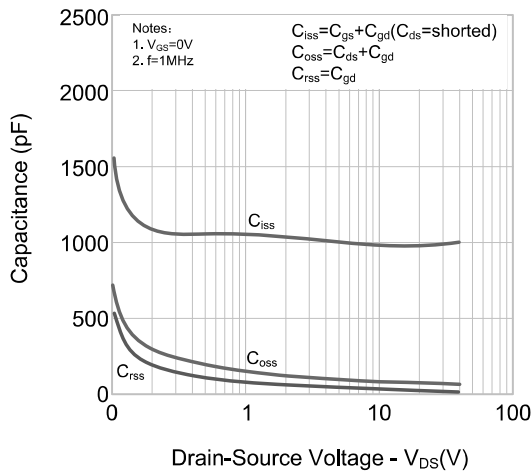
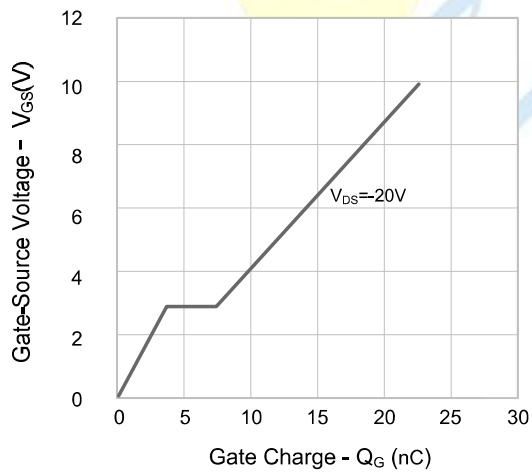


Figure 6. Gate Charge



Typical Performance Characteristics

Figure 7. Breakdown Voltage vs. Temperature Characteristics

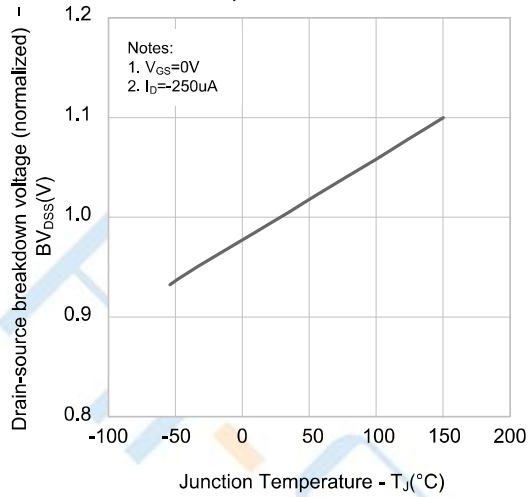


Figure 8. On-resistance vs. Temperature Characteristics

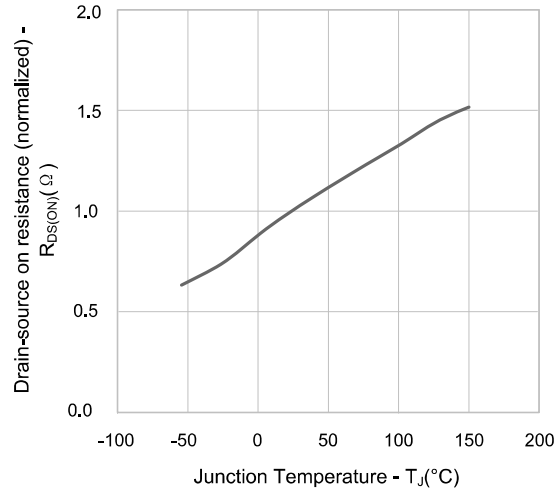
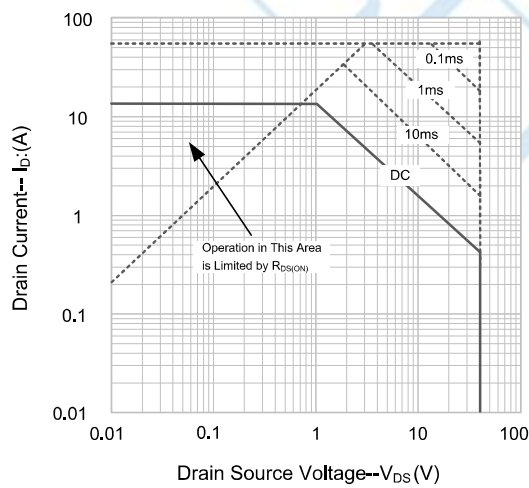
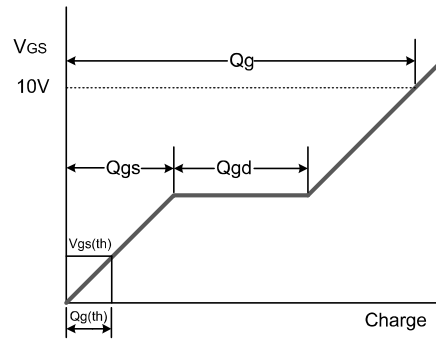
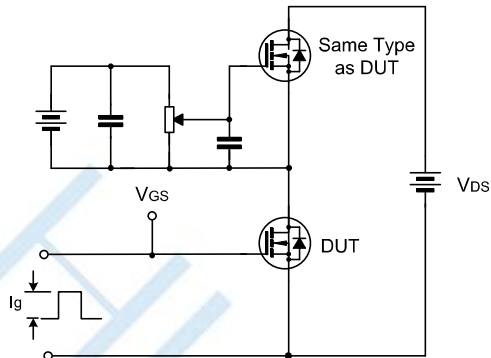


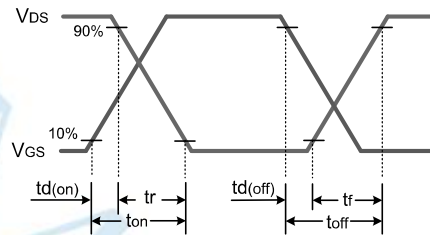
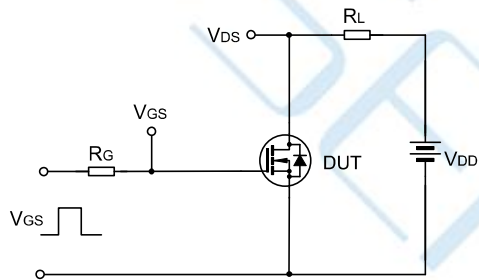
Figure 9. Max. Safe Operating Area



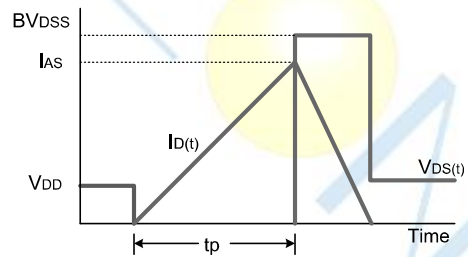
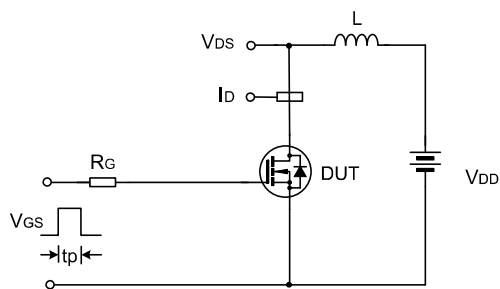
Test Circuit



Gate Charge Test Circuit & Waveform

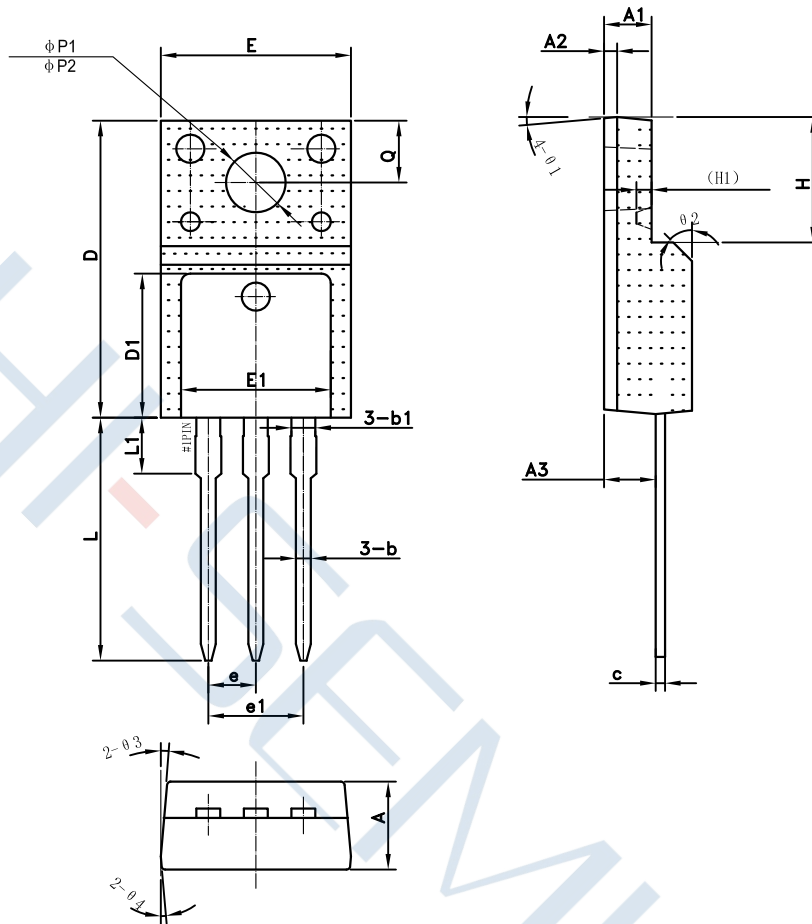


Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform

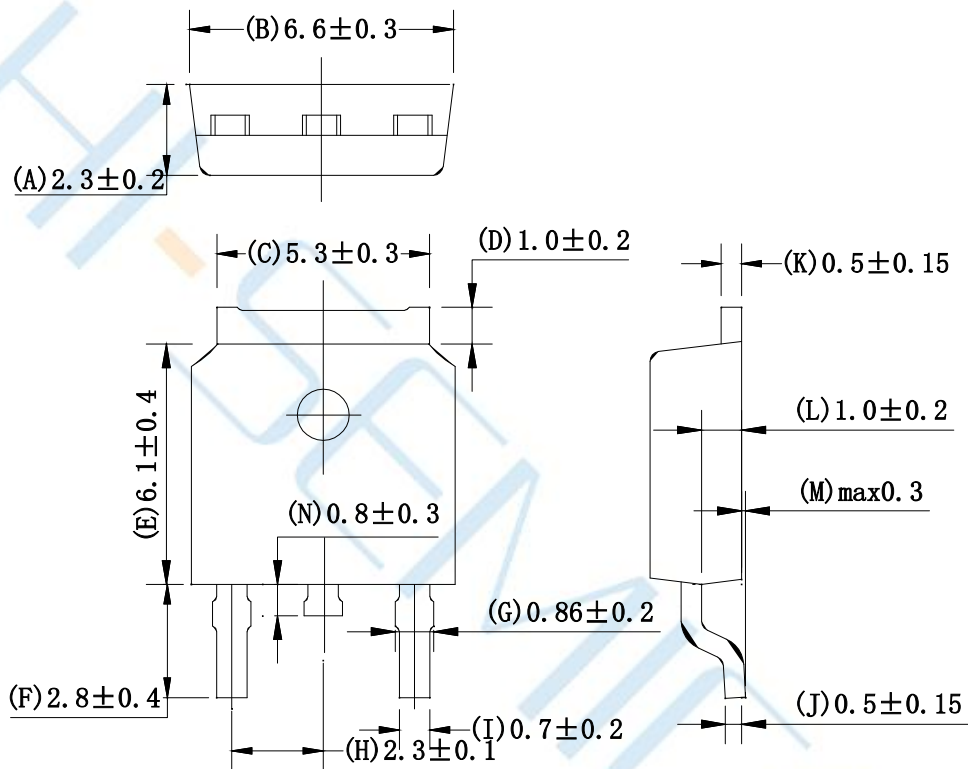
Package Dimensions of TO-220F-3L



Symbol	Mechanical Dimension/mm		
	Min	Typ	Max
A	4.50	4.70	4.90
A1	2.44	2.54	2.64
A2	0.60	0.70	0.80
A3	2.56	2.76	2.96
b	0.70	0.80	0.95
b1		1.28	
c	0.45	0.50	0.65
D	15.67	15.87	16.07
D1		7.70	
E	9.96	10.16	10.36
E1		8.00	
e		2.54	
e1		5.08	
H	6.50	6.70	6.90
(H1)		(0.81)	
L	12.48	12.98	13.20
L1		2.93	
φP1	2.98	3.18	3.38
φP2	3.20	3.40	3.60
Q	3.10	3.30	3.50
θ 1		5°	
θ 2		45°	
θ 3		5°	
θ 4		5°	

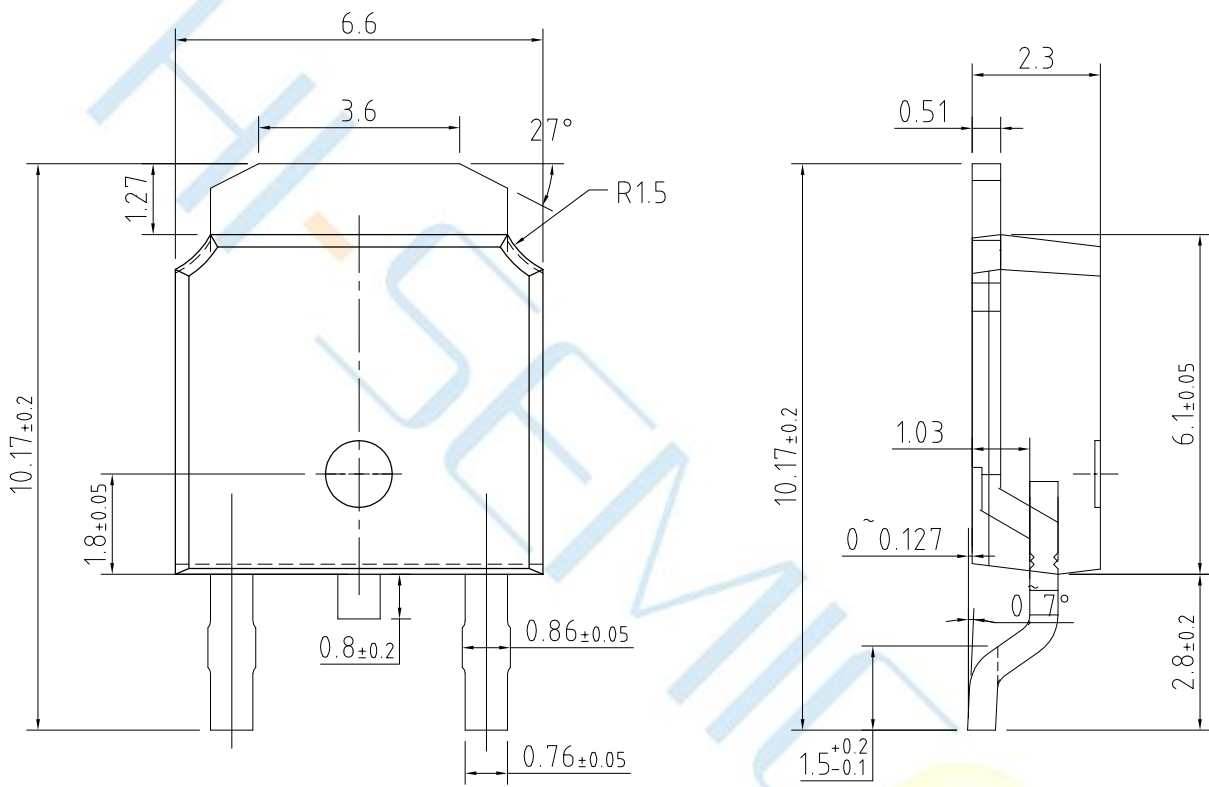
Package Dimensions of TO-252-2L

Unit:mm



Package Dimensions of TO-252-2L

Unit:mm



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