

## Dual NPN-PNP complementary Bipolar transistor

### General features

$V_{CE(sat)}$	$h_{FE}$	$I_C$
0.35V	>100	1A

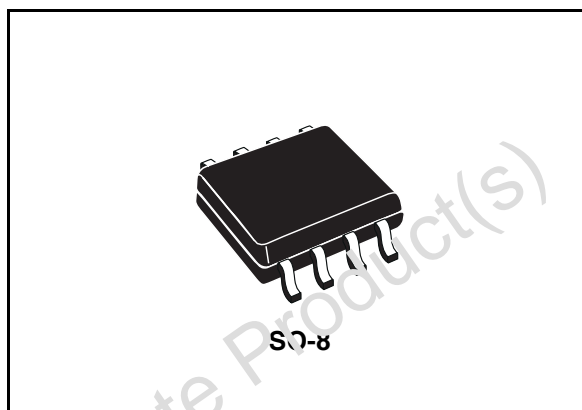
- High gain
- Low  $V_{CE(sat)}$
- Simplified circuit design
- Reduced component count

### Applications

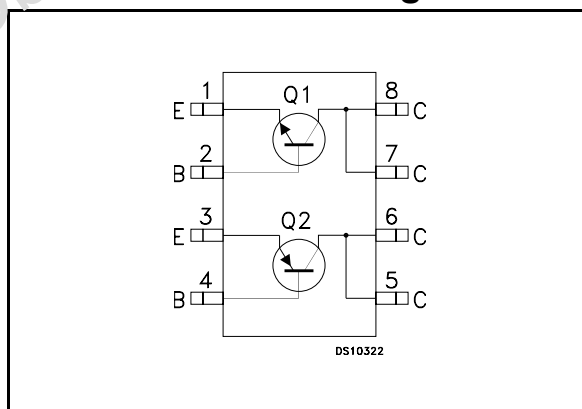
- Push-Pull or Totem-Pole configuration
- MOSFET and IGBT gate driving
- Motor, relay and solenoid driving

### Description

The STS01DTP06 is a Hybrid dual NPN-PNP complementary power bipolar transistor manufactured by using the latest low voltage planar technology. The STS01DTP06 is housed in dual island SO-8 package with separated terminals for higher assembly flexibility, specifically recommended to be used in Push-Pull or Totem Pole configuration as post IGBTs and MOSFETs driver.



### Internal schematic diagram



### Order codes

Part Number	Marking	Package	Packing
STS01DTP06	S01DTP06	SO-8	Tape & reel

# Contents

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value		Unit
		NPN	PNP	
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	60	-60	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	30	-30	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	5	-5	V
$I_C$	Collector current	3	-3	A
$I_{CM}$	Collector peak current ( $t_P < 5\text{ms}$ )	6	-6	A
$I_B$	Base current	1	-1	A
$I_{BM}$	Base peak current ( $t_P < 1\text{ms}$ )	2	-2	A
$P_{tot}$	Total dissipation at $T_c = 25^\circ\text{C}$ single	2		W
$P_{tot}$	Total dissipation at $T_c = 25^\circ\text{C}$ couple	1.6		W
$T_{stg}$	Storage temperature	-65 to 150		$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150		$^\circ\text{C}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-amb}$ <sup>1</sup>	Thermal resistance junction-ambient (Single operation)	Max 62.5	$^\circ\text{C/W}$
$R_{\theta j-amb}$ <sup>1</sup>	Thermal resistance junction-ambient (Dual operation)	Max 78	$^\circ\text{C/W}$

<sup>1</sup> When mounted on 1 inch square pad of 2 oz. copper,  $t \leq 10$  sec.

## 2 Electrical characteristics

( $T_{\text{case}} = 25^{\circ}\text{C}$  unless otherwise specified)

**Table 3. Q1-NPN transistor electrical characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 60\text{V}$			0.1	$\mu\text{A}$
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = 30\text{V}$			1	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 5\text{V}$			1	$\mu\text{A}$
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{mA}$	30			V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 10\text{mA}$		0.35	1	V
		$I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 100\text{mA}$			0.7	V
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 10\text{mA}$		0.85	1.1	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 1\text{A}$ $V_{\text{CE}} = 2\text{V}$	100			
		$I_{\text{C}} = 3\text{A}$ $V_{\text{CE}} = 2\text{V}$	30			

1. Pulsed: Pulse duration = 100  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

( $T_{\text{case}} = 25^{\circ}\text{C}$  unless otherwise specified)

**Table 4. Q2-PNP transistor electrical characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = -60\text{V}$			-0.1	$\mu\text{A}$
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = -30\text{V}$			-1	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = -5\text{V}$			-1	$\mu\text{A}$
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = -10\text{mA}$	-30			V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = -1\text{A}$ $I_{\text{B}} = -10\text{mA}$		-0.35	-1	V
		$I_{\text{C}} = -2\text{A}$ $I_{\text{B}} = -100\text{mA}$			-0.7	V

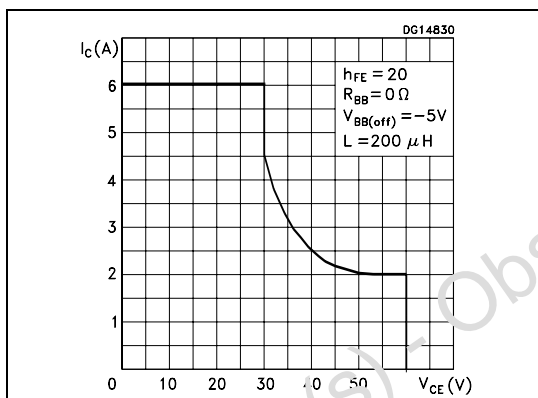
**Table 4. Q2-PNP transistor electrical characteristics**

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$V_{BE(sat)}^{(1)}$	Base-emitter saturation voltage	$I_C = -1A$	$I_B = -10mA$		-0.85	-1.1	V
$h_{FE}^{(1)}$	DC current gain	$I_C = -1A$ $I_C = -3A$	$V_{CE} = -2V$ $V_{CE} = -2V$	100 30			

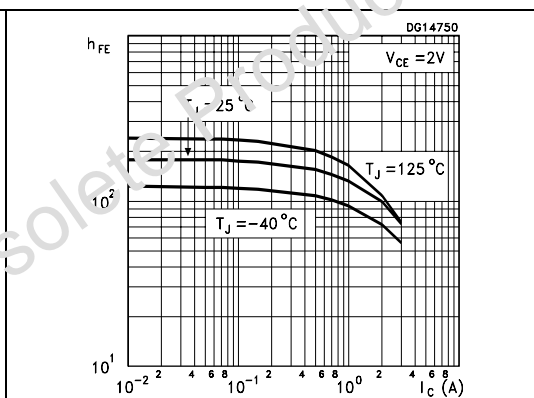
1. Pulsed: Pulse duration = 300 ms, duty cycle  $\leq$  1.5 %

## 2.1 Electrical characteristics (curve)

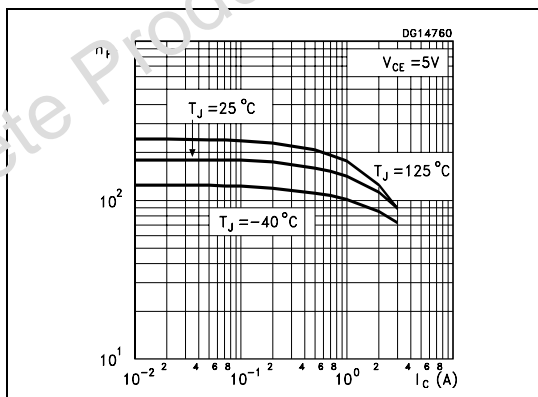
**Figure 1. Reverse biased area Q1 NPN transistor**



**Figure 2. DC current gain Q1 NPN transistor**



**Figure 3. DC current gain Q1 NPN transistor**



**Figure 4. Collector-emitter saturation voltage Q1 NPN transistor**

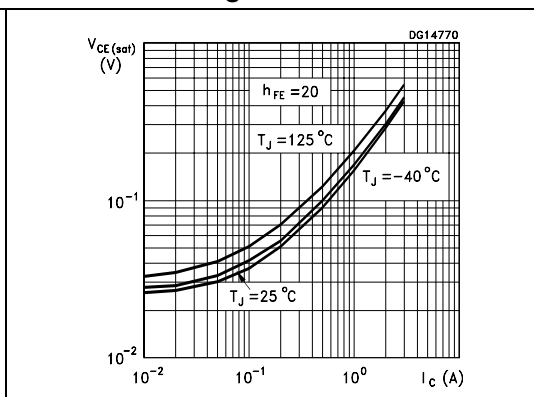


Figure 5. Base-emitter saturation voltage Q1 NPN transistor

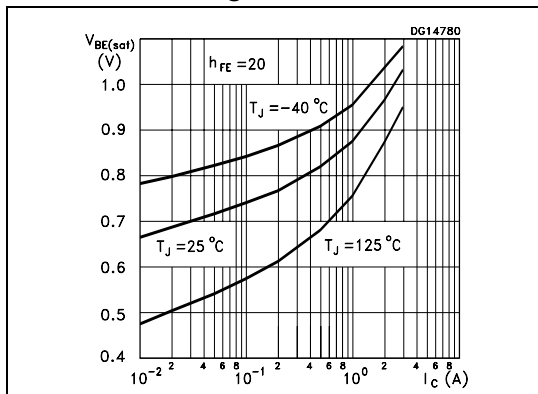


Figure 6. Reverse biased area Q2 PNP transistor

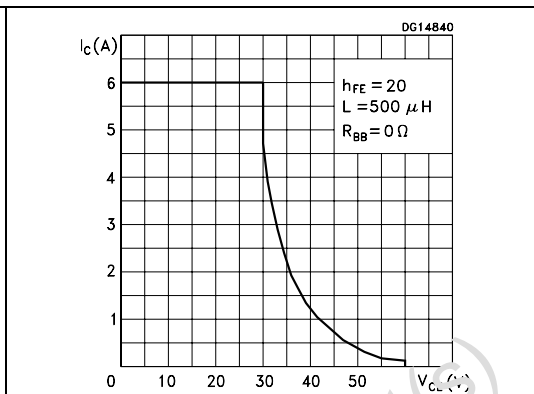


Figure 7. DC current gain Q2 PNP transistor

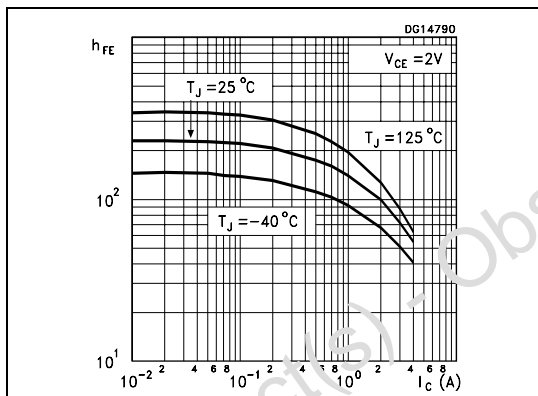


Figure 8. DC current gain Q2 PNP transistor

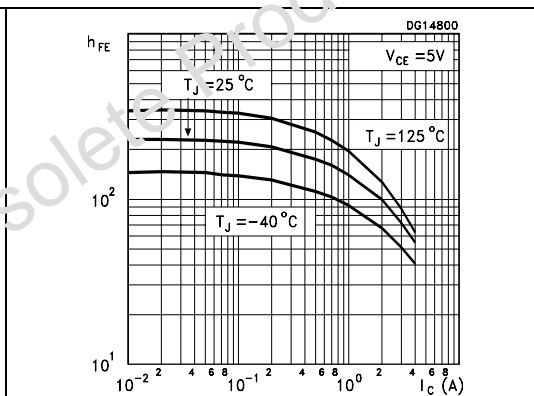


Figure 9. Collector-emitter saturation voltage Q2 PNP transistor

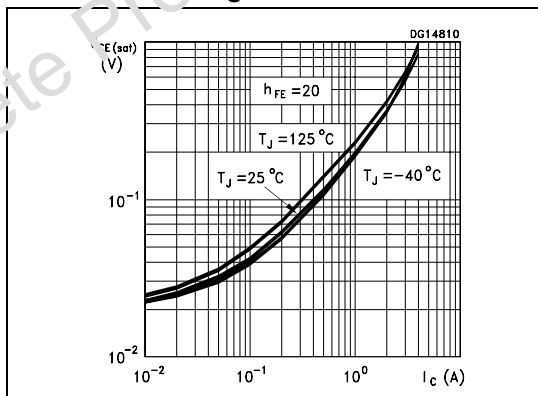
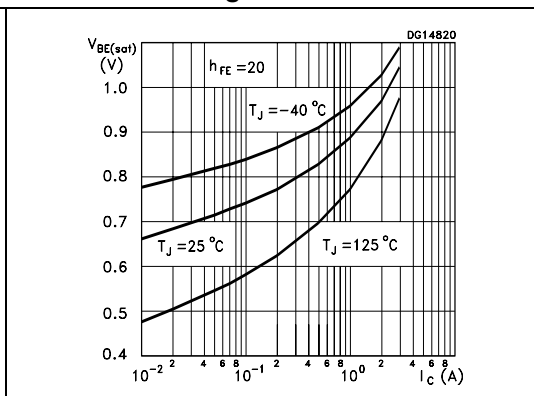
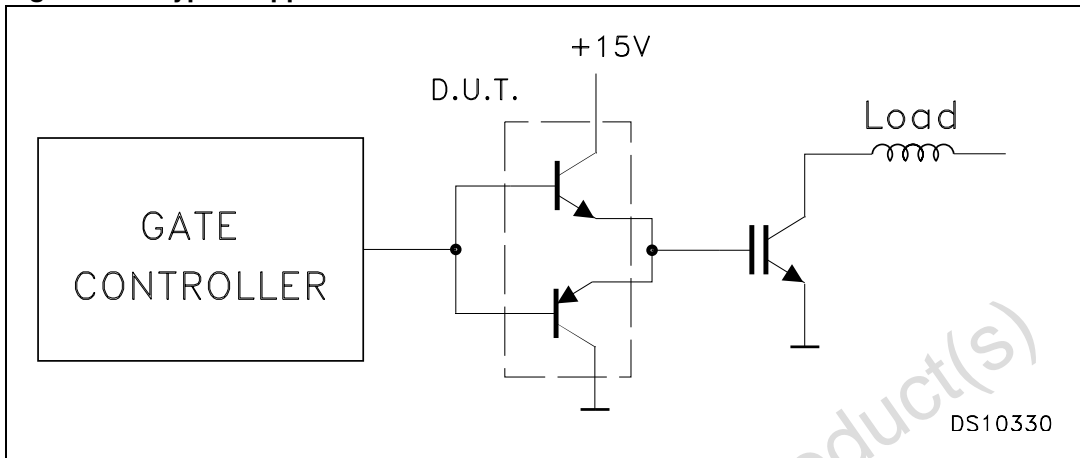


Figure 10. Base-emitter saturation voltage Q2 PNP transistor



## 2.2 Test circuits

Figure 11. Typical application



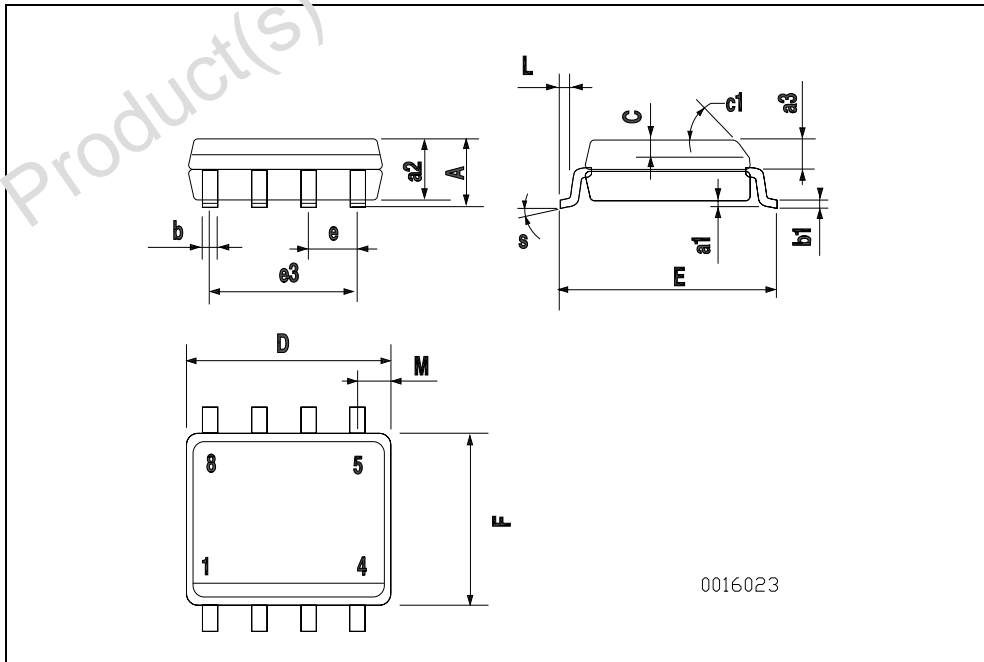
### 3 Package mechanical data

In order to meet environmental requirements, ST 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 ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

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**SO-8 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45 (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.5			0.023
S	8 (max.)					



## 4 Revision history

**Table 5. Revision history**

Date	Revision	Changes
22-Apr-2005	1	Initial release.
22-Mar-2006	2	New template
30-Mar-2006	3	The limit of current in figure number six has been modified from 6.5A to 6A.

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