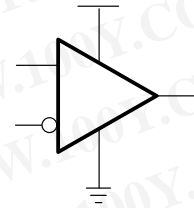


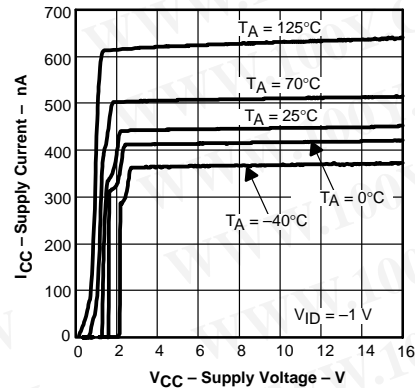
TLV3401, TLV3402, TLV3404 FAMILY OF NANOPOWER OPEN DRAIN OUTPUT COMPARATORS

SLCS135A – AUGUST 2000 – REVISED NOVEMBER 2000

- Low Supply Current . . . 470 nA/Per Channel
- Input Common-Mode Range Exceeds the Rails . . . -0.1 V to $V_{CC} + 5\text{ V}$
- Supply Voltage Range . . . 2.5 V to 16 V
- Reverse Battery Protection Up to 18 V
- Open Drain CMOS Output Stage
- Specified Temperature Range
 - 0°C to 70°C – Commercial Grade
 - -40°C to 125°C – Industrial Grade
- Ultrasmall Packaging
 - 5-Pin SOT-23 (TLV3401)
 - 8-Pin MSOP (TLV3402)
- Universal Op-Amp EVM (Reference SLOU060 for more information)



SUPPLY CURRENT
vs
SUPPLY VOLTAGE

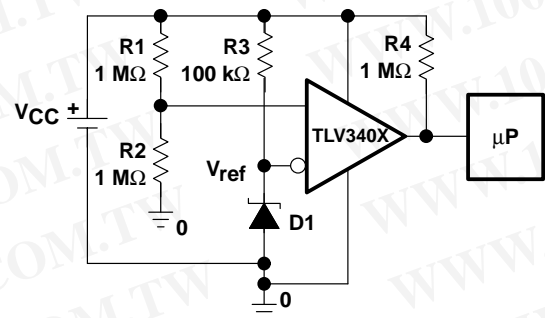


description

The TLV340x is Texas Instruments' first family of nanopower comparators with only 470 nA per channel supply current, which make this device ideal for battery power and wireless handset applications.

The TLV340x has a minimum operating supply voltage of 2.7 V over the extended industrial temperature range ($T_A = -40^{\circ}\text{C}$ to 125°C), while having an input common-mode range of -0.1 to $V_{CC} + 5\text{ V}$. The low supply current makes it an ideal choice for battery powered portable applications where quiescent current is the primary concern. Reverse battery protection guards the amplifier from an over-current condition due to improper battery installation. For harsh environments, the inputs can be taken 5 V above the positive supply rail without damage to the device.

high side voltage sense circuit



All members are available in PDIP and SOIC with the singles in the small SOT-23 package, duals in the MSOP, and quads in the TSSOP package.

A SELECTION OF OUTPUT COMPARATOR†

DEVICE	V_{CC} (V)	V_{IO} (μV)	I_{CC}/Ch (μA)	I_{IB} (pA)	t_{PLH} (μs)	t_{PHL} (μs)	t_f (μs)	t_r (μs)	RAIL-TO-RAIL	OUTPUT STAGE
TLV340x	2.5 – 16	250	0.47	80	55	30	5	–	I	OD
TLV370x	2.5 – 16	250	0.47	80	25	30	5	3.5	I	PP
TLC3702/4	3 – 16	1200	9	5	1.1	0.65	0.5	0.125	–	PP
TLC393/339	3 – 16	1400	11	5	1.1	0.55	0.22	–	–	OD
TLC372/4	3 – 16	1000	75	5	0.65	0.65	–	–	–	OD

† All specifications are typical values measured at 5 V.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2000, Texas Instruments Incorporated

勝特力材料 866-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

TLV3401, TLV3402, TLV3404

FAMILY OF NANOPOWER OPEN DRAIN OUTPUT COMPARATORS

SLCS135A – AUGUST 2000 – REVISED NOVEMBER 2000

TLV3401 AVAILABLE OPTIONS

T _A	V _{IO} max AT 25°C	PACKAGED DEVICES			
		SMALL OUTLINE (D) [†]	SOT-23 (DBV) [‡]	SYMBOL	PLASTIC DIP (P)
0°C to 70°C	3600 μV	TLV3401CD	TLV3401CDBV	VBDC	—
-40°C to 125°C		TLV3401ID	TLV3401IDBV	VBDI	TLV3401IP

[†] This package is available taped and reeled. To order this packaging option, add an R suffix to the part number (e.g., TLV3401CDR).

[‡] This package is only available taped and reeled. For standard quantities (3000 pieces per reel), add an R suffix (i.e., TLV3401CDBVR). For small quantities (250 pieces per mini-reel), add a T suffix to the part number (e.g., TLV3401CDBVT).

TLV3402 AVAILABLE OPTIONS

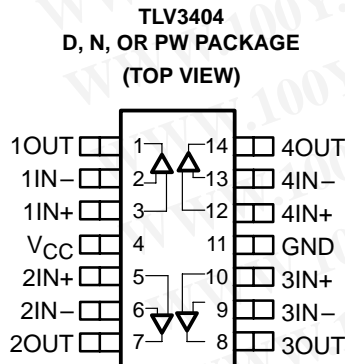
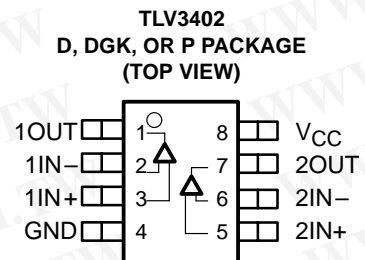
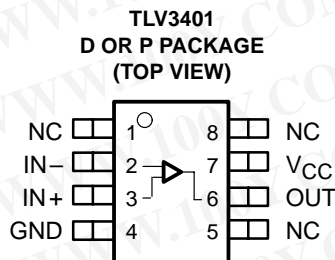
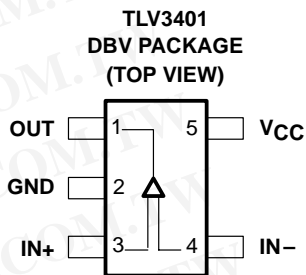
T _A	V _{IO} max AT 25°C	PACKAGED DEVICES			
		SMALL OUTLINE (D) [†]	MSOP (DGK) [†]	SYMBOL	PLASTIC DIP (P)
0°C to 70°C	3600 μV	TLV3402CD	TLV3402CDGK	xxTIAJJ	—
-40°C to 125°C		TLV3402ID	TLV3402IDGK	xxTIAJK	TLV3402IP

[†] This package is available taped and reeled. To order this packaging option, add an R suffix to the part number (e.g., TLV3402CDR).

TLV3404 AVAILABLE OPTIONS

T _A	V _{IO} max AT 25°C	PACKAGED DEVICES		
		SMALL OUTLINE (D) [†]	PLASTIC DIP (N)	TSSOP (PW)
0°C to 70°C	3600 μV	TLV3404CD	—	TLV3404CPW
-40°C to 125°C		TLV3404ID	TLV3404IN	TLV3404IPW

[†] This package is available taped and reeled. To order this packaging option, add an R suffix to the part number (e.g., TLV3404CDR).



勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

TLV3401, TLV3402, TLV3404 FAMILY OF NANOPOWER OPEN DRAIN OUTPUT COMPARATORS

SLCS135A – AUGUST 2000 – REVISED NOVEMBER 2000

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V_{CC} (see Note 1)	17 V
Differential input voltage, V_{ID}	± 20 V
Input voltage range, V_I (see Notes 1 and 2)	0 to $V_{CC} + 5$ V
Input current range, I_I	± 10 mA
Output current range, I_O	± 10 mA
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : C suffix	0°C to 70°C
I suffix	-40°C to 125°C
Maximum junction temperature, T_J	150°C
Storage temperature range, T_{stg}	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. All voltage values, except differential voltages, are with respect to GND.
2. Input voltage range is limited to 20 V or $V_{CC} + 5$ V, whichever is smaller.

DISSIPATION RATING TABLE

PACKAGE	θ_{JC} (°C/W)	θ_{JA} (°C/W)	$T_A \leq 25^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
D (8)	38.3	176	710 mW	142 mW
D (14)	26.9	122.6	1022 mW	204.4 mW
DBV (5)	55	324.1	385 mW	77.1 mW
DGK (8)	54.2	259.9	481 mW	96.2 mW
N (14)	32	78	1600 mW	320.5 mW
P (8)	41	104	1200 mW	240.4 mW
PW (14)	29.3	173.6	720 mW	144 mW

recommended operating conditions

			MIN	MAX	UNIT
Supply voltage, V_{CC}	Single supply	C-suffix	2.5	16	V
		I-suffix	2.7	16	
	Split supply	C-suffix	± 1.25	± 8	
		I-suffix	± 1.35	± 8	
Common-mode input voltage range, V_{ICR}			-0.1	$V_{CC}+5$	V
Operating free-air temperature, T_A	C-suffix		0	70	°C
	I-suffix		-40	125	

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
 Http://www.100y.com.tw



TLV3401, TLV3402, TLV3404 FAMILY OF NANOWATT OPEN DRAIN OUTPUT COMPARATORS

SLCS135A – AUGUST 2000 – REVISED NOVEMBER 2000

electrical characteristics at specified operating free-air temperature, $V_{CC} = 2.7\text{ V}, 5\text{ V}, 15\text{ V}$ (unless otherwise noted)

dc performance

PARAMETER	TEST CONDITIONS	T_A †	MIN	TYP	MAX	UNIT
V_{IO} Input offset voltage	$V_{IC} = V_{CC}/2, R_S = 50\ \Omega, R_P = 1\text{ M}\Omega$	25°C		250	3600	μV
		Full range			4400	
αV_{IO} Offset voltage drift		25°C		3		$\mu\text{V}/^\circ\text{C}$
CMRR Common-mode rejection ratio	$V_{IC} = 0\text{ to }2.7\text{ V}, R_S = 50\ \Omega$	25°C	55	72	dB	
		Full range	50			
	$V_{IC} = 0\text{ to }5\text{ V}, R_S = 50\ \Omega$	25°C	60	76		
		Full range	55			
	$V_{IC} = 0\text{ to }15\text{ V}, R_S = 50\ \Omega$	25°C	65	88		
		Full range	60			
AVD Large-signal differential voltage amplification	$R_P = 1\text{ M}\Omega$	25°C		1000	V/mV	

† Full range is 0°C to 70°C for C suffix and -40°C to 125°C for I suffix. If not specified, full range is -40°C to 125°C.

input/output characteristics

PARAMETER	TEST CONDITIONS	T_A †	MIN	TYP	MAX	UNIT
I_{IO} Input offset current	$V_{IC} = V_{CC}/2, R_P = 1\text{ M}\Omega, R_S = 50\ \Omega$	25°C		20	100	μA
		Full range			1000	
I_{IB} Input bias current		25°C		80	250	μA
		Full range			1500	
$r_{i(d)}$ Differential input resistance		25°C		300		$\text{M}\Omega$
I_{OZ} High-impedance output leakage current	$V_{IC} = V_{CC}/2, V_O = V_{CC}, V_{ID} = 1\text{ V}$	25°C		50		μA
V_{OL} Low-level output voltage	$V_{IC} = V_{CC}/2, I_{OL} = 2\ \mu\text{A}, V_{ID} = -1\text{ V}$	25°C		8		mV
		25°C		80	200	
	Full range				300	

† Full range is 0°C to 70°C for C suffix and -40°C to 125°C for I suffix. If not specified, full range is -40°C to 125°C.

power supply

PARAMETER	TEST CONDITIONS	T_A †	MIN	TYP	MAX	UNIT
I_{CC} Supply current (per channel)	$R_P = \text{No pullup}$	Output state low	25°C	470	550	nA
			Full range		750	
		Output state high	25°C	560	640	
			Full range		950	
PSRR Power supply rejection ratio	$V_{IC} = V_{CC}/2\text{ V}, \text{No load}$	$V_{CC} = 2.7\text{ V to }5\text{ V}$	25°C	75	100	dB
			Full range	70		
		$V_{CC} = 5\text{ V to }15\text{ V}$	25°C	85	105	
			Full range	80		

† Full range is 0°C to 70°C for C suffix and -40°C to 125°C for I suffix. If not specified, full range is -40°C to 125°C.

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)



TLV3401, TLV3402, TLV3404 FAMILY OF NANOPOWER OPEN DRAIN OUTPUT COMPARATORS

SLCS135A – AUGUST 2000 – REVISED NOVEMBER 2000

switching characteristics at recommended operating conditions, $V_{CC} = 2.7\text{ V}, 5\text{ V}, 15\text{ V}, T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS		T_A	MIN	TYP	MAX	UNIT
$t_{(PLH)}$	Propagation delay time, low-to-high-level output	f = 10 kHz, VSTEP = 1 V, R _P = 1 M Ω , C _L = 10 pF	Overdrive = 2 mV	25°C		175		μs
			Overdrive = 10 mV			80		
			Overdrive = 50 mV			55		
$t_{(PHL)}$	Propagation delay time, high-to-low-level output		Overdrive = 2 mV	25°C		300		
			Overdrive = 10 mV			60		
			Overdrive = 50 mV			30		
t_f	Fall time	R _P = 1 M Ω , C _L = 10 pF		25°C		5	μs	

NOTE: The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
	Input bias/offset current	vs Free-air temperature	1
	Open collector leakage current	vs Free-air temperature	2
V _{OL}	Low-level output voltage	vs Low-level output current	3, 4, 5
I _{DD}	Supply current	vs Supply voltage	6
I _{DD}	Supply current	vs Free-air temperature	7
	Low-to-high level output response for various input overdrives		8, 9, 10
	High-to-low level output response for various input overdrives		11, 12, 13
	Output fall time	vs Supply voltage	14

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)



TLV3401, TLV3402, TLV3404 FAMILY OF NANOWATT OPEN DRAIN OUTPUT COMPARATORS

SLCS135A – AUGUST 2000 – REVISED NOVEMBER 2000

TYPICAL CHARACTERISTICS

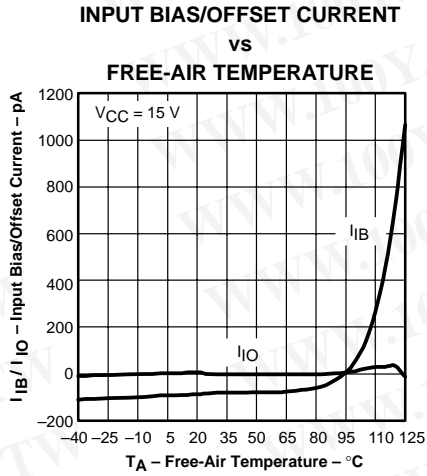


Figure 1

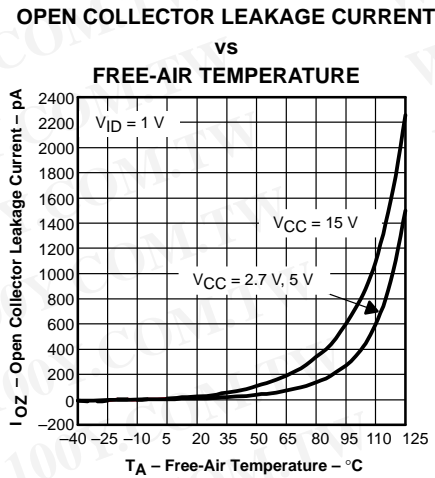


Figure 2

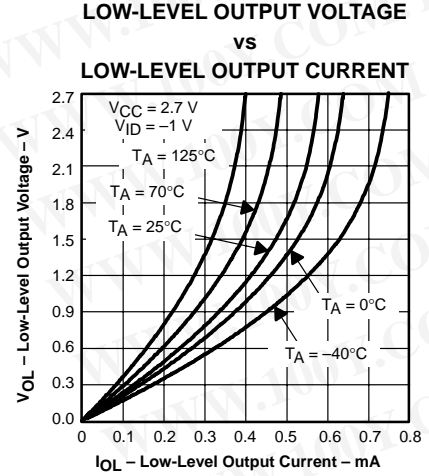


Figure 3

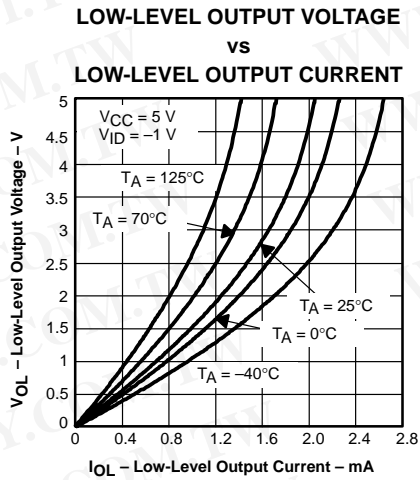


Figure 4

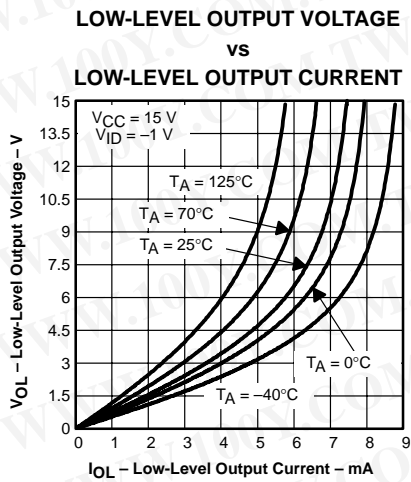


Figure 5

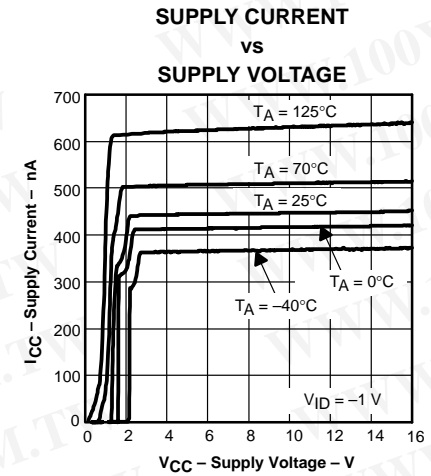


Figure 6

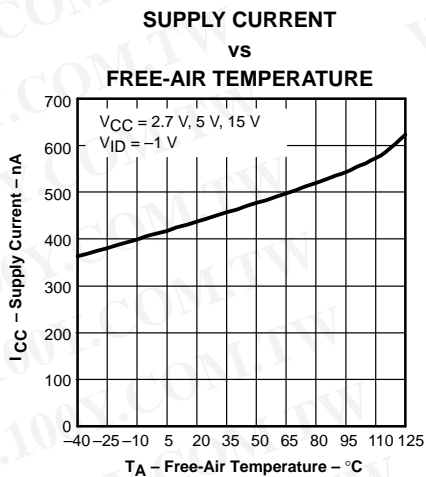


Figure 7

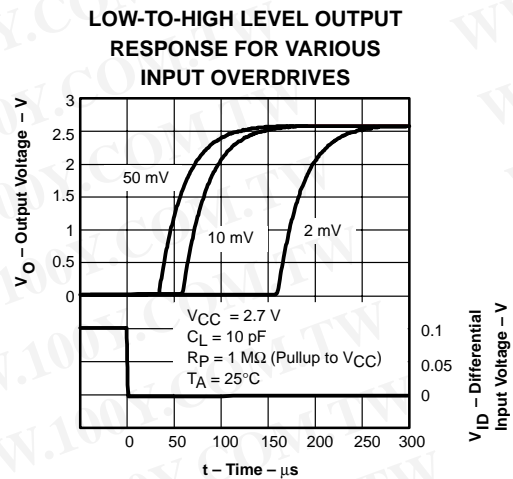


Figure 8

TLV3401, TLV3402, TLV3404 FAMILY OF NANOPOWER OPEN DRAIN OUTPUT COMPARATORS

SLCS135A – AUGUST 2000 – REVISED NOVEMBER 2000

TYPICAL CHARACTERISTICS

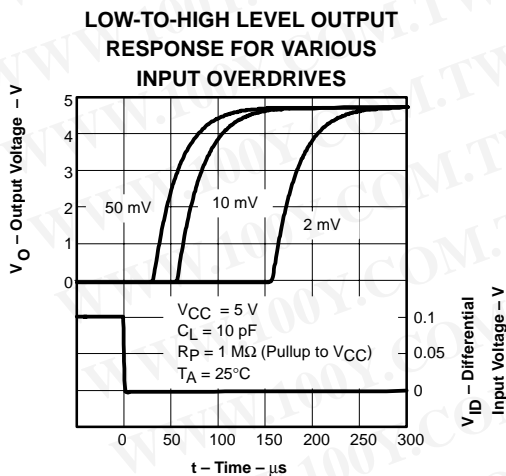


Figure 9

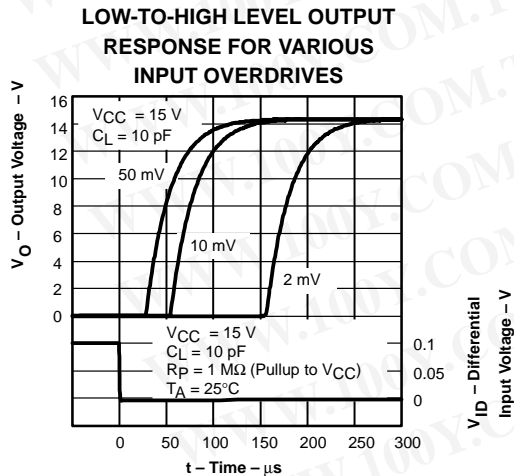


Figure 10

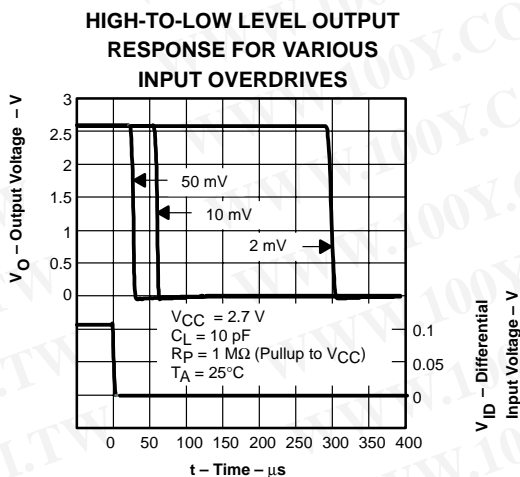


Figure 11

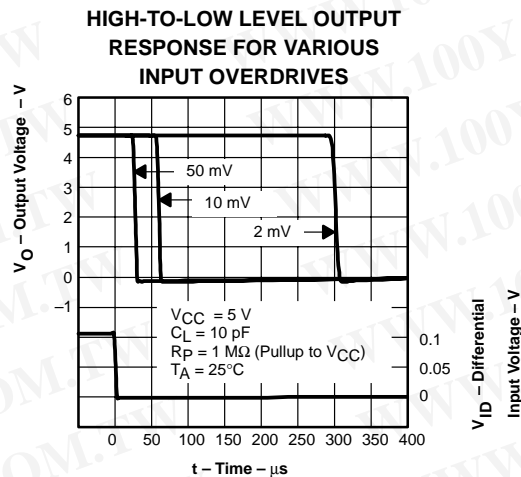


Figure 12

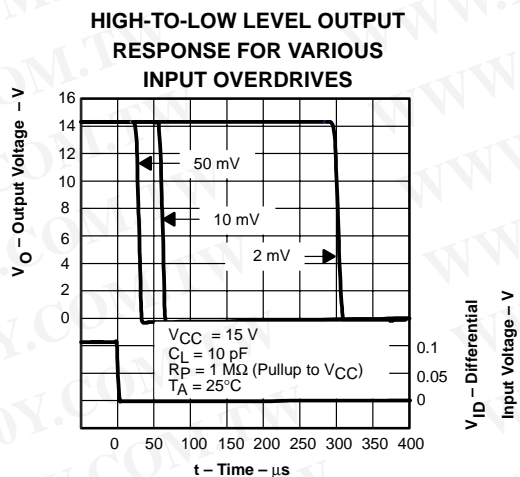


Figure 13

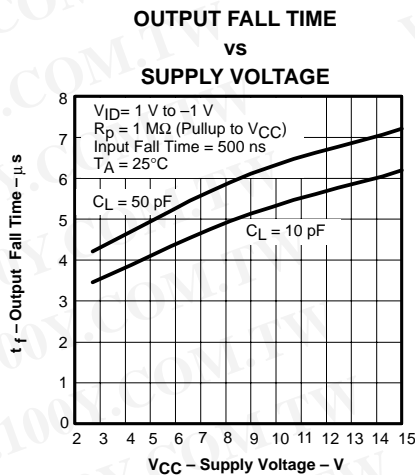


Figure 14

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)


**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TLV3401CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401CDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401CDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401CDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401CDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401IDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401IDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401IDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401IDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3401IP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLV3401IPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLV3402CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402CDGK	ACTIVE	MSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402CDGKG4	ACTIVE	MSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402CDGKR	ACTIVE	MSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402CDGKRG4	ACTIVE	MSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TLV3402IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402IDGK	ACTIVE	MSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402IDGKG4	ACTIVE	MSOP	DGK	8	80	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402IDGKR	ACTIVE	MSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402IDGKRG4	ACTIVE	MSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3402IP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLV3402IPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLV3404CD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404CDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404CDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404CDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404CPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404CPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404CPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404CPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404ID	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404IDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404IDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404IDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404IN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLV3404INE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
TLV3404IPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404IPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TLV3404IPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TLV3404IPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

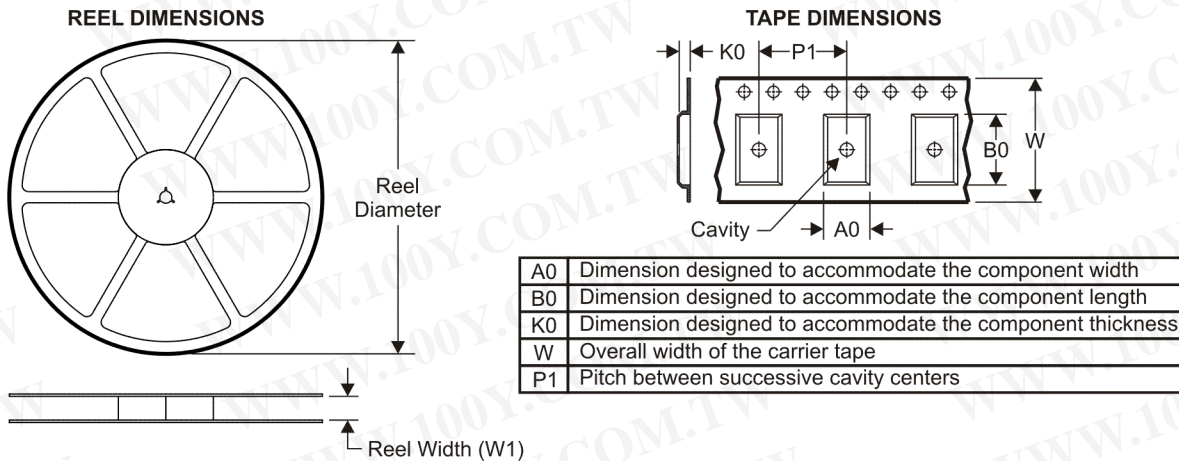
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

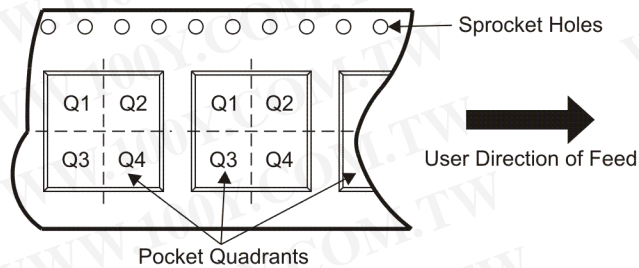
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

TAPE AND REEL INFORMATION



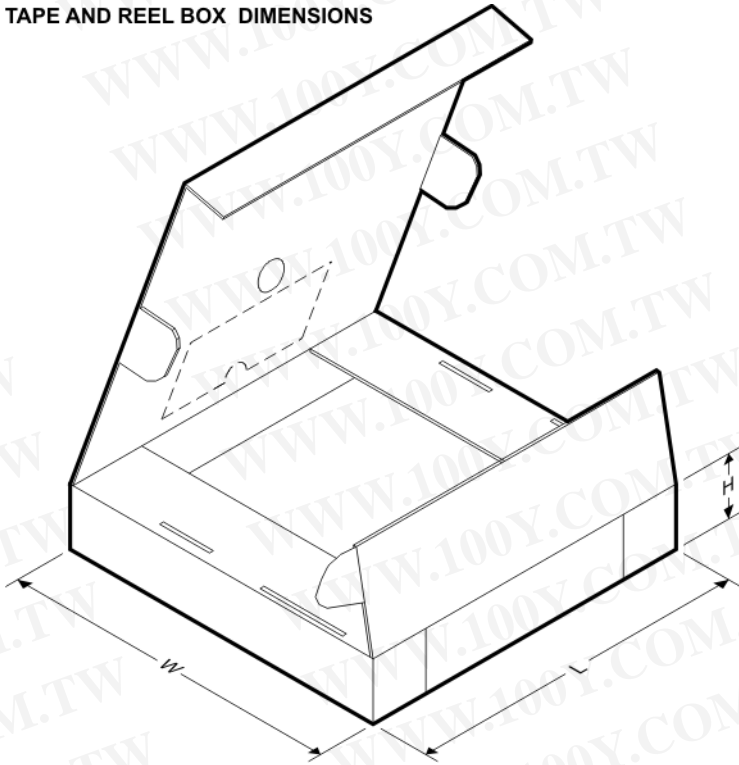
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLV3401CDBVR	SOT-23	DBV	5	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TLV3401CDBVT	SOT-23	DBV	5	250	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TLV3401IDBVR	SOT-23	DBV	5	3000	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TLV3401IDBVT	SOT-23	DBV	5	250	180.0	9.0	3.15	3.2	1.4	4.0	8.0	Q3
TLV3401IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLV3402CDGKR	MSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TLV3402CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLV3402IDGKR	MSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
TLV3402IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLV3404CDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLV3404CPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
TLV3404IDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLV3404IPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLV3401CDBVR	SOT-23	DBV	5	3000	182.0	182.0	20.0
TLV3401CDBVT	SOT-23	DBV	5	250	182.0	182.0	20.0
TLV3401IDBVR	SOT-23	DBV	5	3000	182.0	182.0	20.0
TLV3401IDBVT	SOT-23	DBV	5	250	182.0	182.0	20.0
TLV3401IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLV3402CDGKR	MSOP	DGK	8	2500	358.0	335.0	35.0
TLV3402CDR	SOIC	D	8	2500	340.5	338.1	20.6
TLV3402IDGKR	MSOP	DGK	8	2500	358.0	335.0	35.0
TLV3402IDR	SOIC	D	8	2500	533.4	186.0	36.0
TLV3404CDR	SOIC	D	14	2500	333.2	345.9	28.6
TLV3404CPWR	TSSOP	PW	14	2000	346.0	346.0	29.0
TLV3404IDR	SOIC	D	14	2500	333.2	345.9	28.6
TLV3404IPWR	TSSOP	PW	14	2000	346.0	346.0	29.0

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Transportation and Automotive	www.ti.com/automotive
Video and Imaging	www.ti.com/video
Wireless	www.ti.com/wireless-apps

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated

勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-34970699
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)