



ST3241EB ST3241EC

±15 kV ESD protected 3 to 5.5 V, 400 kbps,
RS-232 transceiver with auto-power-down

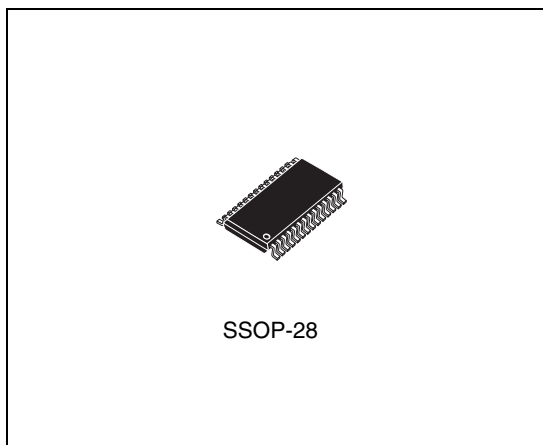
Features

- ESD protection for RS-232 I/O pins:
±8 kV IEC 1000-4-2 contact discharge
±15 kV human body model
- 1 µA supply current achieved when in auto-power-down
- 250 kbps minimum guaranteed data rate
- Guaranteed 6 V/ms slew rate range
- Guaranteed mouse drive ability
- 0.1 µF external capacitors
- Meets EIA/TIA-232 specifications down to 3 V
- Available in SSOP-28 package

Description

The ST3241E device consists of 3 drivers, 5 receivers and a dual charge-pump circuit. The device meets the requirements of EIA/TIA and V.28/V.24 communication standards providing high data rate capability and enhanced electrostatic discharge (ESD) protection. All transmitter outputs and receiver inputs are protected to ±8 kV using IEC 1000-4-2 contact discharge and ±15 kV using the human body model. The receiver R2 is always active to implement a wake-up feature for serial port.

The ST3241E has a proprietary low-dropout transmitter output stage enabling true RS-232 performance from a 3.0 V to 5.5 V supply with a dual charge pump. The device is guaranteed to run at data rates of 250 kbps while maintaining RS-232 output levels.



It is a complete serial port (3 drivers, 5 receivers) intended for notebook or sub-notebook computers. Receivers R1 and R2 have extra outputs in addition to their standard outputs. These extra outputs are always active.

Typical applications are in notebooks, sub-notebooks, palmtop computers, battery-powered equipment, hand-held equipment, peripherals and printers.

Table 1. Device summary

Order code	Temperature range	Package	Packaging
ST3241ECPR	0 to 70°C	SSOP-28 (tape and reel)	1350 parts per reel
ST3241EBPR	-40 to 85°C	SSOP-28 (tape and reel)	1350 parts per reel

Contents

1	Pin configuration	3
2	Maximum ratings	5
3	Electrical characteristics	6
4	Application	8
5	Package mechanical data	9
6	Revision history	12

1 Pin configuration

Figure 1. Pin configuration

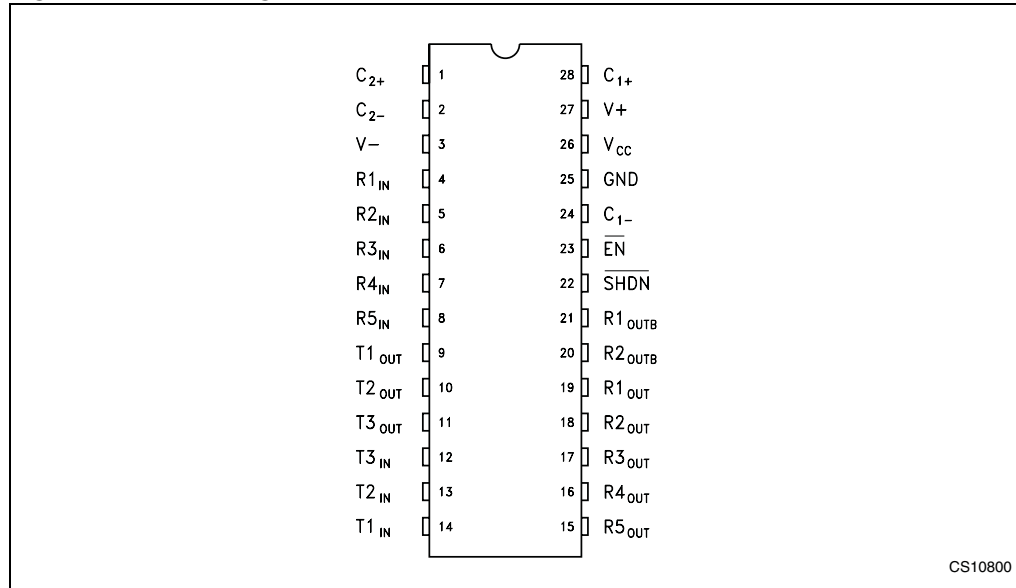


Table 2. Pin description

Pin number	Symbol	Name and function
1	C ₂₊	Positive terminal of inverting charge pump capacitor
2	C ₂₋	Negative terminal of inverting charge pump capacitor
3	V-	-5.5 V generated by the charge pump
4	R1 _{IN}	First receiver input voltage
5	R2 _{IN}	Second receiver input voltage
6	R3 _{IN}	Third receiver input voltage
7	R4 _{IN}	Fourth receiver input voltage
8	R5 _{IN}	Fifth receiver input voltage
9	T1 _{OUT}	First transmitter output voltage
10	T2 _{OUT}	Second transmitter output voltage
11	T3 _{OUT}	Third transmitter output voltage
12	T3 _{IN}	Third transmitter input voltage
13	T2 _{IN}	Second transmitter input voltage
14	T1 _{IN}	First transmitter input voltage
15	R5 _{OUT}	Fifth receiver output voltage
16	R4 _{OUT}	Fourth receiver output voltage

Table 2. Pin description (continued)

Pin number	Symbol	Name and function
17	R3 _{OUT}	Third receiver output voltage
18	R2 _{OUT}	Second receiver output voltage
19	R1 _{OUT}	First receiver output voltage
20	R2 _{OUTB}	Non-inverting complementary receiver output, always active for wake-up
21	R1 _{OUTB}	Non-inverting complementary receiver output, always active for wake-up
22	SHDN	Shutdown control. Active low.
23	EN	Receiver enable. Active low
24	C ₁₋	Negative terminal of voltage - charge pump capacitor
25	GND	Ground
26	V _{CC}	Supply voltage
27	V+	5.5 V Generated by the charge pump
28	C ₁₊	Positive terminal of voltage - charge pump capacitor

Table 3. Shutdown and enable control truth table

$\overline{\text{SHDN}}$	$\overline{\text{EN}}$	T _{OUT}	R _{OUT}	R _{OUTB}
0	0	HIGH Z	ACTIVE	ACTIVE
0	1	HIGH Z	HIGH Z	ACTIVE
1	0	ACTIVE	ACTIVE	ACTIVE
1	1	ACTIVE	HIGH Z	ACTIVE

2 Maximum ratings

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	-0.3 to 6	V
$V+$	Extra positive voltage (<i>Note: 1</i>)	$(V_{CC} - 0.3)$ to 7	V
$V-$	Extra negative voltage (<i>Note: 1</i>)	0.3 to -7	V
$V+ + V- $	(<i>Note: 1</i>)	13	V
\overline{SHDN} , \overline{EN} , T_{IN}	Input voltage	-0.3 to 6	V
R_{IN}	Receiver input voltage range	± 25	V
T_{OUT}	Transmitter output voltage range	± 13.2	V
R_{OUT} , R_{OUTB} $\overline{INVALID}$	Receiver output voltage range	-0.3 to $(V_{CC} + 0.3)$	V
t_{SHORT}	Short circuit duration on T_{OUT} (one at a time)	Continuous	
T_{stg}	Storage temperature range	-65 to 150	°C

Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

Note: 1 $V+$ and $V-$ can have a maximum magnitude of +7 V, but their absolute addition cannot exceed 13 V.

Table 5. ESD performance: transmitter outputs, receiver inputs

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
ESD	ESD protection voltage	Human body model	± 15	-	-	kV
ESD	ESD protection voltage	IEC 1000-4-2 (contact discharge)	± 8	-	-	kV

3 Electrical characteristics

Table 6. Electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 3 V to 5.5 V, T_A = -40 to 85 °C, unless otherwise specified.
Typical values are referred to T_A = 25 °C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SUPPLY}	Supply current	No load V_{CC} = 3.3V or 5V, T_A = 25°C	-	0.3	1	mA
I_{SHDN}	Shutdown supply current	\overline{SHDN} = GND, T_A = 25°C	-	1	10	μ A

Table 7. Logic input and receiver output electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 3 V to 5.5 V, T_A = -40 to 85 °C, unless otherwise specified.)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{TIL}	Input logic threshold low	T_{IN} , \overline{EN} , \overline{SHDN}			0.8	V
V_{TIH}	Input logic threshold high	V_{CC} = 3.3V V_{CC} = 5V	2 2.4			V V
I_{IL}	Input leakage current	T_{IN} , \overline{EN} , \overline{SHDN}		± 0.01	± 1.0	μ A

Table 8. Receiver output electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 3 V to 5.5 V, T_A = -40 to 85 °C, unless otherwise specified.)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{OL}	Output leakage current	R_{OUT} , \overline{EN} , receiver disabled	-	± 0.05	± 10	μ A
V_{OL}	Output voltage low	I_{OUT} = 1.6mA	-		0.4	V
V_{OH}	Output voltage high	I_{OUT} = -1mA	-	$V_{CC}-0.6$	$V_{CC}-0.1$	V

Table 9. Transmitter electrical characteristics

(C1 - C4 = 0.1 μ F, V_{CC} = 3 V to 5.5 V, T_A = -40 to 85 °C, unless otherwise specified.)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{TOUT}	Output voltage swing	All transmitter outputs are loaded with 3 k Ω to GND	± 5	± 5.4		V
R_{OUT}	Output resistance	V_{CC} = V_+ = V_- = 0 V, V_{OUT} = ± 2 V	300	10M		Ω
I_{SC}	Output short circuit current			± 35	± 60	mA
I_L	Output leakage current	V_{CC} = 0 to 5.5V, transmitter output = ± 12 V, transmitter disabled			± 25	μ A
V_{TO}	Transmitter output voltage	T1IN = T2IN = GND, T3IN = V_{CC} T3OUT loaded with 3 k Ω to GND T1OUT and T2OUT loaded with 2.5 mA each	± 5			V

Table 10. Receiver electrical characteristics $(C_1 - C_4 = 0.1 \mu\text{F}, V_{\text{CC}} = 3 \text{ V to } 5.5 \text{ V}, T_A = -40 \text{ to } 85 \text{ }^\circ\text{C}, \text{ unless otherwise specified.})$

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{RIN}	Receiver input voltage operating range		-25		25	V
V_{RIL}	RS-232 Input threshold low	$T_A = 25 \text{ }^\circ\text{C}, V_{\text{CC}} = 3.3 \text{ V}$ $T_A = 25 \text{ }^\circ\text{C}, V_{\text{CC}} = 5.0 \text{ V}$	0.6 0.8	1.2 1.5		V
V_{RIH}	RS-232 Input threshold high	$T_A = 25 \text{ }^\circ\text{C}, V_{\text{CC}} = 3.3 \text{ V}$ $T_A = 25 \text{ }^\circ\text{C}, V_{\text{CC}} = 5.0 \text{ V}$		1.5 1.8	2.4 2.4	V
V_{RIHYS}	Input hysteresis			0.3		V
R_{RIN}	Input resistance	$T_A = 25 \text{ }^\circ\text{C}$	3	5	7	k Ω

Table 11. Timing characteristics $(C_1 - C_4 = 0.1 \mu\text{F}, V_{\text{CC}} = 3 \text{ V to } 5.5 \text{ V}, T_A = -40 \text{ to } 85 \text{ }^\circ\text{C}, \text{ unless otherwise specified.})$

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
D_{R}	Maximum data rate	$R_L = 3 \text{ k}\Omega, C_L = 1000 \text{ pF}$ one transmitter switching	250			kbps
t_{PHL} t_{PLH}	Receiver propagation delay	R_{IN} to $R_{\text{OUT}}, C_L = 150 \text{ pF}$		0.15		μs
$t_{\text{T_SKEW}}$	Transmitter skew			100		ns
$t_{\text{R_SKEW}}$	Receiver skew			300		ns
S_{RT}	Transition slew rate	$T_A = 25 \text{ }^\circ\text{C}, R_L = 3 \text{ k to } 7 \text{ k}\Omega, V_{\text{CC}} = 3.3 \text{ V}$ measured from +3 V to -3 V or -3 V to +3 V $C_L = 150 \text{ pF to } 1000 \text{ pF}$ $C_L = 150 \text{ pF to } 2500 \text{ pF}$	6 4		30 30	V/ μs V/ μs

4 Application

Figure 2. Application circuits

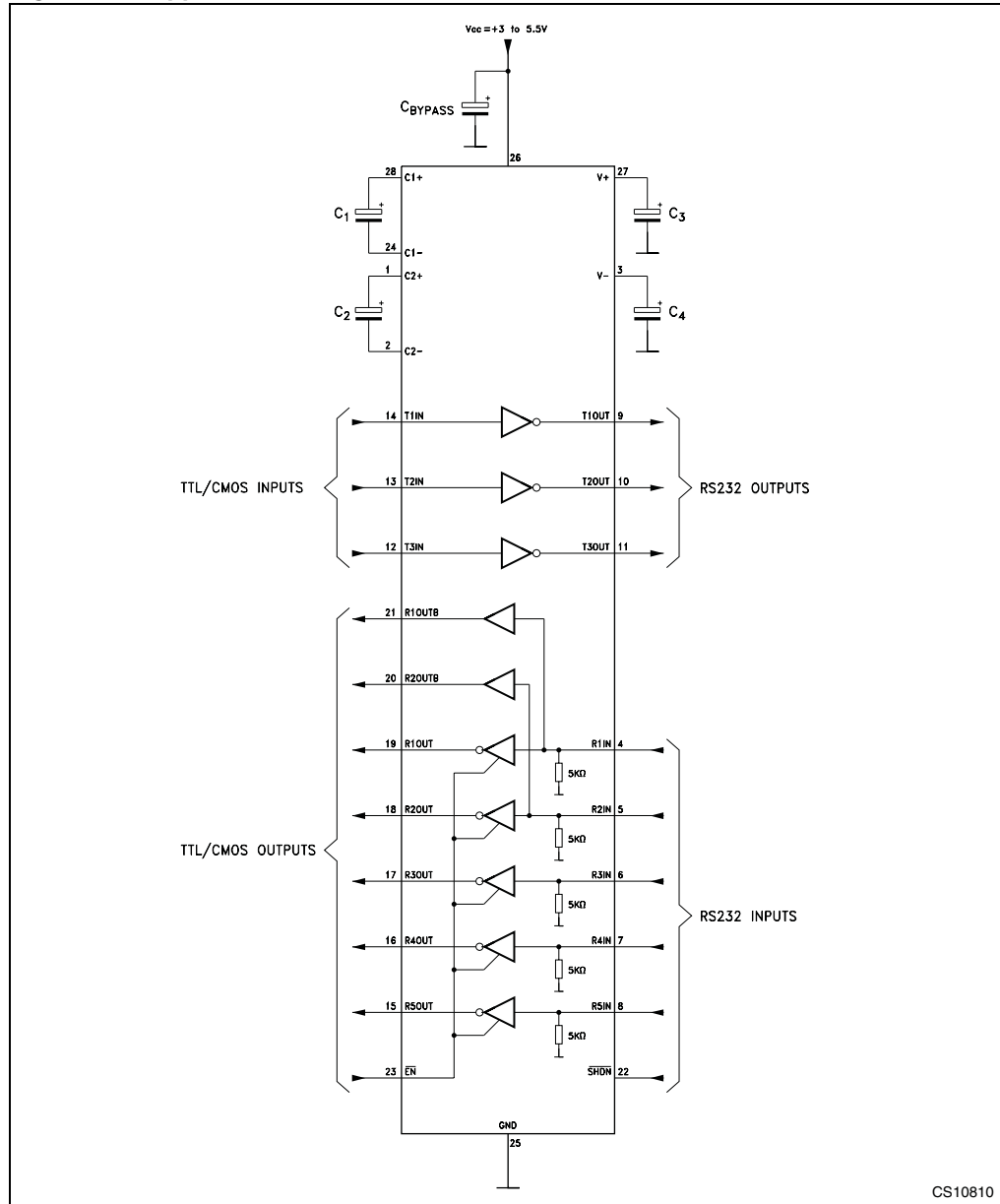


Table 12. Required minimum capacitance value (μF)

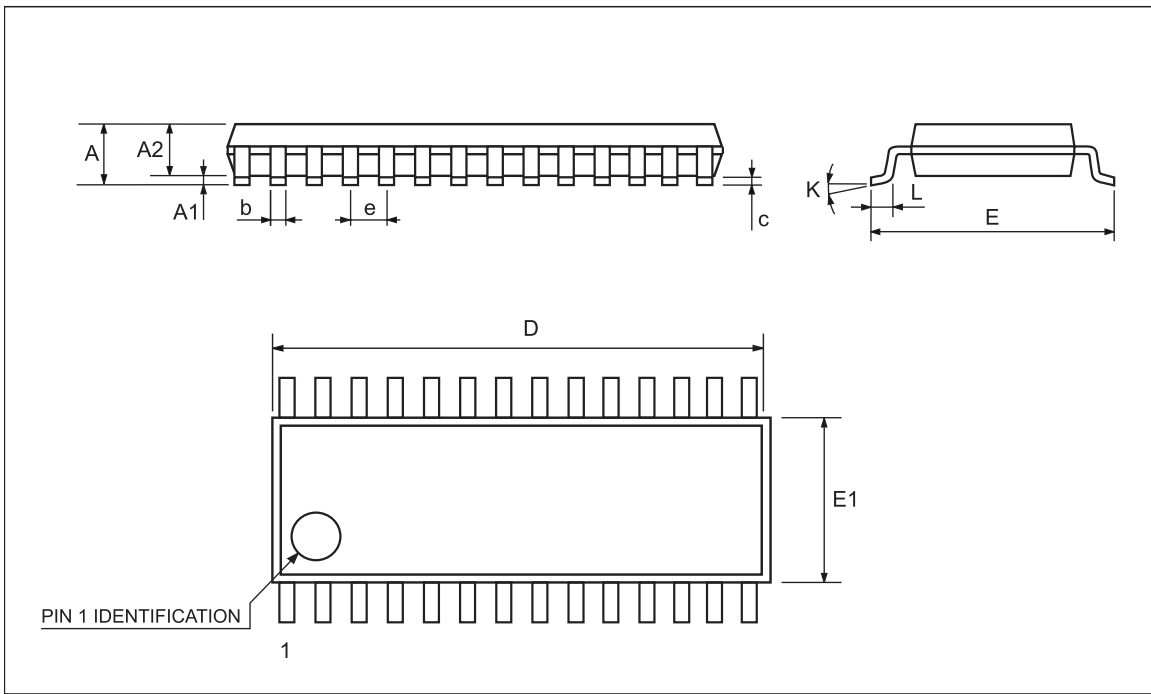
V_{CC}	C1	C2	C3	C4	Cbypass
3.0 to 3.6	0.1	0.1	0.1	0.1	0.1
4.5 to 5.5	0.047	0.33	0.33	0.33	0.1
3.0 to 5.5	0.1	0.47	0.47	0.47	0.1

5 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

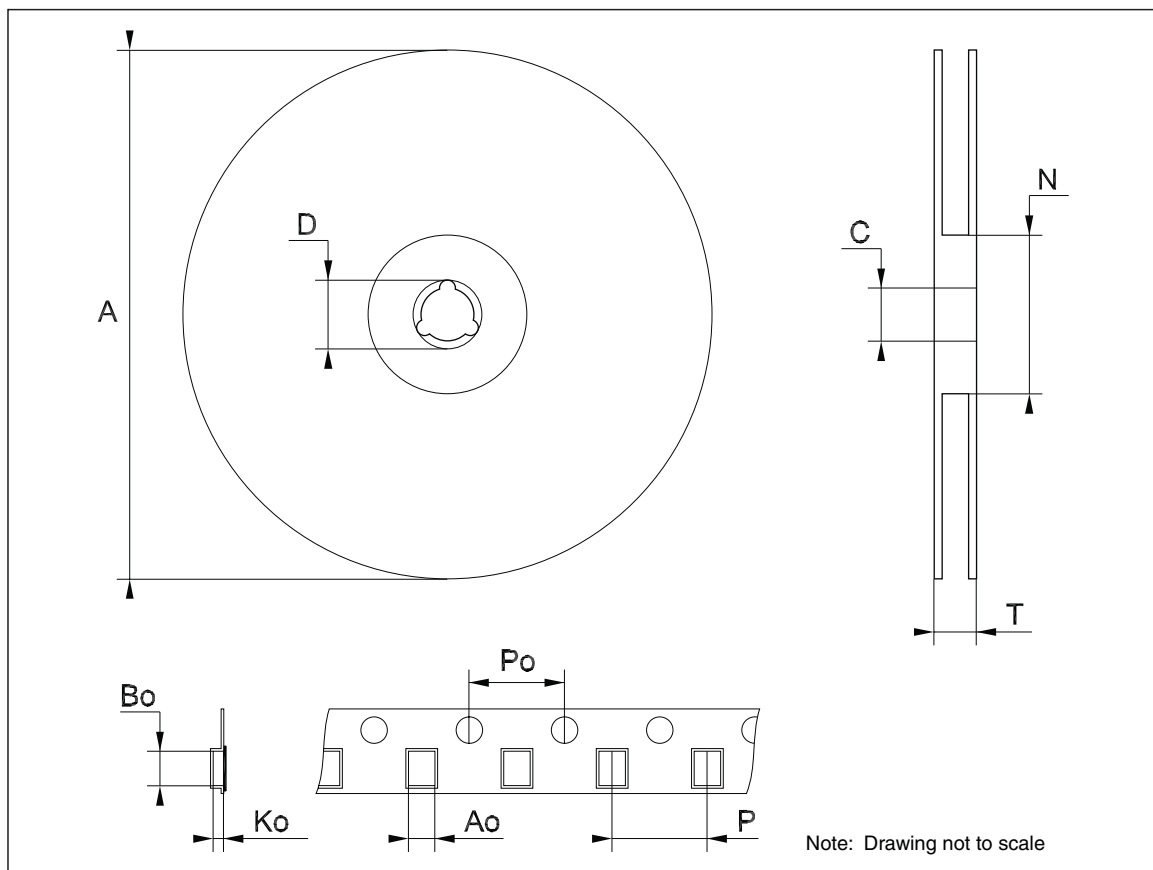
SSOP28 mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			2			0.079
A1	0.050			0.002		
A2	1.65	1.75	1.85	0.065	0.069	0.073
b	0.22		0.38	0.009		0.015
c	0.09		0.25	0.004		0.010
D	9.9	10.2	10.5	0.390	0.402	0.413
E	7.4	7.8	8.2	0.291	0.307	0.323
E1	5	5.3	5.6	0.197	0.209	0.220
e		0.65 BSC			0.0256 BSC	
K	0°		10°	0°		10°
L	0.55	0.75	0.95	0.022	0.030	0.037



Tape & reel SSOP28 mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	8.4		8.6	0.331		0.339
Bo	10.7		10.9	0.421		0.429
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



6 Revision history

Table 13. Document revision history

Date	Revision	Changes
21-Jun-2004	2	The I_L (Output Leakage Current) mA ==> μ A in table 8.
03-Apr-2006	3	Order code updated.
13-Nov-2007	4	Added Table 1
28-Sep-2010	5	Removed TSSOP28 package and all references from datasheet; updated ECOPACK [®] text in Section 5 ; reformatted document; minor textual updates.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2010 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com

