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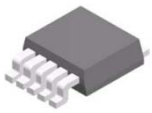
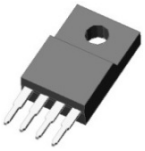
SN278Rxxx

Low Dropout Voltage Regulator (2.0A Series)



TO-252-5L



TO-220F-4SL

Description

The SN278Rxx is an efficient linear low dropout voltage regulator for various electronic equipment. It is designed to provide very low dropout voltage, and better than 2.5% output voltage accuracy.

And the SN278Rxx has various key features such as current limiting, over temperature shut-down, over voltage protection, enable pin, and low noise performance with an low noise option.

Furthermore, it is available in adjustable or fixed output voltages in TO-252-5L, TO-220F-4SL packages.

Application

◈ Consumer and personal electronics

◈ SMPS post-regulator / dc-to-dc modules

◈ High-efficiency linear power supplies

ORDERING INFORMATION

Product	Marking	Package
SN278RxxD	SN278Rxx	TO-252-5L
SN278RxxPIC	SN278Rxx	TO-220F-4SL

▲ **Marking Detail Information**

[TO-220F-4SL PKG Marking]

AUK (①)
G△YMDD (②)
SN278Rxx (③)

① AUK Logo

② Grade & M Code & Year & Monthly & Daily Code

③ Device Code

[TO-252-5L PKG Marking]

SN278Rxx (①)
G△YWW (②)

① Device Code

② Grade & M Code & Year & Week Code

Features and Benefits

◈ Low Dropout Voltage for 2.0A Output : [Max. 500mV]

◈ Built in Thermal shut down circuit

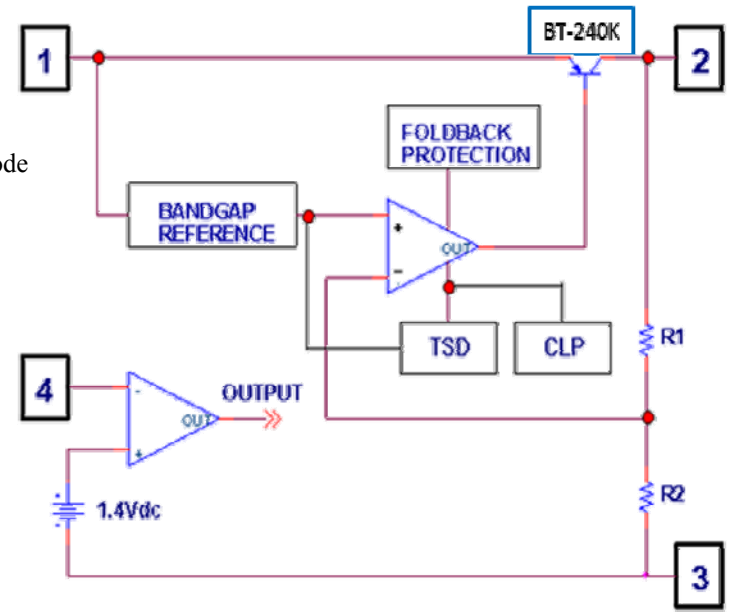
◈ Built in OVP, CLP circuit

◈ Low Quiescent Current

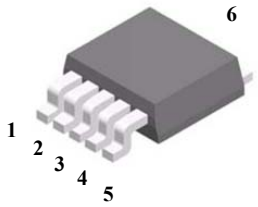
◈ Ultra High level of ESD [Built in ESD Protection Cell]

MM : 400V ↑ / HBM 4KV ↑

Equivalent Circuit

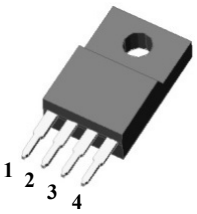


◈ Pin Configuration



TO-252-5L

1: V_{IN}
2: GND
3: V_{OUT}
4: V_{CTL}
5: NC
6: V_{OUT}



TO-220F-4SL

1: V_{IN}
2: V_{OUT}
3: GND
4: V_{CTL}

◈ Product Line-up

Product Name	V_{OUT}	Junction Operating	Package	Marking Code
SN278R33D	3.3V	-40~150℃	TO-252-5L	SN278R33
SN278R35D	3.5V	-40~150℃	TO-252-5L	SN278R35
SN278R05D	5.0V	-40~150℃	TO-252-5L	SN278R05
SN278R06D	6.0V	-40~150℃	TO-252-5L	SN278R06
SN278R08D	8.0V	-40~150℃	TO-252-5L	SN278R08
SN278R09D	9.0V	-40~150℃	TO-252-5L	SN278R09
SN278R12D	12V	-40~150℃	TO-252-5L	SN278R12
SN278R15D	15V	-40~150℃	TO-252-5L	SN278R15
SN278R33PIC	3.3V	-40~150℃	TO-220F-4SL	SN278R33
SN278R35PIC	3.5V	-40~150℃	TO-220F-4SL	SN278R35
SN278R05PIC	5.0V	-40~150℃	TO-220F-4SL	SN278R05
SN278R06PIC	6.0V	-40~150℃	TO-220F-4SL	SN278R06
SN278R08PIC	8.0V	-40~150℃	TO-220F-4SL	SN278R08
SN278R09PIC	9.0V	-40~150℃	TO-220F-4SL	SN278R09
SN278R12PIC	12V	-40~150℃	TO-220F-4SL	SN278R12
SN278R15PIC	15V	-40~150℃	TO-220F-4SL	SN278R15

◈ Absolute Maximum Ratings (Ta = 25℃)

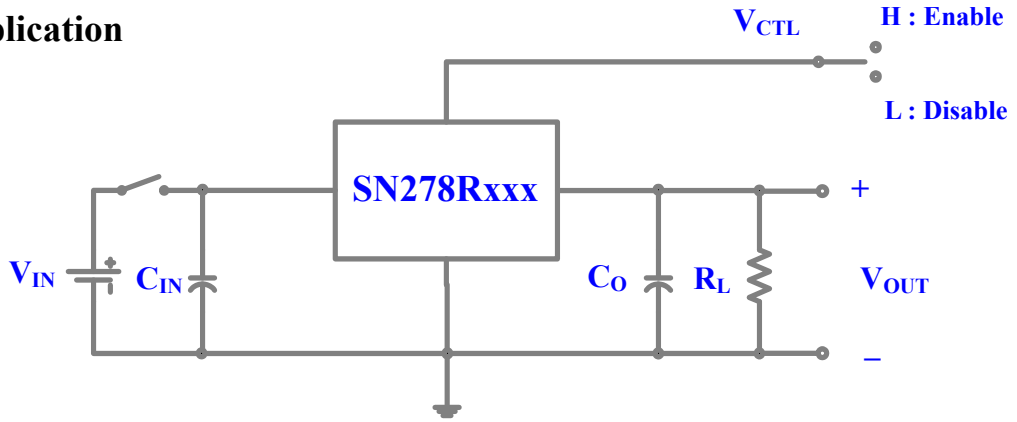
Parameter		Symbol	Limits		Unit
Input Voltage		V_{IN}	35.0		V
Power Dissipation	TO-220F-4SL	P_D	1.5(Note1)	15(Note2)	W
	TO-252-5L		1.3(Note1)	2.7(Note2)	
Junction Temperature		T_J	150		℃
Operate Junction Temperature		T_{opr}	-40 ~ +150		℃
Storage Temperature Range		T_{stg}	-55 ~ +150		℃

Note 1 : No Heat-sink

Note 2 : Infinite Heat-sink(TO-220F) / FR-4 PCB (25.4*25.4mm) for SMD PKG

Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings. The maximum allowable power dissipation is a function of the maximum junction temperature, $T_{J(max)}$, the junction-to-ambient thermal resistance, θ_{JA}, and the ambient temperature, T_A.
The maximum allowable power dissipation at any ambient temperature is calculated using:
$P_{D(max)} = (T_{J(max)} - T_A) \div \theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

Typical Application



1) C_{IN} should be required if regulators are located far from power supply filter
2) C_O improves output stability and transient response ($C_O \geq 47uF$)

◈ Electrical characteristics

(Vin=(Note 1): Io = 1.0A, $V_{CT(High)}$=2.7V, T_a = 25°C, unless otherwise specified)

Electric Characteristic	Symbol	Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_O	SN278R33	-	3.22	3.3	3.38	V
		SN278R35	-	3.41	3.5	3.59	V
		SN278R05	-	4.88	5.0	5.12	V
		SN278R06	-	5.85	6.0	6.15	V
		SN278R08	-	7.80	8.0	8.20	V
		SN278R09	-	8.78	9.0	9.22	V
		SN278R12	-	11.70	12.0	12.30	V
		SN278R15	-	14.60	15.0	15.40	V
Line Regulation	$\triangle V_{O(\triangle VI)}$	(Note2)		-	0.5	2.5	%
Load Regulation	$\triangle V_{O(\triangle IL)}$	5mA≤I_O≤2.0A		-	0.1	2.0	%
Quiescent Current	I_{QC}	I_O=0mA		-	-	10	mA
Ripple Rejection Ratio	RR	I_O=50mA, f=120Hz		45	55	-	dB
Dropout Voltage	V_{DROP}	I_O=1.0A		-	-	0.3	V
		I_O=2.0A		-	-	0.5	V
Control Voltage High	$V_{CT(High)}$	I_O=0mA, Output ON		2.0	-	-	V
Control Voltage Low	$V_{CT(Low)}$	I_O=0mA, Output OFF		-	-	0.8	V
Control Bias Current High	$I_{CT(High)}$	$V_{CT(High)}$ = 2.7V		-	-	20	μA
Control Bias Current Low	$I_{CT(Low)}$	$V_{CT(Low)}$ = 0.4V		-	-	-0.4	mA

Note 1)

SN278R33: V_I=5.3V SN278R35: V_I=5.5V

SN278R05: V_I=7.0V SN278R06: V_I=8.0V

SN278R08: V_I=10V SN278R09: V_I=15V

SN278R12: V_I=18V SN278R15: V_I=21V

Note 2)

SN278R33: V_I=4.3V~12V SN278R35: V_I=4.5V~12V

SN278R05: V_I=6V~12V SN278R06: V_I=7V~15V

SN278R08: V_I=9V~25V SN278R09: V_I=10V~25V

SN278R12: V_I=13V~29V SN278R15: V_I=16V~32V

Electrical Characteristic Curves

Fig.1 I_O vs. V_O

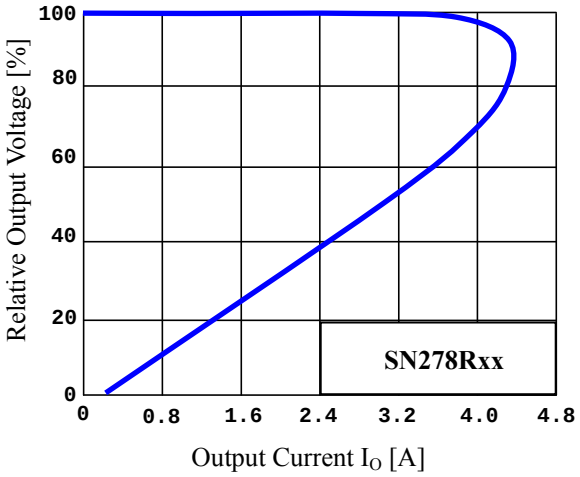


Fig.2 T_a vs. P_D

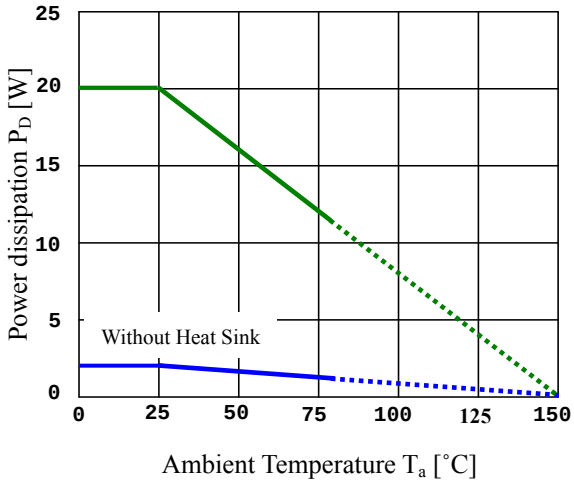


Fig.3 V_I vs. I_{QC}

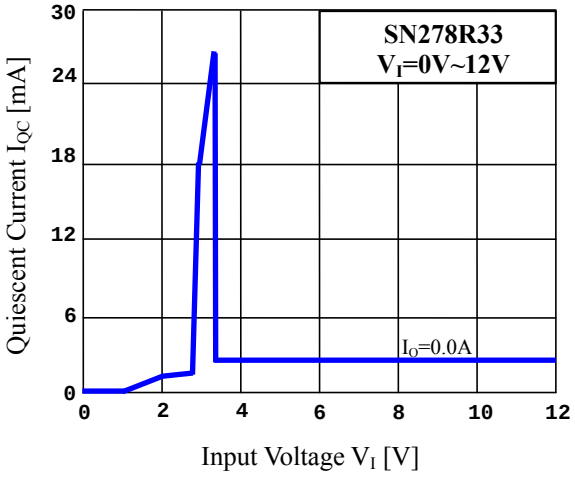


Fig.4 V_I vs. I_{QC}

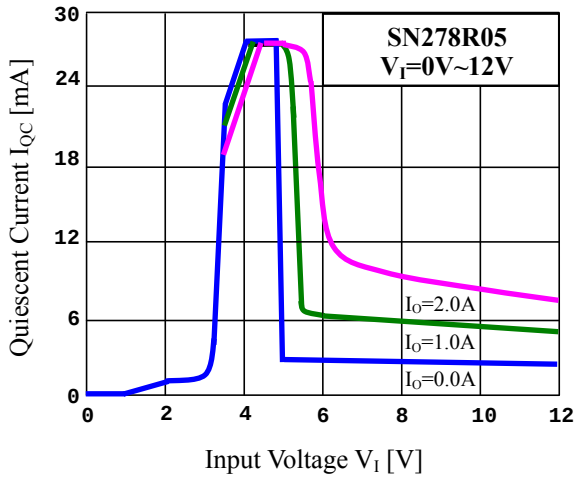


Fig.6 V_I vs. I_{QC}

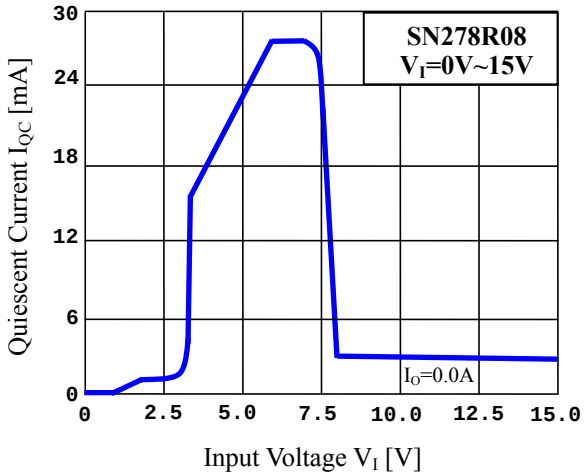
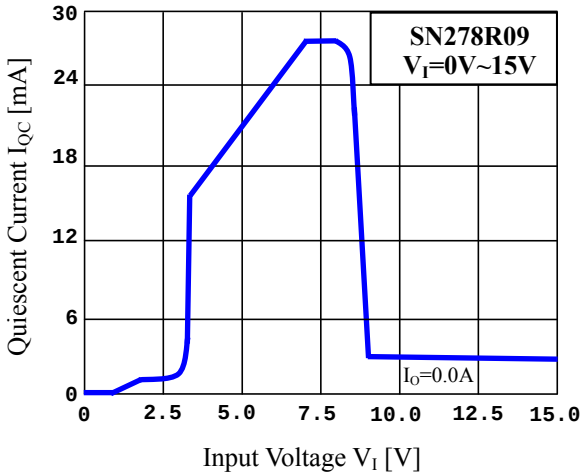


Fig.7 V_I vs. I_{QC}



Electrical Characteristic Curves

Fig.8 V_I vs. I_{QC}

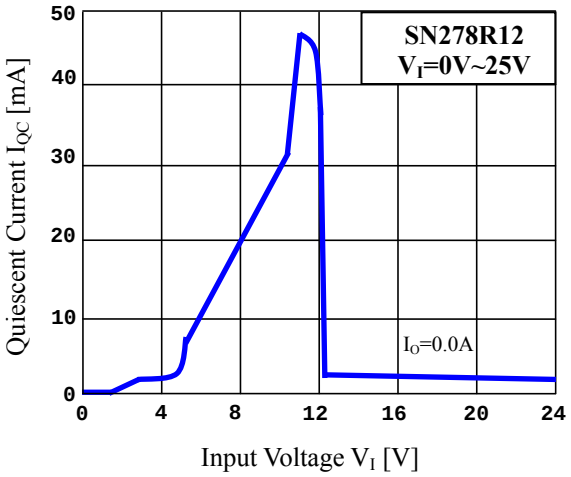


Fig.9 T_j vs. I_{QC}

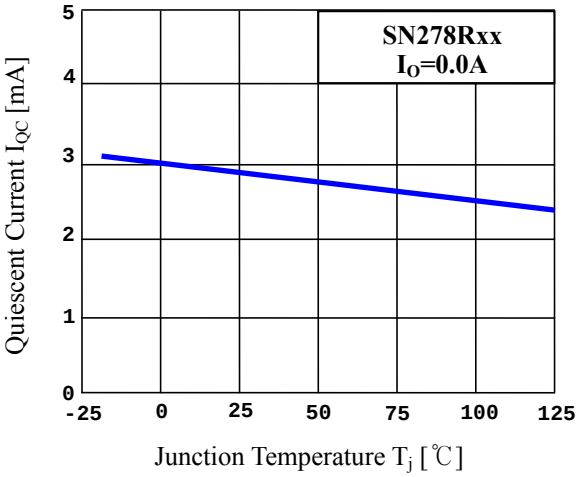


Fig.10 V_{CT} vs. V_O

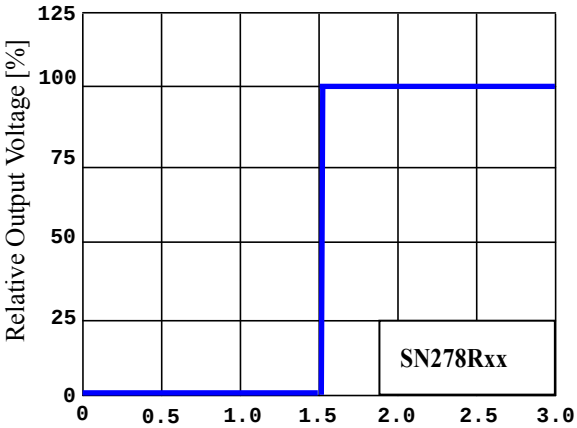
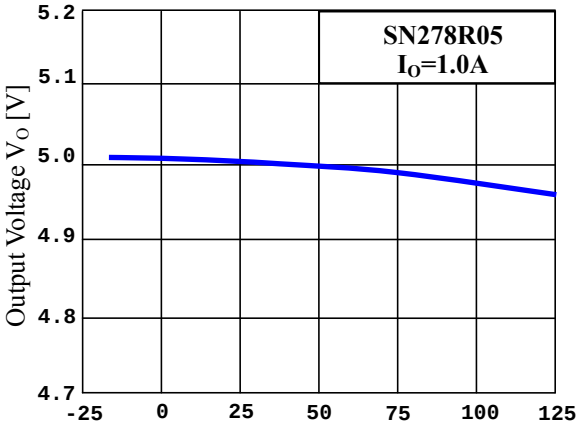
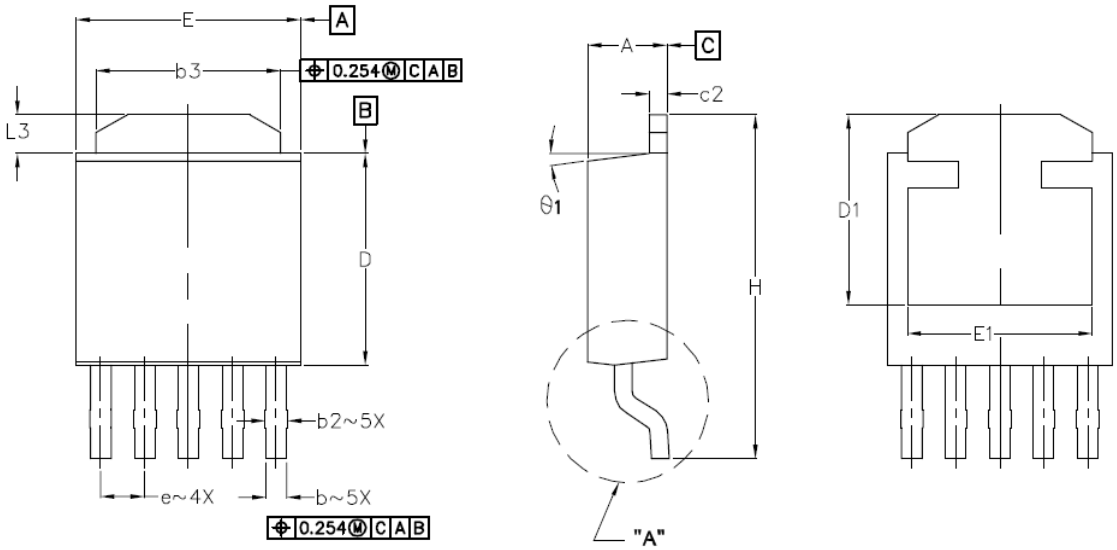
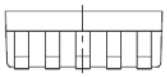


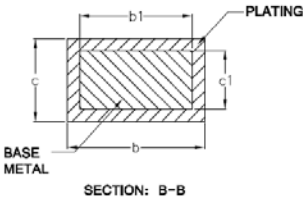
Fig.11 T_j vs. V_O

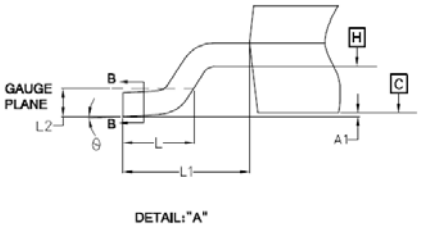


◈ TO-252-5L Outline Dimension (Unit : mm)



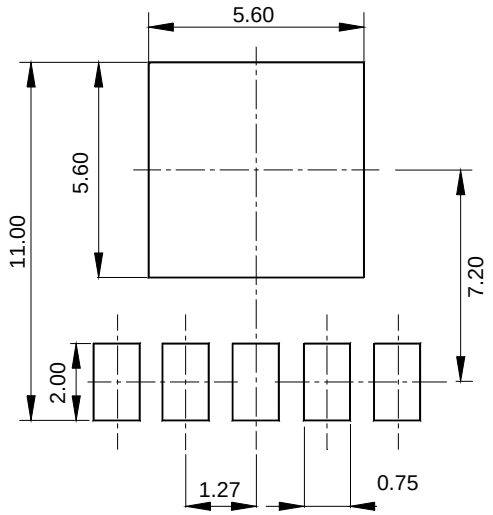




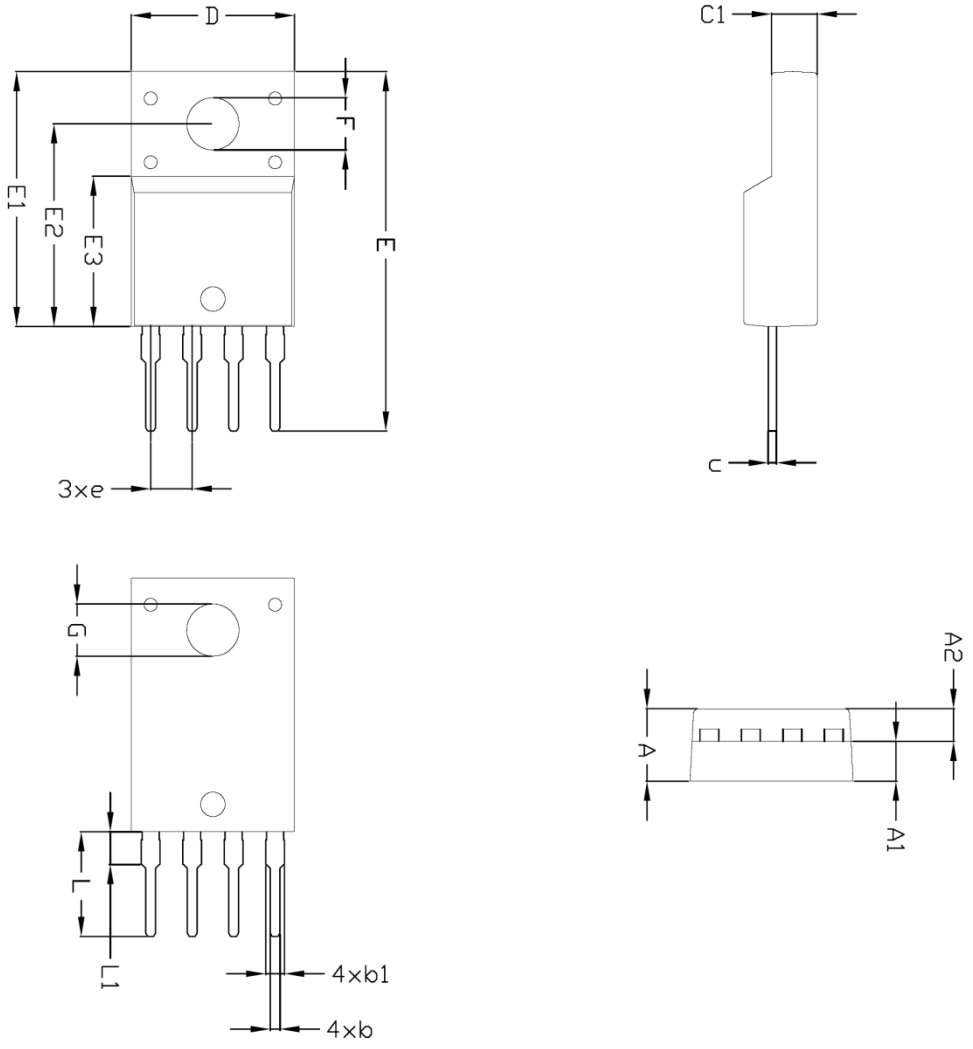


SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	2.184	2.286	2.387	
A1	—	—	0.127	
b	0.508	0.610	0.711	
b1	0.508	0.584	0.660	
b2	0.610	0.699	0.787	
b3	4.953	5.207	5.461	
c	0.460	0.535	0.610	
c1	0.410	0.485	0.559	
c2	0.460	0.675	0.889	
D	5.969	6.096	6.223	
D1	5.207	—	—	
E	6.350	6.541	6.731	
E1	4.318	—	—	
e	1.270 BSC			
H	9.398	9.906	10.414	
L	1.397	1.588	1.778	
L1	2.743 BSC			
L2	0.508 BSC			
L3	0.889	1.080	1.270	
θ	0°	5°	10°	
θ1	0°	7.5°	15°	

※ Recommend PCB solder land [Unit : mm]



◈ TO-220F-4SL Outline Dimension (Unit : mm)



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	-	-	4.60	
A1	2.45	2.50	2.55	
A2	1.95	2.00	2.05	
b	0.50	0.60	0.70	
b1	0.85	1.05	1.25	
c	0.40	0.50	0.60	
c1	2.70	2.80	2.90	
D	9.90	10.00	10.10	
E	20.80	-	21.40	
E1	15.50	15.60	15.70	
E2	12.30	12.40	12.50	
E3	9.15	9.20	9.25	
F	3.10	3.20	3.30	
G	3.30	3.40	3.50	
e	2.54 BSC			
L	5.20	-	5.80	
L1	2.00 BSC			

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