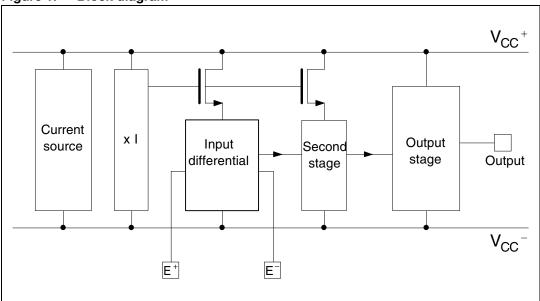
## 1 Circuit schematics





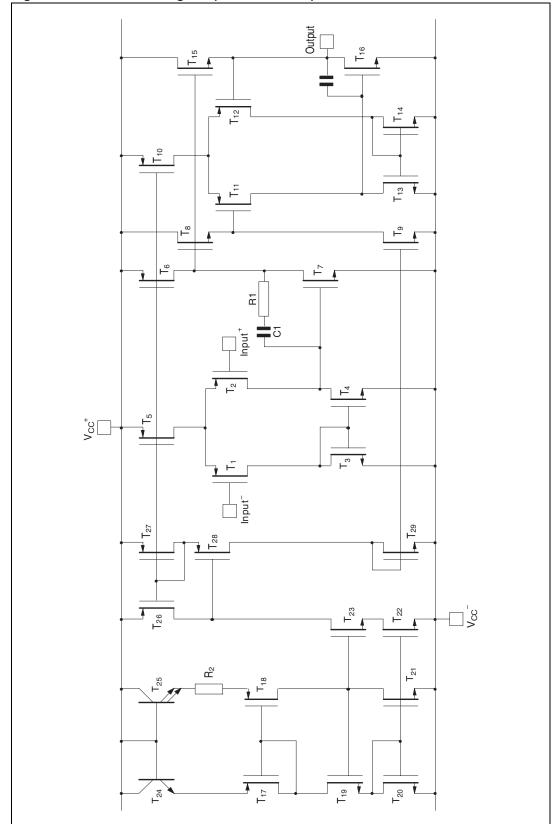


Figure 2. Schematic diagram (for 1/4 TS27M4)

#### 2 Absolute maximum ratings and operating conditions

Table 1. Absolute maximum ratings (AMR)

Symbol	Parameter	TS27M4C/AC	TS27M4M/AM	Unit		
V <sub>CC</sub> +	Supply voltage <sup>(1)</sup>	18				
V <sub>id</sub>	Differential input voltage (2)		±18		V	
V <sub>in</sub>	Input voltage (3)		-0.3 to 18		V	
I <sub>o</sub>	Output current for V <sub>CC</sub> <sup>+</sup> ≥ 15V		±30		mA	
I <sub>in</sub>	Input current		±5		mA	
T <sub>oper</sub>	Operating free-air temperature range	0 to +70	-40 to +125	-55 to +125	°C	
T <sub>stg</sub>	Storage temperature range -65 to +150			°C		
R <sub>thja</sub>	Thermal resistance junction to ambient <sup>(4)</sup> SO-14 TSSOP14 DIP14	105 100 80		°C/W		
R <sub>thjc</sub>	Thermal resistance junction to case <sup>(4)</sup> SO-14 TSSOP14 DIP14	31 32 33			°C/W	
	HBM: human body model <sup>(5)</sup>	1				
ESD	MM: machine model <sup>(6)</sup>	100		V		
	CDM: charged device model <sup>(7)</sup>		1.5		kV	

- 1. All values, except differential voltage are with respect to network ground terminal.
- 2. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
- 3. The magnitude of the input and the output voltages must never exceed the magnitude of the positive supply voltage.
- 4. Short-circuits can cause excessive heating and destructive dissipation. Values are typical.
- 5. Human body model: a 100 pF capacitor is charged to the specified voltage, then discharged through a  $1.5 \mathrm{k}\Omega$  resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.
- Machine model: a 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the
  device with no external series resistor (internal resistor < 5Ω). This is done for all couples of connected pin combinations
  while the other pins are floating.</li>
- 7. Charged device model: all pins and the package are charged together to the specified voltage and then discharged directly to the ground through only one pin. This is done for all pins.

Table 2. Operating conditions

Symbol	Parameter	Value	Unit
V <sub>CC</sub> <sup>+</sup>	Supply voltage	3 to 16	V
V <sub>icm</sub>	Common mode input voltage range	0 to V <sub>CC</sub> <sup>+</sup> - 1.5	V

## 3 Electrical characteristics

Table 3.  $V_{CC}^+ = +10 \text{ V}, V_{CC}^- = 0 \text{ V}, T_{amb} = +25^{\circ} \text{ C} \text{ (unless otherwise specified)}$ 

Symbol	Parameter		27M4C		TS27M4I/AI TS27M4M/AM			Unit
-			Тур.	Max.	Min.	Тур.	Max.	
V <sub>io</sub>	Input offset voltage $V_O = 1.4V, \ V_{ic} = 0V$ $TS27M4C/I/M$ $TS27M4AC/AI/AM$ $T_{min} \leq T_{amb} \leq T_{max}$ $TS27M4C/I/M$ $TS27M4AC/AI/AM$		1.1 0.9	10 5 12 6.5		1.1 0.9	10 5 12 6.5	mV
DV <sub>io</sub>	Input offset voltage drift		2			2		μV/°C
I <sub>io</sub>	Input offset current note <sup>(1)</sup> $V_{ic} = 5V, V_{O} = 5V$ $T_{min} \le T_{amb} \le T_{max}$ 100			1	200	pA		
l <sub>ib</sub>	Input bias current <sup>(1)</sup> $V_{ic} = 5V, V_{O} = 5V$ $T_{min} \le T_{amb} \le T_{max}$		1	150		1	300	pА
V <sub>OH</sub>	High level output voltage $V_{id}$ = 100mV, $R_L$ = 100kΩ $T_{min} \le T_{amb} \le T_{max}$	8.7 8.6	8.9		8.7 8.5	8.9		٧
V <sub>OL</sub>	Low level output voltage V <sub>id</sub> = -100mV			50			50	mV
A <sub>vd</sub>	Large signal voltage gain $\begin{aligned} &V_{iC} = 5\text{V, R}_L = 100\text{k}\Omega, &V_o = 1\text{V to 6V} \\ &T_{min} \leq T_{amb} \leq T_{max} \end{aligned}$	30 20	50		30 10	50		V/mV
GBP	Gain bandwidth product $A_v = 40 dB$ , $R_L = 100 k\Omega$ , $C_L = 100 pF$ , $f_{in} = 100 kHz$		1			1		MHz
CMR	Common mode rejection ratio $V_{iC} = 1V$ to 7.4V, $V_0 = 1.4V$	65	80		65	80		dB
SVR	Supply voltage rejection ratio $V_{CC}^+$ = 5V to 10V, $V_0$ = 1.4V	60	80		60	80		dB
I <sub>CC</sub>	Supply current (per amplifier) $A_{v} = 1, \text{ no load, } V_{o} = 5V$ $T_{min} \le T_{amb} \le T_{max}$		150	200 250		150	200 300	μΑ
I <sub>o</sub>	Output short-circuit current $V_0 = 0V$ , $V_{id} = 100mV$		60			60		mA
I <sub>sink</sub>	Output sink current $V_0 = V_{CC}$ , $V_{id} = -100$ mV		45			45		mA
SR	Slew rate at unity gain $R_L = 100k\Omega$ , $C_L = 100pF$ , $V_i = 3$ to $7V$		0.6			0.6		V/µs

Table 3.  $V_{CC}^+ = +10 \text{ V}, V_{CC}^- = 0 \text{ V}, T_{amb} = +25^{\circ} \text{ C} \text{ (unless otherwise specified) (continued)}$ 

Symbol	Parameter		TS27M4C/AC			527M4I 27M4M	Unit	
			Тур.	Max.	Min.	Тур.	Max.	
фm	Phase margin at unity gain $A_v = 40 dB$ , $R_L = 100 k\Omega$ $C_L = 100 pF$		45			45		Degrees
K <sub>OV</sub>	Overshoot factor		30			30		%
e <sub>n</sub>	Equivalent input noise voltage $f = 1 \text{kHz}, R_s = 100\Omega$		38			38		<u>nV</u> √Hz
V <sub>01</sub> /V <sub>02</sub>	Channel separation		120			120		dB

<sup>1.</sup> Maximum values include unavoidable inaccuracies of the industrial tests.

Figure 3. Supply current (each amplifier) versus supply voltage

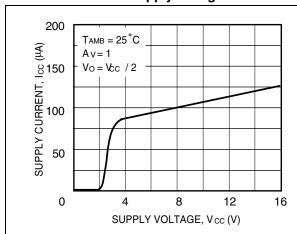


Figure 4. Input bias current versus free air temperature

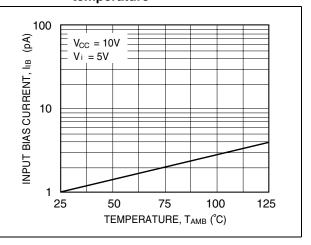


Figure 5. High level output voltage versus high level output current

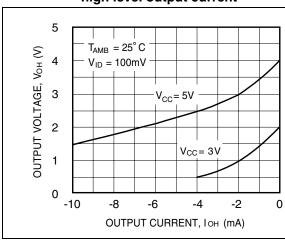


Figure 6. High level output voltage versus high level output current

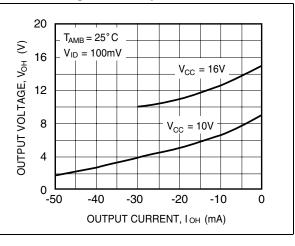
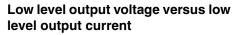
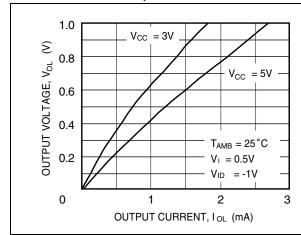


Figure 7. Low level output voltage versus low Figure 8. level output current





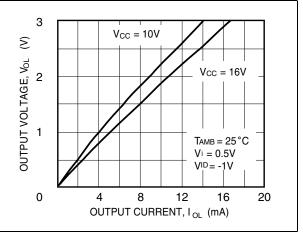
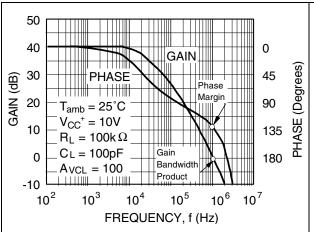


Figure 9. Open loop frequency response and Figure 10. Gain bandwidth product versus phase shift supply voltage



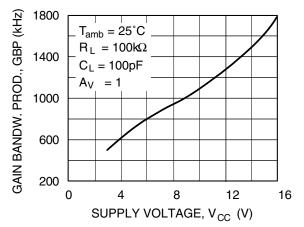


Figure 11. Phase margin versus supply voltage

(\$\text{So} 50 \\
\text{Voltage} \\
\text{Volta

Figure 12. Phase margin versus capacitive load

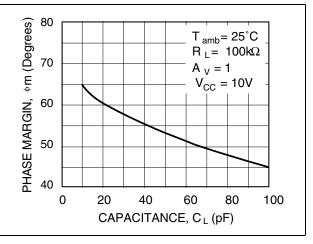
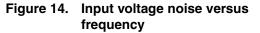
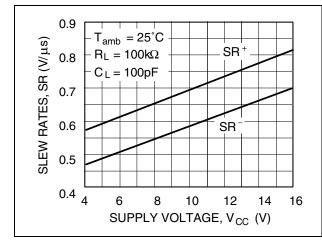
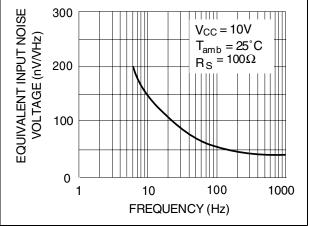


Figure 13. Slew rate versus supply voltage







#### **Package information** 4

In order to meet environmental requirements, STMicroelectronics offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an STMicroelectronics trademark. ECOPACK specifications are available at: www.st.com.

#### **DIP14** package information 4.1

D

Figure 15. DIP14 package mechanical drawing

Table 4. DIP14 package mechanical data

Dof	Millimeters				Inches	
Ref.	Min.	Тур.	Max.	Min.	Тур.	Max.
a1	0.51			0.020		
В	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
Е		8.5			0.335	
е		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100

### 4.2 SO-14 package information

Figure 16. SO-14 package mechanical drawing

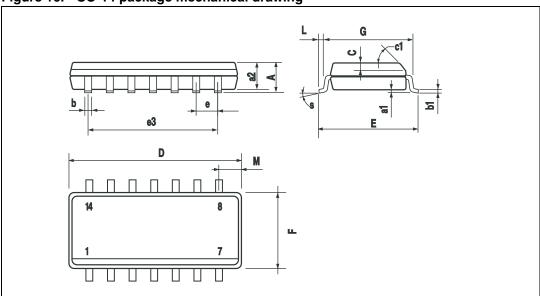


Table 5. SO-14 package mechanical data

			Dime	nsions		
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
С		0.5			0.019	
c1			45°	(typ.)		
D	8.55		8.75	0.336		0.344
Е	5.8		6.2	0.228		0.244
е		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
М			0.68			0.026
S			8° (ı	max.)		

### 4.3 TSSOP14 package information

Figure 17. TSSOP14 package mechanical drawing

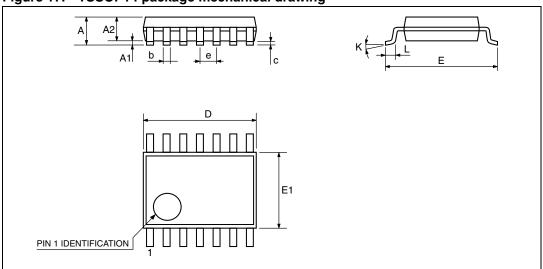


Figure 18. TSSOP14 package mechanical data

	Dimensions					
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
С	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
е		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L1	0.45	0.60	0.75	0.018	0.024	0.030

# 5 Ordering information

Table 6. Order codes

Order code	Temperature range	Package	Packing	Marking
TS27M4CD TS27M4CDT		SO-14	Tube or	27M4C
TS27M4ACD TS27M4ACDT		30-14	Tape & reel	27M4AC
TS27M4CN	0°C, +70°C	DIP14	Tube	TS27M4CN
TS27M4ACN		DIF 14	Tube	TS27M4ACN
TS27M4CPT		TSSOP14	Tape & reel	27M4C
TS27M4ACPT		1330F14	Tape & Teel	27M4AC
TS27M4ID TS27M4IDT		SO-14	Tube or	27M4I
TS27M4AID TS27M4AIDT		50-14	Tape & reel	27M4AI
TS27M4IN	-40°C, +125°C	-40°C, +125°C DIP14	Tuba	TS27M4IN
TS27M4AIN			Tube	TS27M4AIN
TS27M4IPT		T000D14	Tana 8 wast	27M4I
TS27M4AIPT		TSSOP14	Tape & reel	27M4AI
TS27M4MD TS27M4MDT		SO-14	Tube or	27M4M
TS27M4AM TS27M4AMDT		30-14	Tape & reel	27M4AM
TS27M4MN	-55°C, +125°C	DID14	Tubo	TS27M4MN
TS27M4AMN		DIP14	Tube	TS27M4AMN
TS27M4MPT		TSSOP14	Tono 9 voci	27M4M
TS27M4AMPT		1550F14	Tape & reel	27M4AM

# 6 Revision history

Table 7. Document revision history

Date	Revision	Changes
07-Jan-2001	1	Initial release.
08-Sep-2008	2	Removed TS27M4B version of device.  Added R <sub>thja</sub> , R <sub>thjc</sub> , and ESD parameters in <i>Table 1: Absolute maximum ratings (AMR)</i> .  Expanded <i>Table 6: Order codes</i> .  Updated document format.

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