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FAIRCHILD SEMICONDUCTOR®

July 2013

KA278RXXC-Series
2 A Output Low Dropout Voltage Regulators

Features

KA278RXXC-Series (33 / 05 / 12)

- 3.3 V, 5 V, 12 V Output Low-Dropout Voltage Regulator
- TO-220 Full-Mold Package (4 Pin)
- Over-Current Protection, Thermal Shutdown
- Over-Voltage Protection, Short-Circuit Protection
- Output Disable Function

KA278RA05C

- Nominal 5 V Output without Adjusting
- Output Adjustable between 1.27 V and 32 V
- 2 A Output Low-Dropout Voltage Regulator
- TO-220 Full-Mold Package (4 Pin)
- Over-Current Protection, Thermal Shutdown
- Over-Voltage Protection, Short-Circuit Protection

Description

The KA278RXXC is a low-dropout voltage regulator suitable for various electronic equipment. It provides a constant voltage power source in a TO-220 4-lead full-mold package. The dropout voltage is below 0.5 V in full-rated current (2 A). This regulator has peak current protection, thermal shutdown, and over-voltage protection.

TO-220F 4L

1

1. V_{IN} 2. V_O 3. GND 4. V_{dis} - KA278RXXC (33 / 05 / 12)
1.V_{IN} 2. V_O 3. GND 4. V_{adj} - KA278RA05C

Ordering Information

Part Number	Operating Temperature Range	Top Mark	Package	Packing Method
KA278R33CTU	-20 to 80°C	278R33	TO-220F 4L	Rail
KA278R05CTU		278R05		
KA278R12CTU		278R12		
KA278RA05CTU		278RA05		
KA278R12CYDTU		278R12	TO-220F 4L (Forming)	

Block Diagram

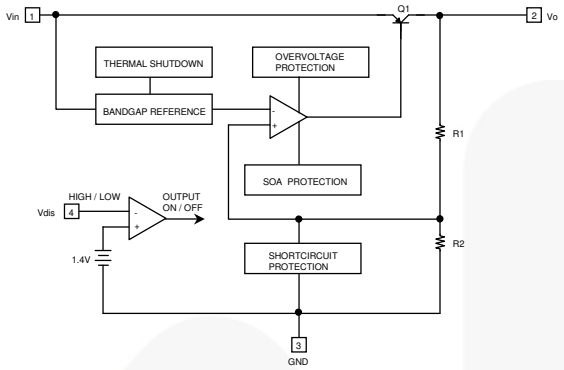


Figure 1. KA278R33 / 05 / 12C

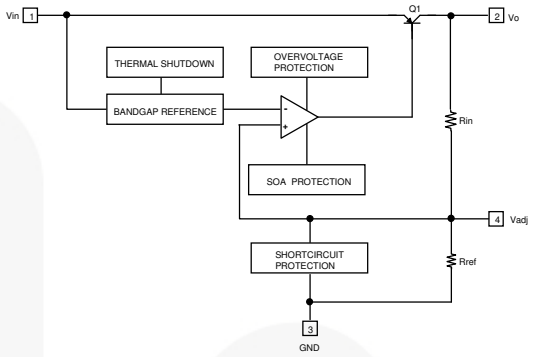


Figure 2. KA278RA05C

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter		Value	Unit
V_{IN}	Input Voltage		35	V
V_{dis}	Disable Voltage	KA278RXXC	35	V
I_O	Output Current		2.0	A
P_D1	Power Dissipation 1	No Heat-Sink	1.5	W
P_D2	Power Dissipation 2	With Heat-Sink	15	W
T_j	Junction Temperature		150	°C
T_{opr}	Operating Temperature		-20 to 80	°C
$R_{\theta jc}$	Thermal Resistance, Junction-to Case(1)		2.9	°C/W
$R_{\theta ja}$	Thermal Resistance, Junction-to-Air		48.51	°C/W

Note:

1. Junction-to-case thermal resistance test environments:
   - Pneumatic heat sink fixture;
   - Clamping pressure 60 psi through 12 mm diameter cylinder;
   - Thermal grease applied between PKG and heat sink fixture.

Electrical Characteristics

V_{IN} = Note 3, I_O = 1.0 A, T_A = 25°C, unless otherwise specified.

Symbol	Parameter		Test Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	KA278R33C		3.22	3.30	3.38	V
		KA278R05C		4.88	5.00	5.12	
		KA278R12C		11.70	12.00	12.30	
R_{load}	Load Regulation		5 mA < I_O < 2 A		0.1	2.0	%
R_{line}	Line Regulation(4)				0.5	2.5	%
RR	Ripple Rejection Ratio(2)			45	55		dB
V_{drop}	Dropout Voltage		I_O = 2 A			0.5	V
V_{disH}	Disable Voltage High	KA278RXXC	Output Active	2.0			V
V_{disL}	Disable Voltage Low	KA278RXXC	Output Disabled			0.8	V
I_{disH}	Disable Bias Current High	KA278RXXC	V_{dis} = 2.7 V			20	µA
I_{disL}	Disable Bias Current Low	KA278RXXC	V_{dis} = 0.4 V			-0.4	mA
I_q	Quiescent Current		I_O = 0 A			10	mA
V_{ref}	Reference Voltage	KA278RA05C		1.24	1.27	1.30	V

Notes:

2. These parameters, although guaranteed, are not 100% tested in production.
3. KA278R33C: V_{IN} = 5 V;
   KA278R05C: V_{IN} = 7 V;
   KA278R12C: V_{IN} = 15 V.
4. KA278R33C: V_{IN} =4 V to 10 V;
   KA278R05C: V_{IN} = 6 V to 12 V;
   KA278R12C: V_{IN} = 13 V to 29 V.

Typical Performance Characteristics (KA278R33C)

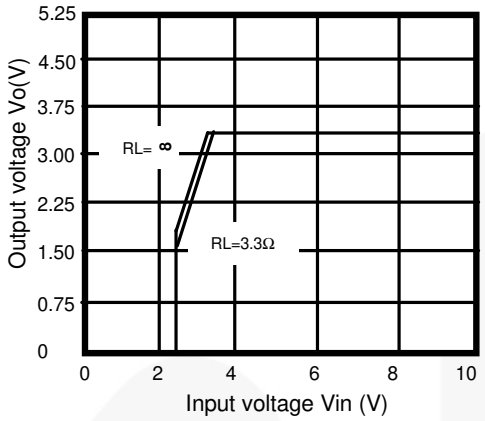


Figure 3. Output Voltage vs. Input Voltage

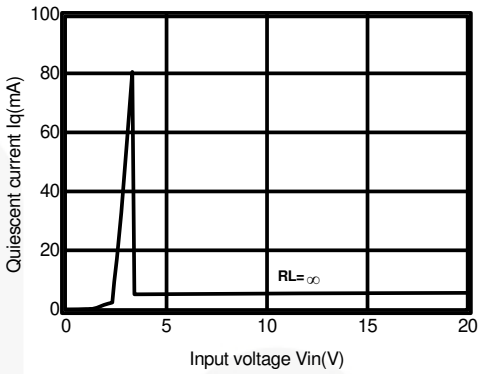


Figure 4. Quiescent Current vs. Input Voltage

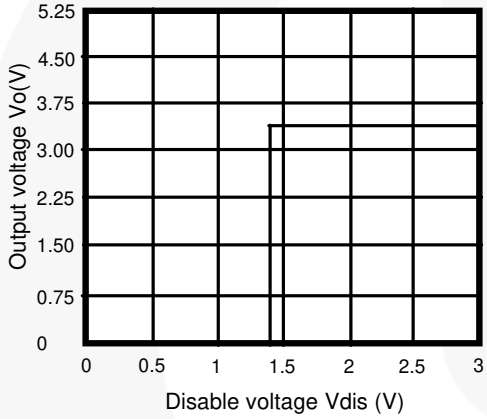


Figure 5. Output Voltage vs. Disable Voltage

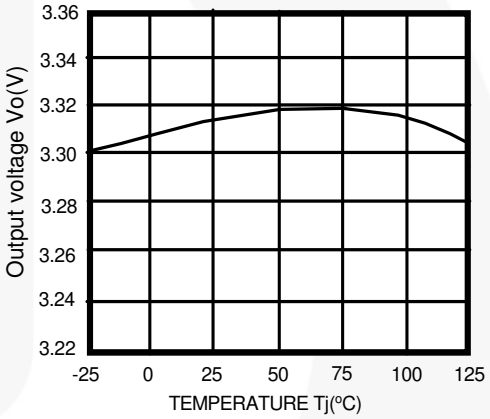


Figure 6. Output Voltage vs. Temperature (T_j)

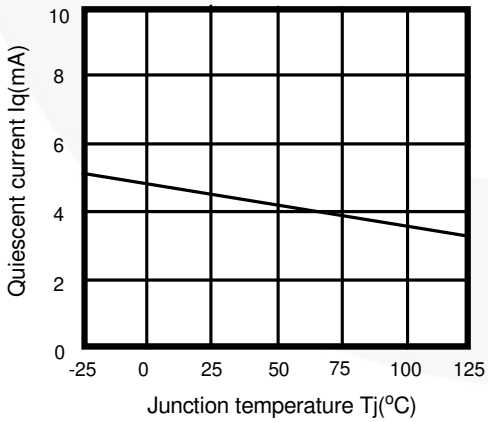


Figure 7. Quiescent Current vs. Temperature (T_j)

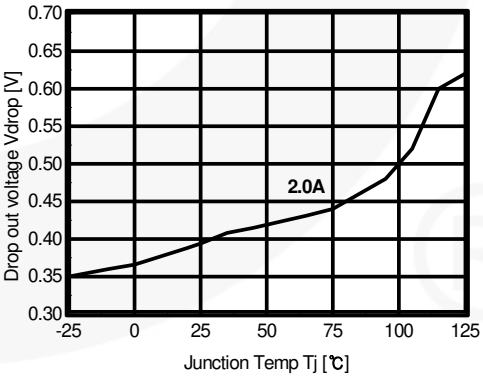


Figure 8. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

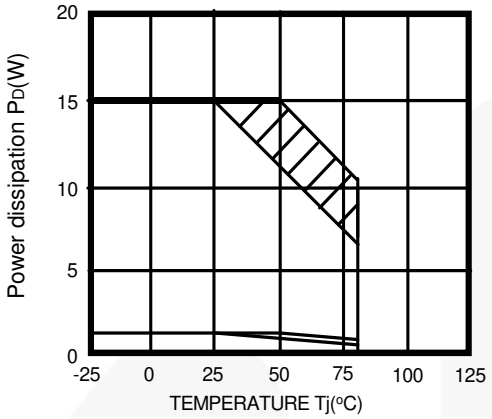


Figure 9. Power Dissipation vs. Temperature (T_j)

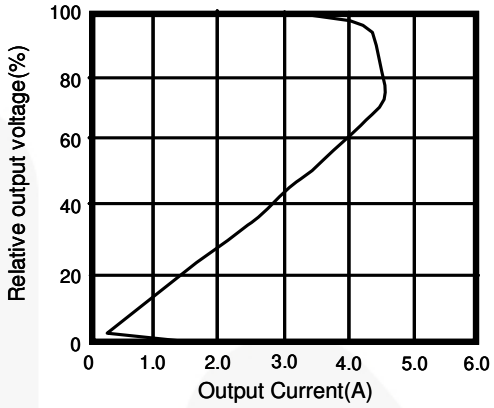


Figure 10. Over-Current Protection Characteristics (Typical Value)

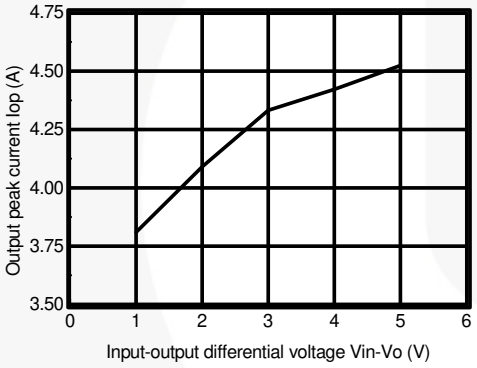


Figure 11. Output Peak Current vs. Input-Output Differential Voltage

Typical Performance Characteristics (KA278R05C)

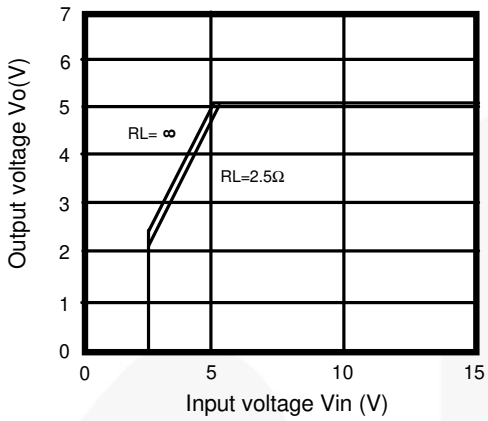


Figure 12. Output Voltage vs. Input Voltage

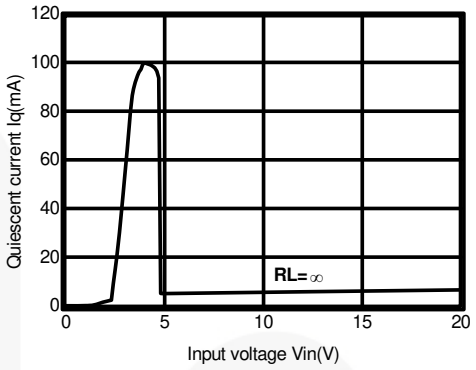


Figure 13. Quiescent Current vs. Input Voltage

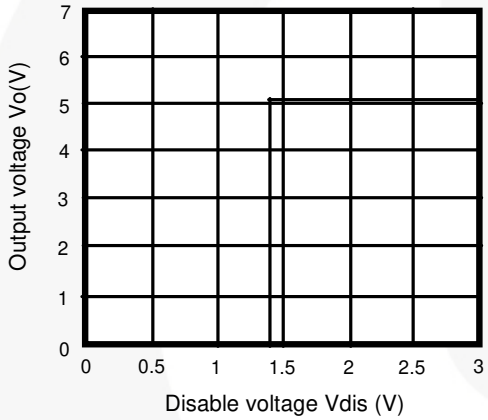


Figure 14. Output Voltage vs. Disable Voltage

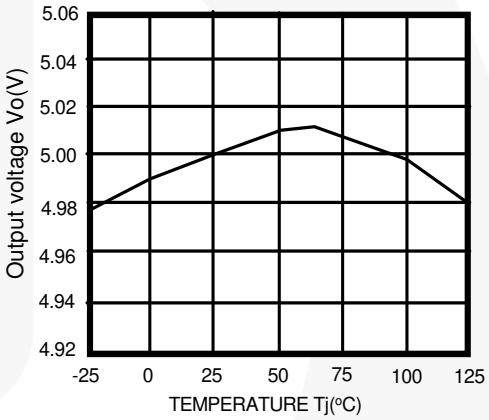


Figure 15. Output Voltage vs. Temperature (T_j)

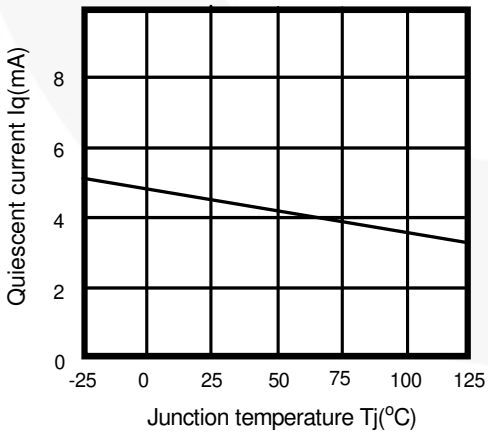


figure 16. Quiescent Current vs. Temperature (T_j)

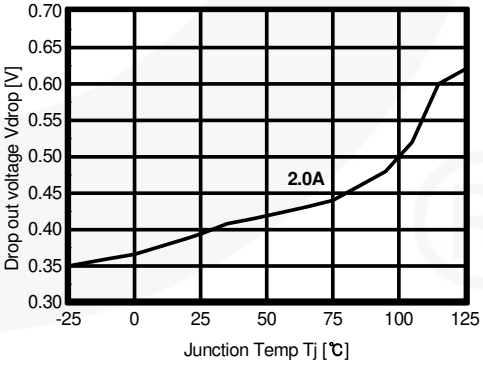


Figure 17. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

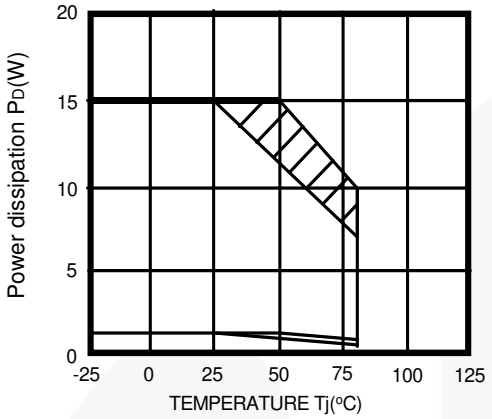


Figure 18. Power Dissipation vs. Temperature (T_j)

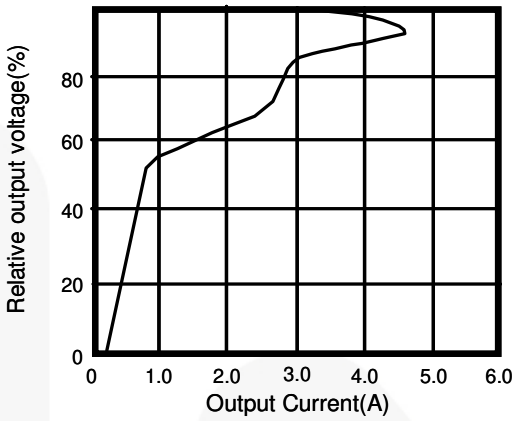


Figure 19. Over-Current Protection Characteristics (Typical Value)

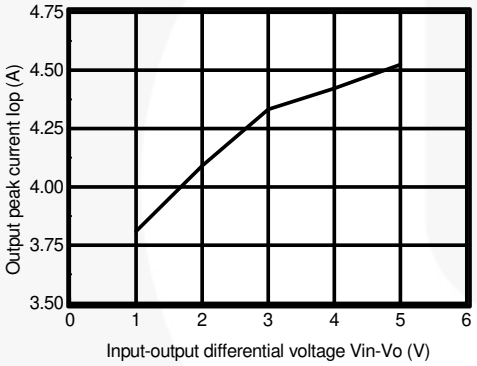


Figure 20. Output Peak Current vs. Input-Output Differential Voltage

Typical Performance Characteristics (KA278R12C)

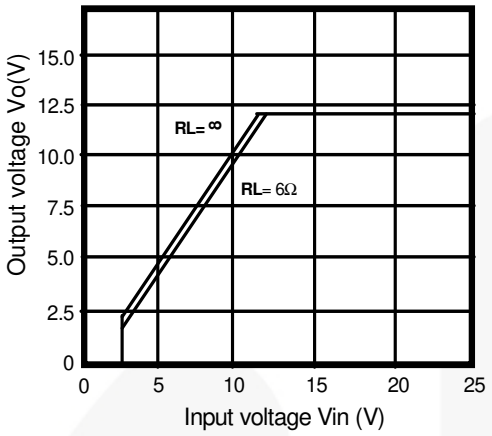


Figure 21. Output Voltage vs. Input Voltage

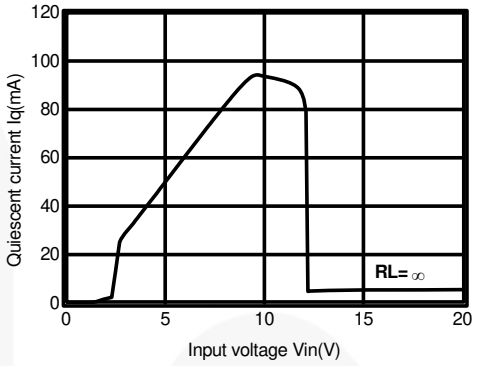


Figure 22. Quiescent Current vs. Input Voltage

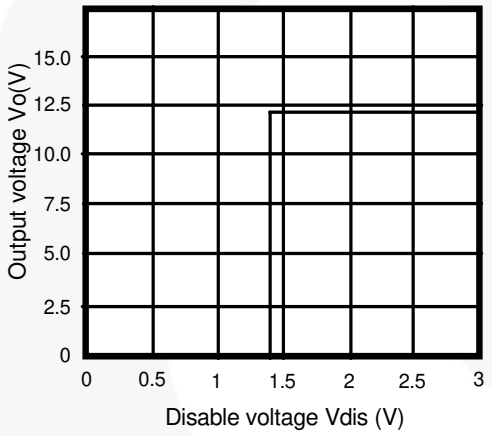


Figure 23. Output Voltage vs. Disable Voltage

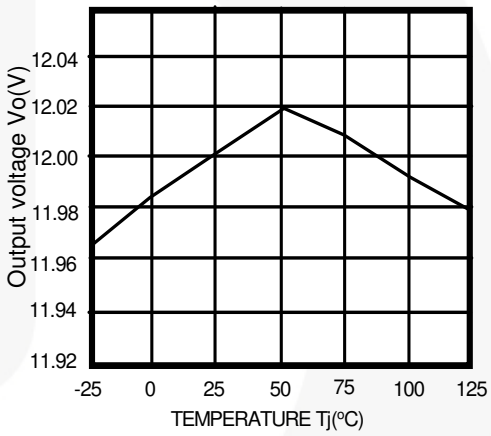
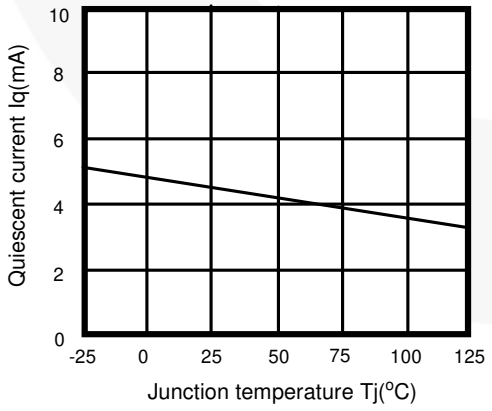


Figure 24. Output Voltage vs. Temperature (T_j)



25. Quiescent Current vs. Temperature (T_j)

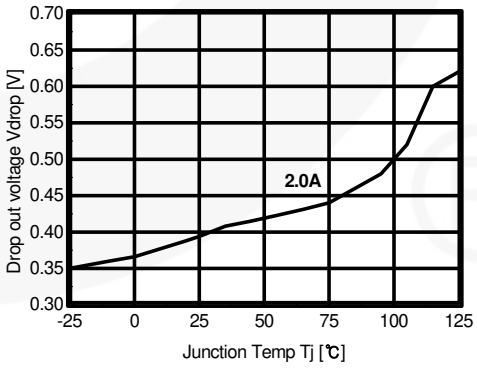


Figure 26. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

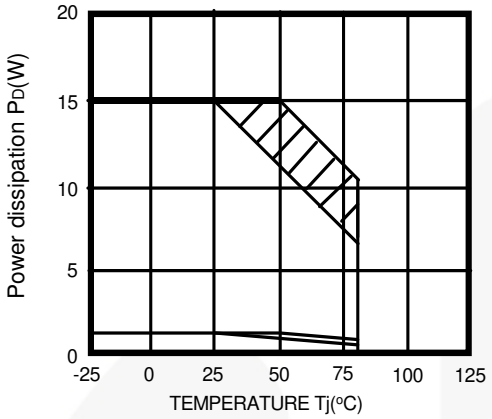


Figure 27. Power Dissipation vs. Temperature (T_j)

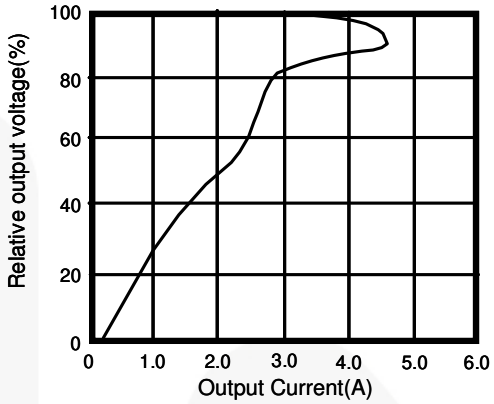


Figure 28. Over-Current Protection Characteristics (Typical Value)

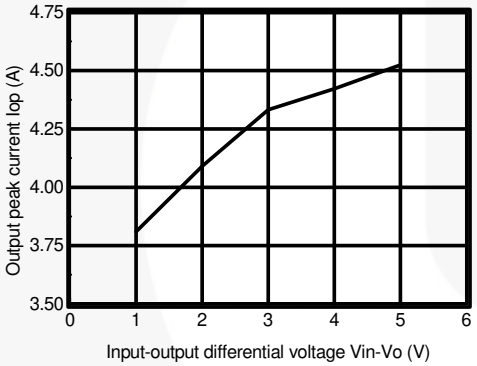


Figure 29. Output Peak Current vs. Input-Output Differential Voltage

Typical Performance Characteristics (KA278RA05C)

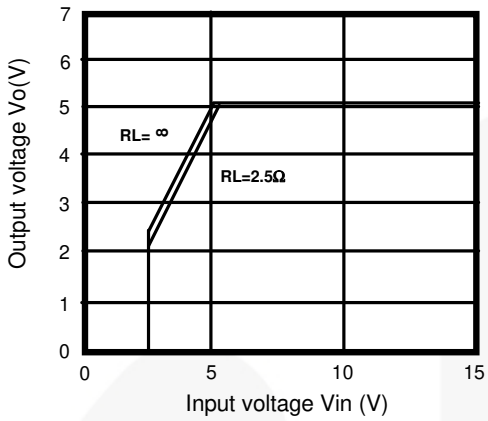


Figure 30. Output Voltage vs. Input Voltage

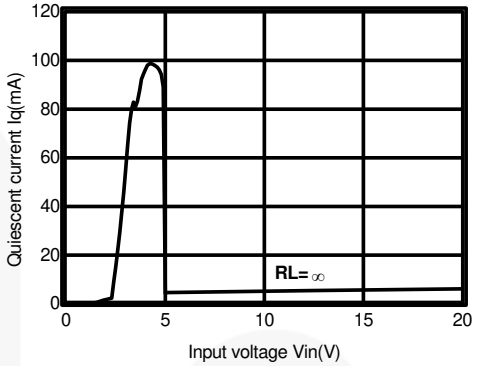


Figure 31.Quiescent Current vs. Input Voltage

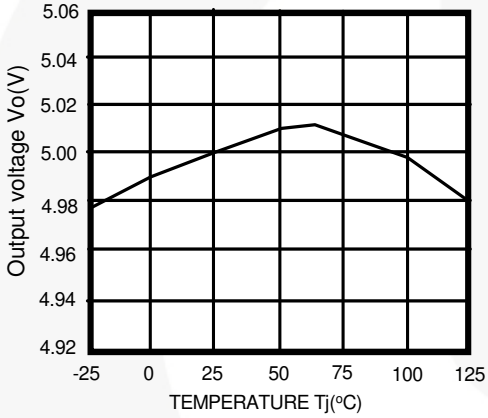


Figure 32. Output Voltage vs. Temperature (T_j)
***Fixed Mode (V_O = 5 V)**

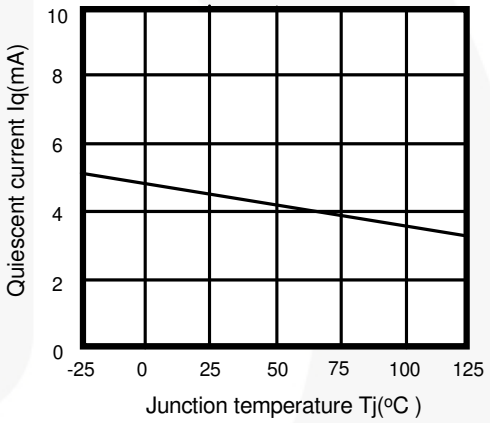


Figure 33. Quiescent Current vs. Temperature (T_j)

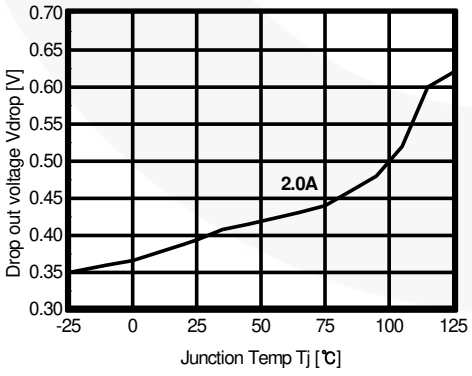


Figure 34. Dropout Voltage vs. Junction Temperature

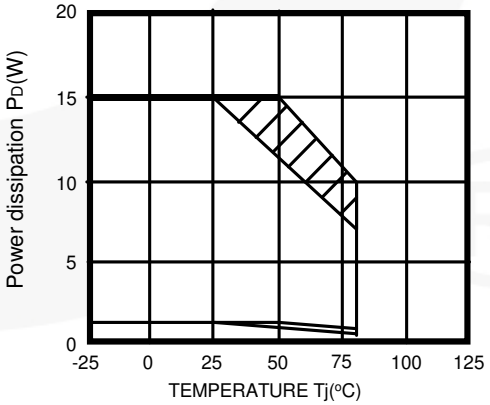


Figure 35. Power Dissipation vs. Temperature (T_j)

Typical Performance Characteristics (Continued)

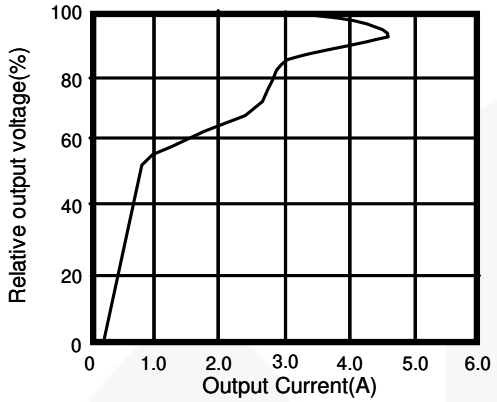


Figure 36. Over-Current Protection Characteristics (Typical Value)

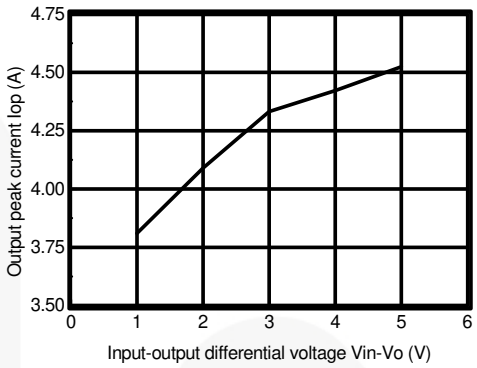


Figure 37. Output Peak Current vs. Input-Output Differential Voltage

Typical Application

KA278R33 / 05 / 12C

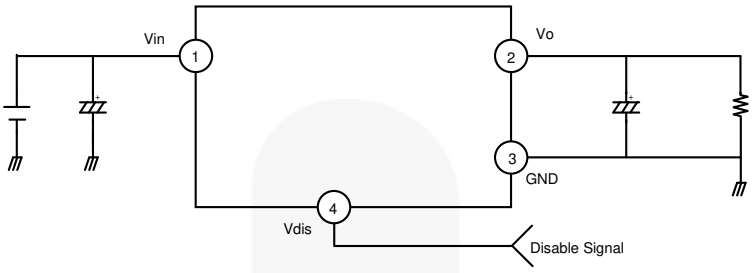
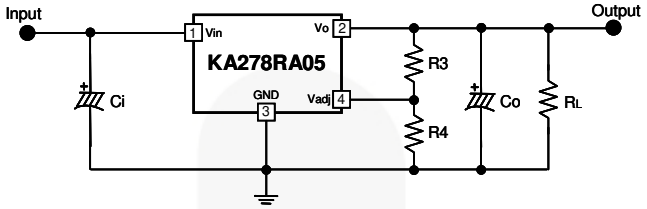


Figure 38. Application Circuit

- C_I is required if regulator is located at an appreciable distance from power supply filter.
- C_O improves stability and transient response (C_O > 47 μF).

Typical Application (continued)

KA278RA05



$$Vo = 1.27\left(1 + \frac{R1//R3}{R2//R4}\right) \quad R_1 = 1.8\ k\Omega,\ R_2 = 0.6\ k\Omega$$

Figure 39. Application Circuit (Adjustable Mode)

- C_I is required if regulator is located at an appreciable distance from power supply filter.
- C_O improves stability and transient response (C_O > 47 μF).

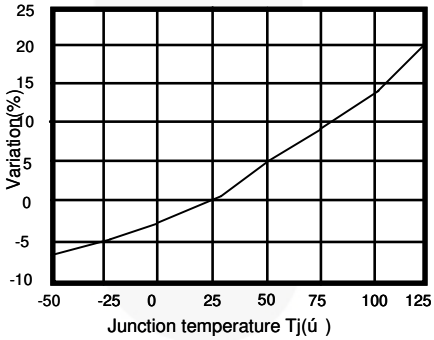


Figure 40. Internal Resistor (R_1, R_2) Variation vs. Temperature (T_j)

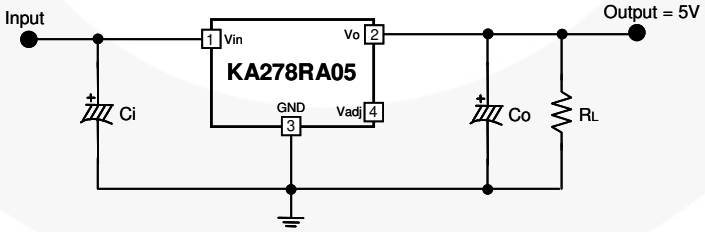
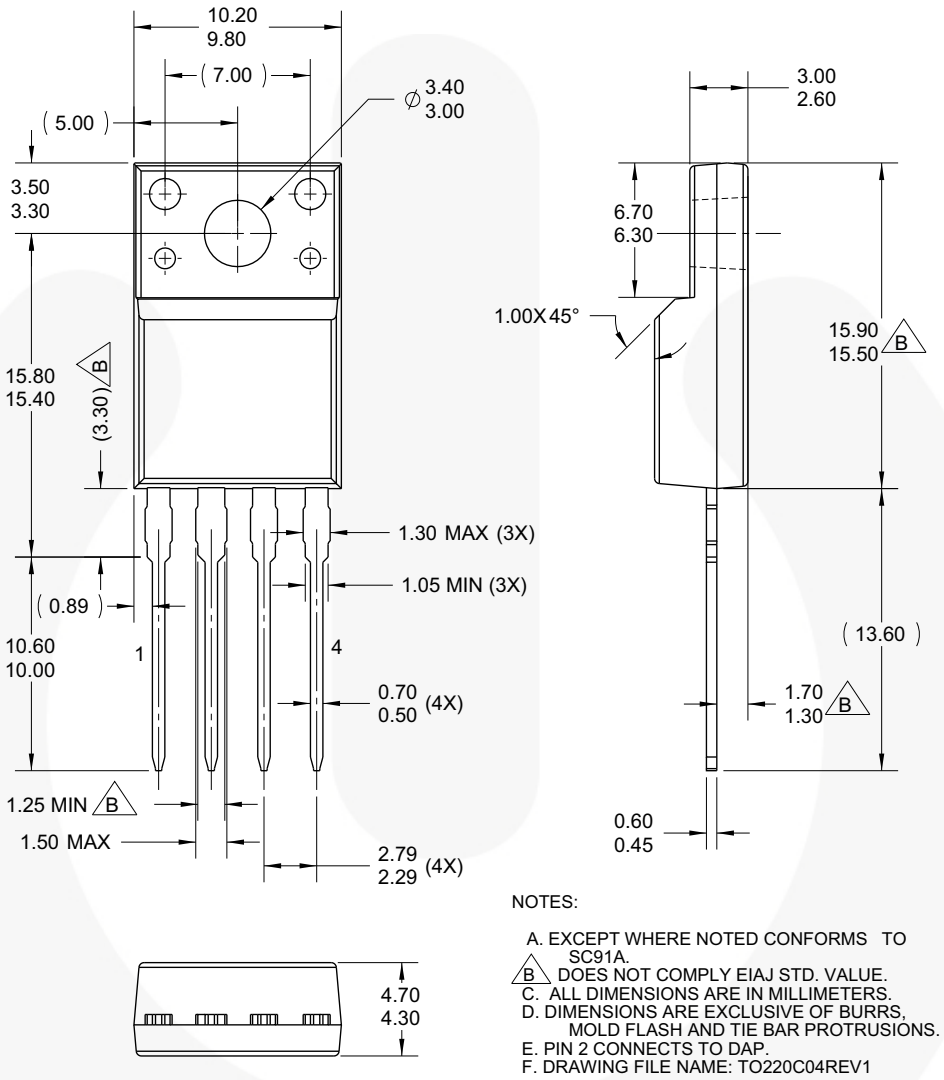


Figure 41. Application Circuit (Fixed Mode)

Physical Dimensions

TO-220F 4L



NOTES:

A. EXCEPT WHERE NOTED CONFORMS TO SC91A.
B DOES NOT COMPLY EIAJ STD. VALUE.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
E. PIN 2 CONNECTS TO DAP.
F. DRAWING FILE NAME: TO220C04REV1

Figure 42. TO220, MOLDED, 4-LEAD, FULL-PACK, STARIGHT LEAD (ACTIVE)

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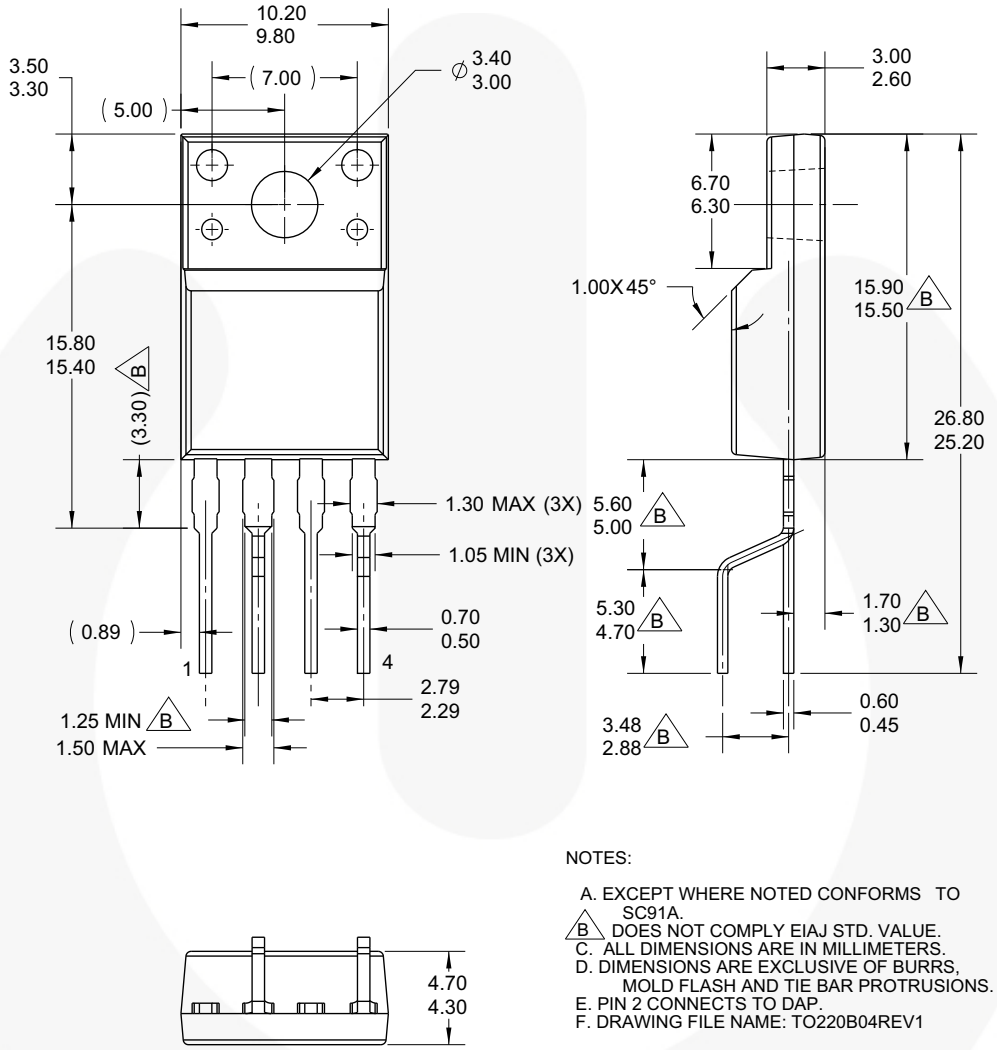
Physical Dimensions (continued)

TO-220F 4L (Forming)



NOTES:

A. EXCEPT WHERE NOTED CONFORMS TO SC91A.
B. DOES NOT COMPLY EIAJ STD. VALUE.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
E. PIN 2 CONNECTS TO DAP.
F. DRAWING FILE NAME: TO220B04REV1

Figure 43. TO220, MOLDED, 4-LEAD, FULL-PACK, YDTU FORMING (ACTIVE)

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