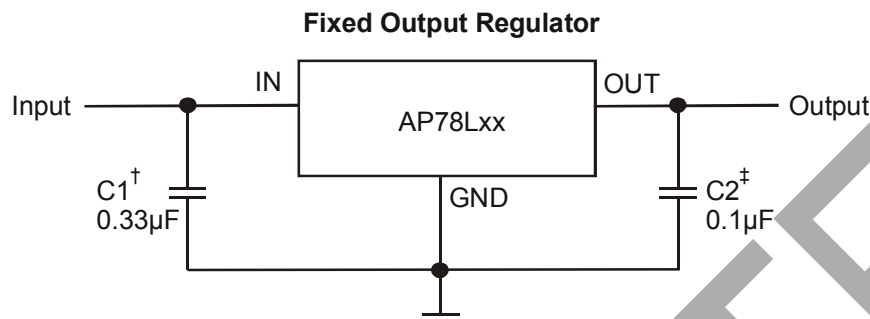


Typical Application Circuit



(†) Required if the regulator is located more than 3" from the power supply filter

(‡) See Note 5 in the electrical characteristics table

Pin Descriptions

Pin Name	Description
V _{IN}	Operating Voltage Input
V _{OUT}	Voltage Output Pin
GND	Ground
NC	No Connection

Functional Block Diagram

Introduction

The AP78LXX series is a three terminal device with fixed output voltages from 5V, 8V and 12V. The AP78LXX fixed voltage regulator series has built-in thermal overload protection which prevents the device from being damaged due to excessive junction temperature. The regulator also contains internal short-circuit protection which limits the maximum output current, and safe-area protection for the pass transistor which reduces the short-circuit current as the voltage across the pass transistor is increased.

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$)

Symbol	Parameter		Rating	Unit
ESD HBM	Human Body Model ESD Protection		3	KV
ESD MM	Machine Model ESD Protection		250	V
V_{CC}	Supply Voltage		30	V
V_{OUT}	Output Voltage to Ground	AP78L05	5	V
		AP78L08	8	
		AP78L12	12	
T_{ST}	Storage Temperature		-65 to +150	$^\circ\text{C}$
T_{OP}	Operating Junction Temperature		-20 to +125	$^\circ\text{C}$
T_{MJ}	Maximum Junction Temperature		150	$^\circ\text{C}$

Recommended Operating Conditions ($T_A = 25^\circ\text{C}$)

Symbol	Parameter		Min	Max	Unit
V_{IN}	Input Voltage	AP78L05	7	20	V
		AP78L08	10.5	23	
		AP78L12	14.5	27	
I_{OUT}	Output Current		0	100	mA
T_A	Operating Ambient Temperature		-20	+85	$^\circ\text{C}$

AP78Lxx Electrical Characteristics (All Output Voltage Versions)

Limits in standard typeface are for $T_A = 25^\circ\text{C}$, **Bold typeface applies over $T_J = -20^\circ\text{C}$ to $+125^\circ\text{C}$ for TO92, SOT89 and SO-8 packages.**
 Unless otherwise specified: $I_O = 40\text{mA}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$.

AP78L05

Unless otherwise specified, $V_{IN} = 10\text{V}$

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
V_O	Output Voltage		4.8	5	5.2	V
		$7\text{V} \leq V_{IN} \leq 20\text{V}$ $1\text{mA} \leq I_O \leq 40\text{mA}$	4.75		5.25	
		$1\text{mA} \leq I_O \leq 70\text{mA}$	4.75		5.25	
ΔV_O	Line Regulation	$7\text{V} \leq V_{IN} \leq 20\text{V}$		18	75	mV
		$8\text{V} \leq V_{IN} \leq 20\text{V}$		10	54	
ΔV_O	Load Regulation	$1\text{mA} \leq I_O \leq 100\text{mA}$		20	60	mV
		$1\text{mA} \leq I_O \leq 40\text{mA}$		5	30	
I_Q	Quiescent Current			3	5	mA
ΔI_Q	Quiescent Current Change	$8\text{V} \leq V_{IN} \leq 20\text{V}$			1.0	
		$1\text{mA} \leq I_O \leq 40\text{mA}$			0.1	
V_N	Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$ (Note 4)	-	40		μV
$\Delta V_{IN}/\Delta V_{OUT}$	Ripple Rejection	$f = 120\text{Hz}$ $8\text{V} \leq V_{IN} \leq 16\text{V}$	47	62		dB
I_{PK}	Peak Output Current			140		mA
$\Delta V_O/\Delta T$	Average Output Voltage Tempco	$I_O = 5\text{mA}$		-0.65		$\text{mV}/^\circ\text{C}$
$V_{IN(MIN)}$	Minimum Value of Input Voltage Required to Maintain Line Regulation			6.7	7	V
θ_{JA}	Thermal Resistance Junction to Ambient	TO92 (Note 5)		176		$^\circ\text{C}/\text{W}$
		SO-8 (Note 6)		153		
		SOT89 (Note 7)		145		
θ_{JC}	Thermal Resistance Junction to Case	TO92 (Note 5)		33		
		SO-8 (Note 6)		18		
		SOT89 (Note 7)		25		

- Notes:
4. Recommend $0.01\mu\text{F}$ minimum load capacitance at output to suppress high frequency noise.
 5. Test conditions for TO92: No heat sink, no air flow.
 6. Test conditions for SO-8: Device mounted on 2oz copper, minimum recommended pad layout, FR-4 PCB.
 7. Test conditions for SOT89: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

AP78Lxx Electrical Characteristics (cont.)
AP78L08

 Unless otherwise specified, $V_{IN} = 14V$

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
V_O	Output Voltage		7.7	8	8.3	V
		$10.5V \leq V_{IN} \leq 23V$ $1mA \leq I_O \leq 40mA$	7.6		8.4	
		$1mA \leq I_O \leq 70mA$	7.6		8.4	
ΔV_O	Line Regulation	$10.5V \leq V_{IN} \leq 23V$		42	175	mV
		$11V \leq V_{IN} \leq 23V$		36	125	
ΔV_O	Load Regulation	$1mA \leq I_O \leq 100mA$		18	80	mV
		$1mA \leq I_O \leq 40mA$		10	40	
I_Q	Quiescent Current			2	5.5	mA
ΔI_Q	Quiescent Current Change	$11V \leq V_{IN} \leq 23V$			1.5	
		$1mA \leq I_O \leq 40mA$			0.1	
V_N	Output Noise Voltage	$f = 10Hz \text{ to } 100kHz$ (Note 4)		54		μV
$\Delta V_{IN}/\Delta V_{OUT}$	Ripple Rejection	$f = 120Hz$ $13V \leq V_{IN} \leq 23V$	37	46		dB
I_{PK}	Peak Output Current			140		mA
$\Delta V_O/\Delta T$	Average Output Voltage Tempco	$I_O = 5mA$		-0.8		$mV/^\circ C$
$V_{IN(MIN)}$	Minimum Value of Input Voltage Required to Maintain Line Regulation			9.7		V
θ_{JA}	Thermal Resistance Junction to Ambient	TO92 (Note 5)		176		$^\circ C/W$
		SO-8 (Note 6)		153		
		SOT89 (Note 7)		157		
θ_{JC}	Thermal Resistance Junction to case	TO92 (Note 5)		33		$^\circ C/W$
		SO-8 (Note 6)		18		
		SOT89 (Note 7)		33		

Notes: 4. Recommend 0.01 μF minimum load capacitance at output to suppress high frequency noise.
 5. Test conditions for TO92: No heat sink, no air flow.
 6. Test conditions for SO-8: Device mounted on 2oz copper, minimum recommended pad layout, FR-4 PCB.
 7. Test conditions for SOT89: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

AP78Lxx Electrical Characteristics (cont.)
AP78L12

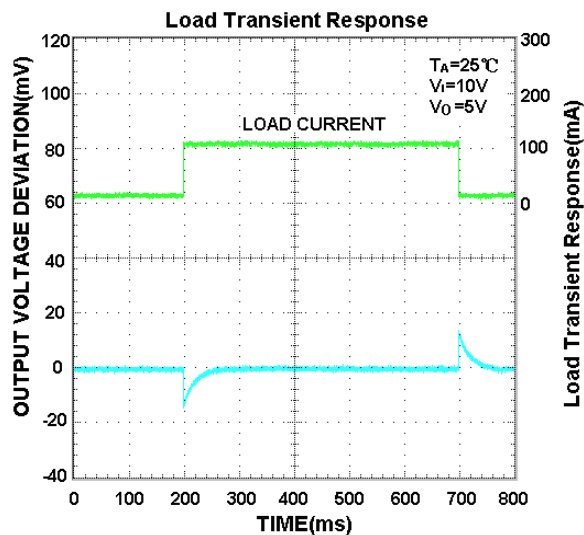
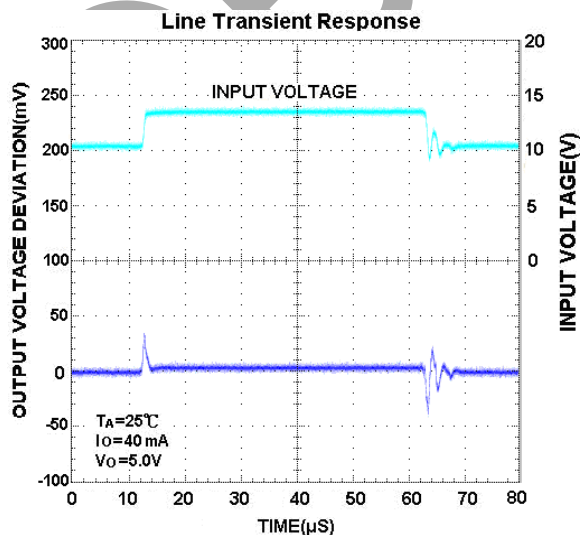
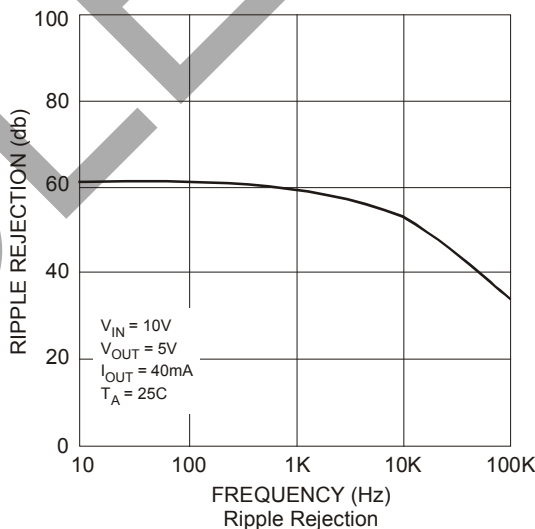
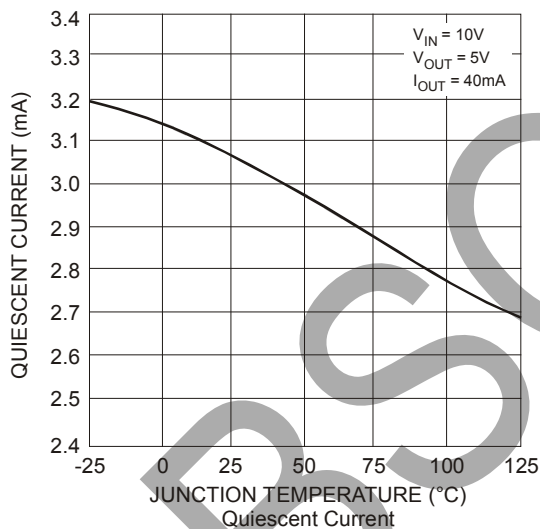
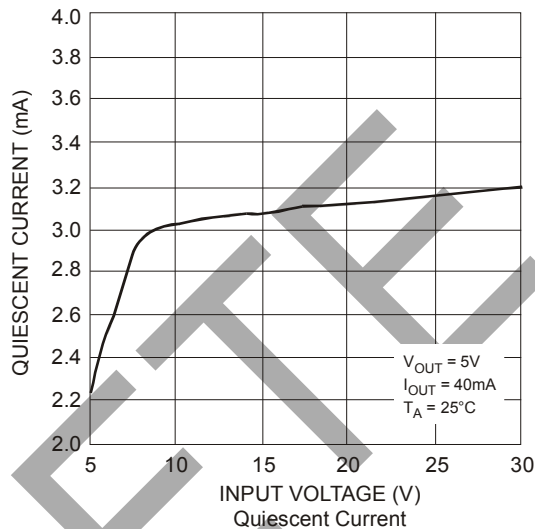
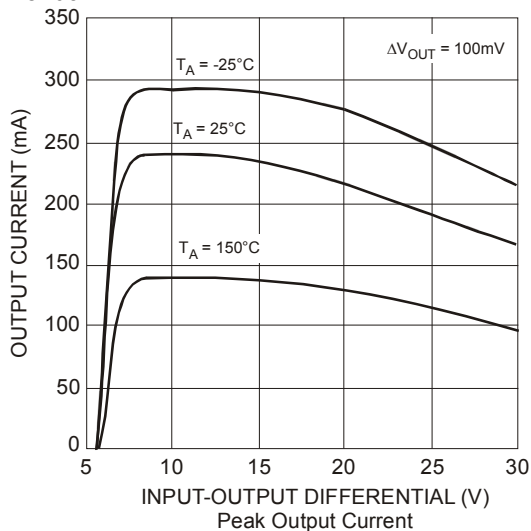
 Unless otherwise specified, $V_{IN} = 19V$

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
V_O	Output Voltage		11.5	12	12.5	V
		$14.5V \leq V_{IN} \leq 27V$ $1mA \leq I_O \leq 40mA$	11.4		12.6	
		$1mA \leq I_O \leq 70mA$	11.4		12.6	
ΔV_O	Line Regulation	$14.5V \leq V_{IN} \leq 27V$		30	180	mV
		$16V \leq V_{IN} \leq 27V$		20	110	
ΔV_O	Load Regulation	$1mA \leq I_O \leq 100mA$		30	100	mV
		$1mA \leq I_O \leq 40mA$		10	50	
I_Q	Quiescent Current			3	5	mA
ΔI_Q	Quiescent Current Change	$16V \leq V_{IN} \leq 27V$			1	
		$1mA \leq I_O \leq 40mA$			0.1	
V_N	Output Noise Voltage			80		μV
$\Delta V_{IN}/\Delta V_{OUT}$	Ripple Rejection	$f = 120Hz$ $15V \leq V_{IN} \leq 25V$	40	54		dB
I_{PK}	Peak Output Current			140		mA
$\Delta V_O/\Delta T$	Average Output Voltage Tempco	$I_O = 5mA$		-1.0		$mV/^{\circ}C$
$V_{IN(MIN)}$	Minimum Value of Input Voltage Required to Maintain Line Regulation			13.7	14.5	V
θ_{JA}	Thermal Resistance Junction to Ambient	TO92 (Note 5)		176		$^{\circ}C/W$
		SO-8 (Note 6)		153		
		SOT89 (Note 7)		145		
θ_{JC}	Thermal Resistance Junction to case	TO92 (Note 5)		33		$^{\circ}C/W$
		SO-8 (Note 6)		18		
		SOT89 (Note 7)		25		

Notes: 5. Test conditions for TO92: No heat sink, no air flow.
 6. Test conditions for SO-8: Device mounted on 2oz copper, minimum recommended pad layout, FR-4 PCB.
 7. Test conditions for SOT89: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

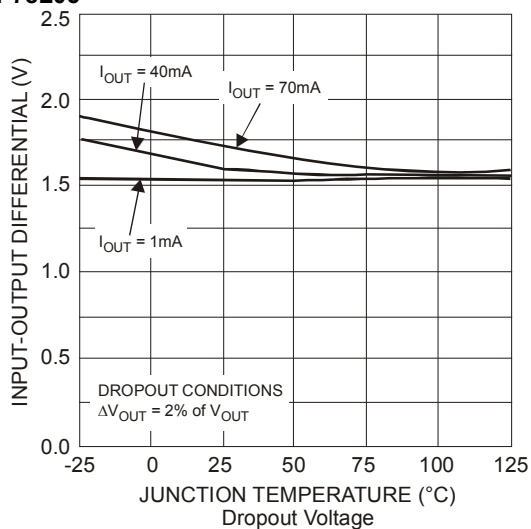
Typical Performance Characteristics

For AP78L05



Typical Performance Characteristics (cont.)

For AP78L05

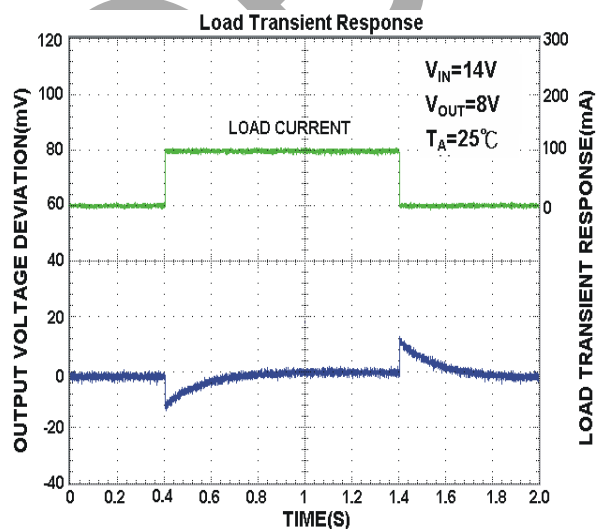
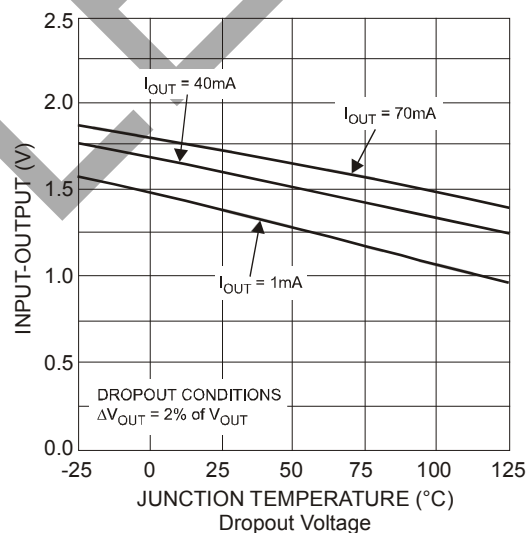
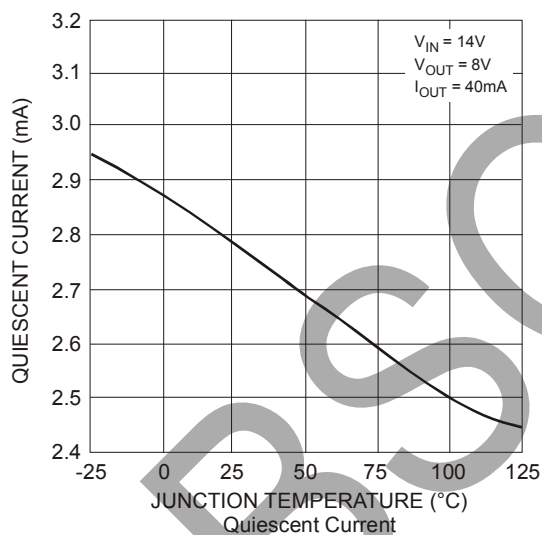
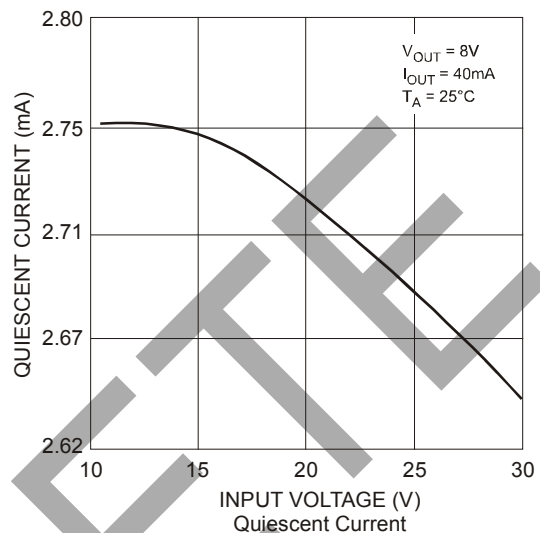
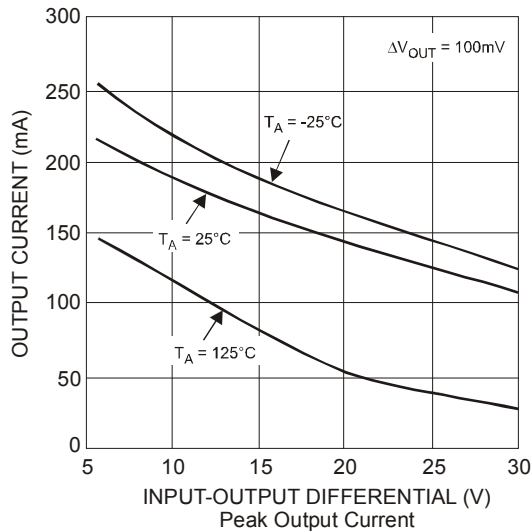


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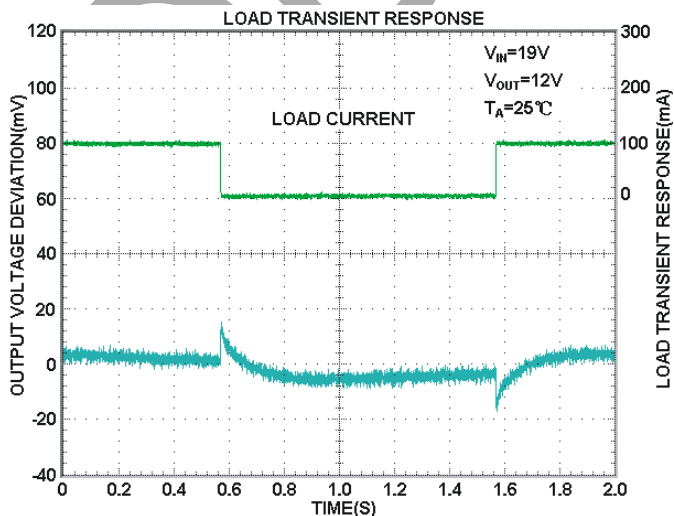
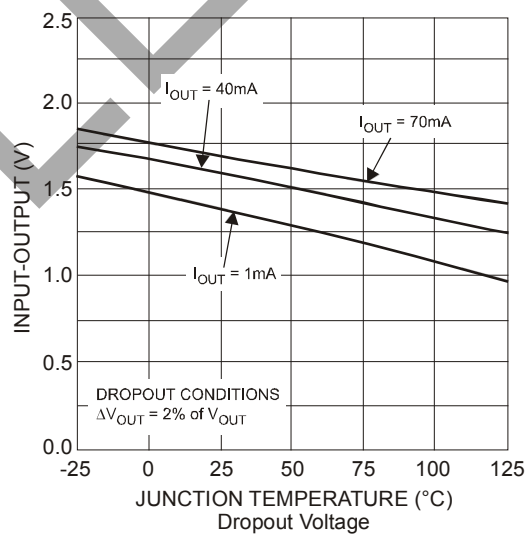
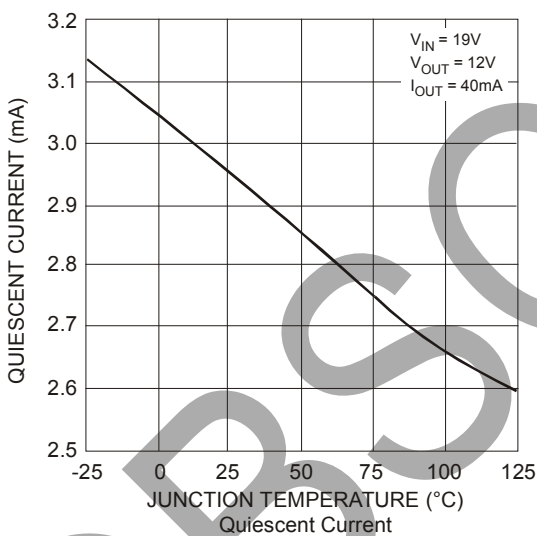
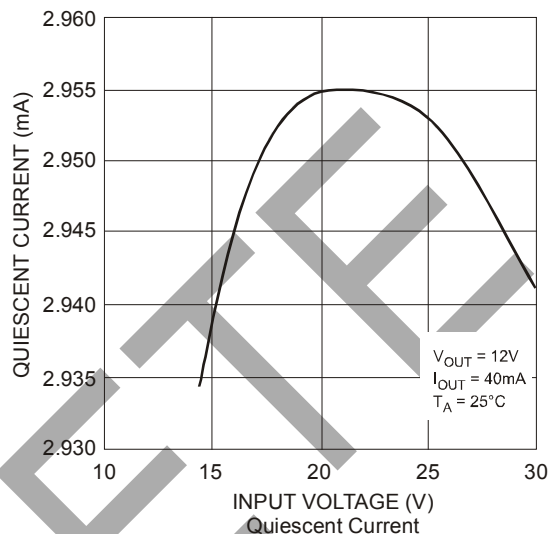
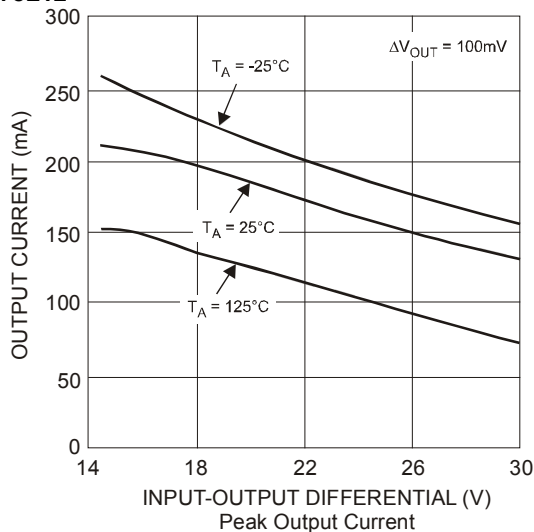
Typical Performance Characteristics

For AP78L08

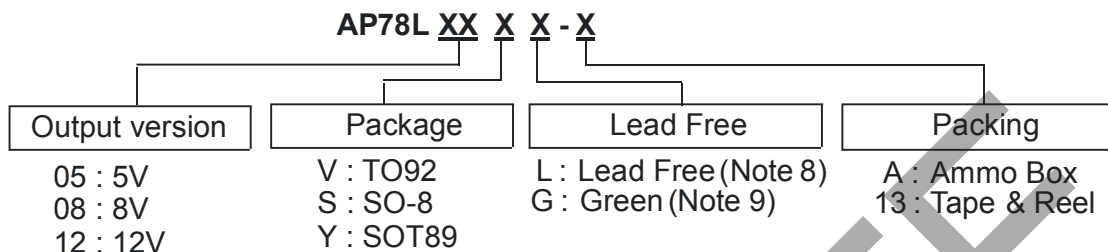


Typical Performance Characteristics (cont.)

For AP78L12



Ordering Information



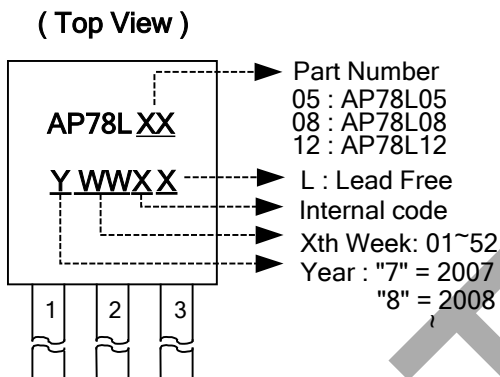
Device	Package Code	Packaging (Note 10)	Ammo Box / Tube		13" Tape and Reel	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix
AP78LXXVL-A	V	TO92	2000/Box	-A	NA	NA
AP78LXXSG-13	S	SO-8	NA	NA	2500/Tape & Reel	-13
AP78LXXYG-13	Y	SOT89	NA	NA	2500/Tape & Reel	-13

Notes:

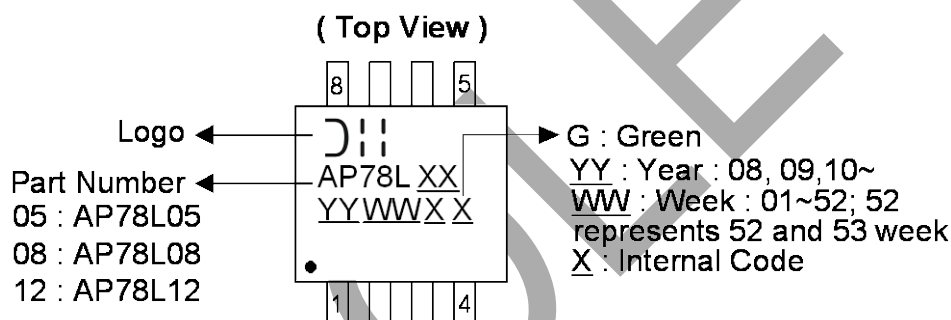
8. TO92 is available in "Lead Free" product only.
9. SO-8 and SOT89 are available in "Green" products only.
10. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

Marking Information

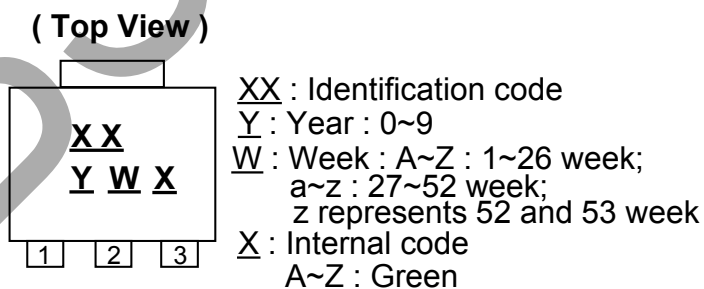
(1) TO92



(2) SO-8



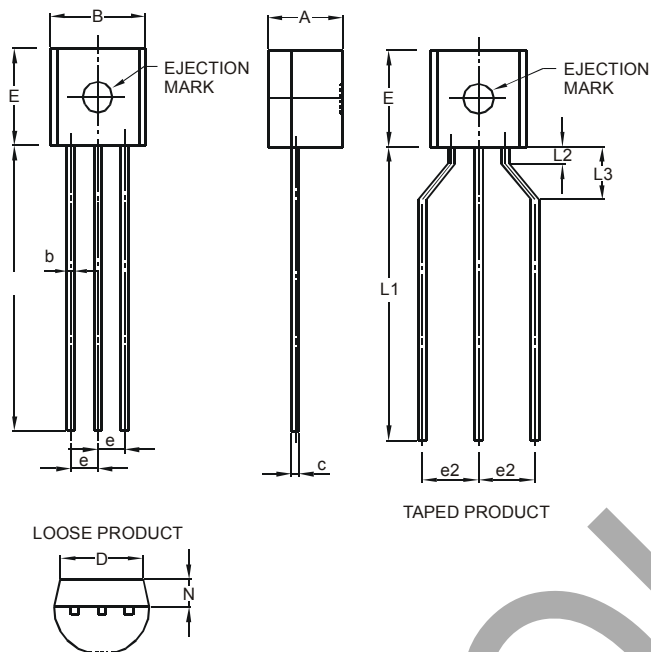
(3) SOT89



Device	Package	Identification Code
AP78L05	SOT89	V2
AP78L08	SOT89	V3
AP78L12	SOT89	V4

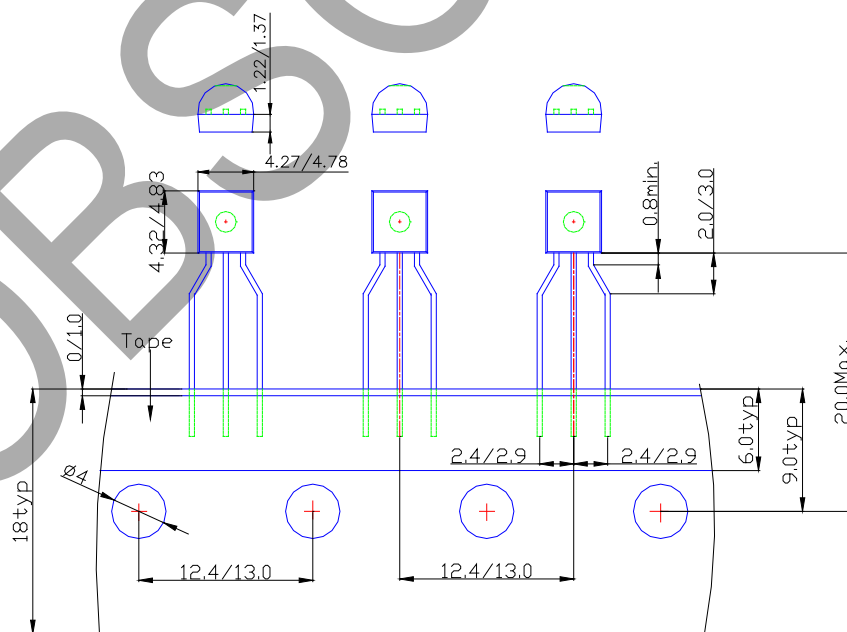
Package Outline Dimensions (All Dimensions in mm)

(1) Package Type: TO92



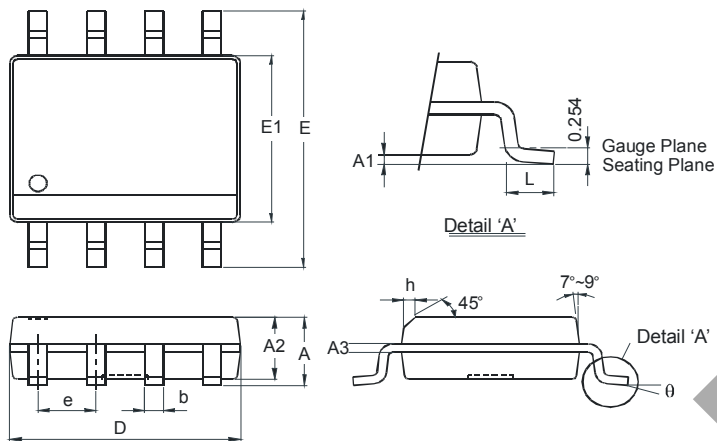
TO92-3L			
Dim	Min	Max	Typ
A	3.45	3.66	-
B	4.27	4.78	-
b	-	-	0.38
c	-	-	0.38
D	-	-	3.87
E	4.32	4.83	□
e	-	-	1.27
e2	2.40	2.90	-
L	12.98	15.00	-
L1	12.80	15.00	-
L2	0.80	-	-
L3	2.00	3.00	-
N	1.22	1.37	-
All Dimensions in mm			

(2) TO92 for Ammo pack



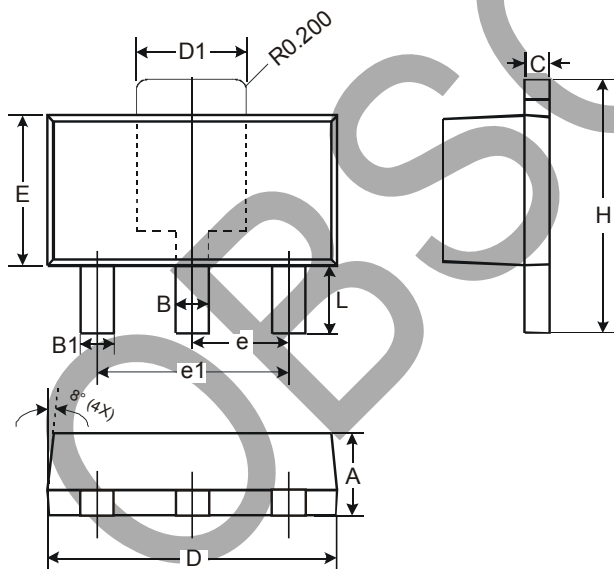
Package Outline Dimensions (cont.) (All Dimensions in mm)

(3) Package Type: SO-8



SO-8		
Dim	Min	Max
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

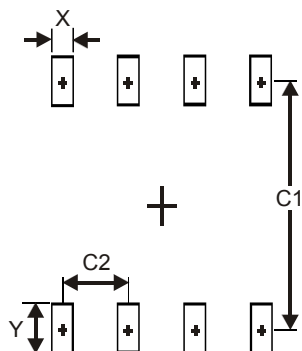
(4) Package Type: SOT89



SOT89		
Dim	Min	Max
A	1.40	1.60
B	0.44	0.62
B1	0.35	0.54
C	0.35	0.43
D	4.40	4.60
D1	1.52	1.83
E	2.29	2.60
e	1.50 Typ	
e1	3.00 Typ	
H	3.94	4.25
L	0.89	1.20
All Dimensions in mm		

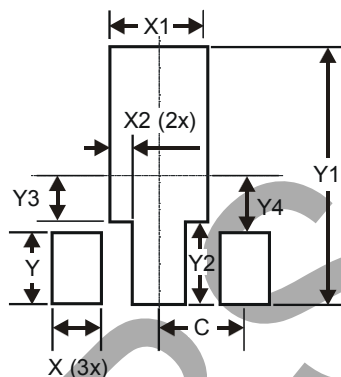
Suggested Pad Layout (All Dimensions in mm)

(1) Package Type: SO-8



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

(2) Package Type: SOT89



Dimensions	Value (in mm)
X	0.900
X1	1.733
X2	0.416
Y	1.300
Y1	4.600
Y2	1.475
Y3	0.950
Y4	1.125
C	1.500

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