



# TEA1705

## GreenChip SMPS transient controller

Rev. 2 — 12 December 2013

Product data sheet

## 1. General description

The TEA1705 is a secondary side IC to be used in Switched Mode Power Supplies (SMPS) with high power density. The device offers excellent transient response in primary controlled systems of NXP Semiconductors, with ultra-low no-load power and minimum sized output capacitors. The TEA1705 is intended to be used in power supplies and battery chargers with 5 V output. The TEA1705 operates in combination with the NXP Semiconductors primary-side controller like the TEA1720xT. The output voltage is continuously monitored and when the output voltage is below the  $V_{det}$  level, a transient interrupt signal is generated. This signal is transmitted via the transformer to the primary side to wake up the primary controller. This system reduces the volume of the output capacitors, minimizing the BOM cost. It also enables the building of compact chargers.

## 2. Features and benefits

- Excellent transient performance with ultra-low no-load power and smallest output capacitors
- Fast detection of a decreasing output voltage during load steps
- Integrated output voltage clamp function
- Device available in small SOT23 package

## 3. Applications

- Battery chargers for smart phones and media tablets
- Standby supply for TV and desktop PC

## 4. Ordering information

Table 1. Ordering information

Type number	Package		Version
	Name	Description	
TEA1705/1	TO-236AB	plastic surface-mounted package; 3 leads	SOT23



## 5. Marking

Table 2. Marking codes

Type number	Marking code <sup>[1]</sup>
TEA1705	%4U

[1] % = placeholder for manufacturing site code

## 6. Block diagram

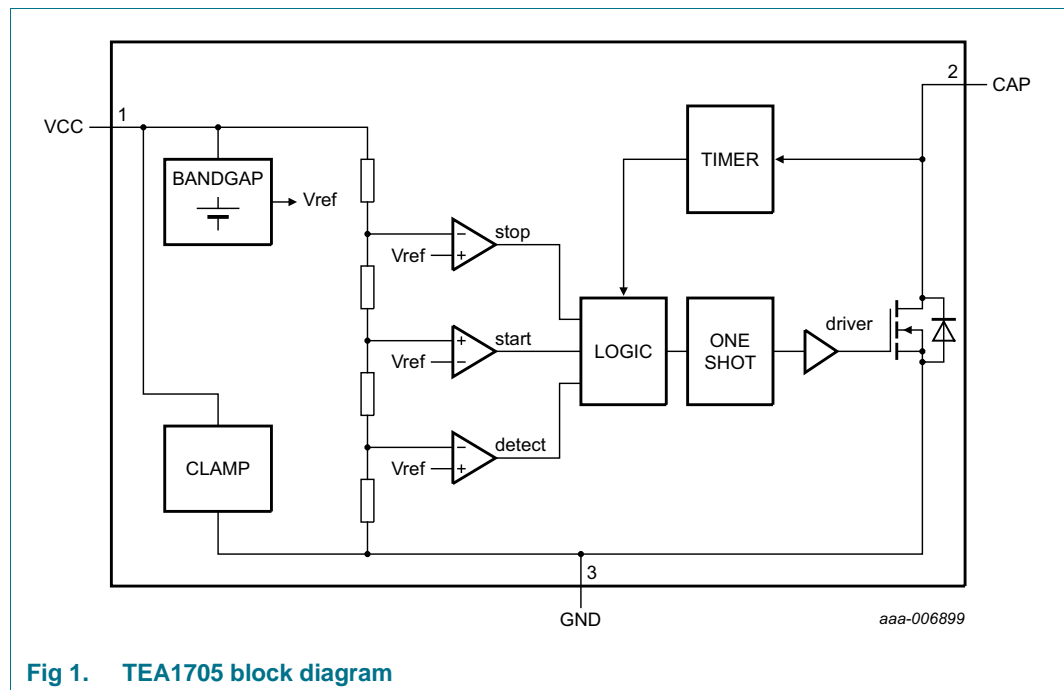


Fig 1. TEA1705 block diagram

## 7. Pinning information

### 7.1 Pinning

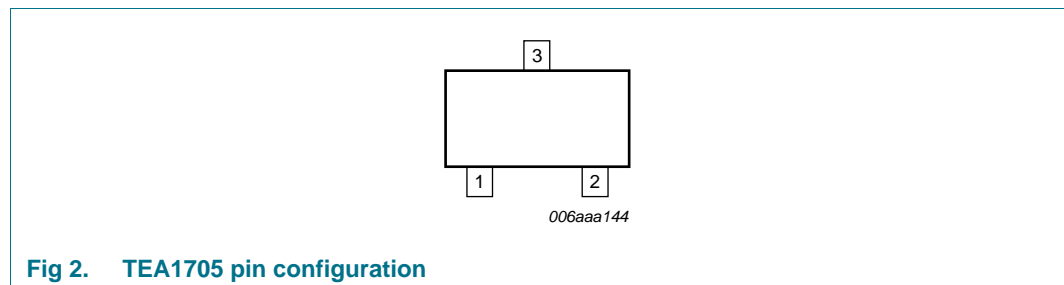


Fig 2. TEA1705 pin configuration

## 7.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
VCC	1	supply voltage
CAP	2	connection for communication capacitor
GND	3	ground

## 8. Functional description

### 8.1 Start-up

The TEA1705 starts up when a supply voltage is applied to the VCC pin. When the VCC voltage exceeds the  $V_{\text{startup}}$  level the IC is enabled. The IC stays in this mode until the VCC voltage drops below the  $V_{\text{CC(stop)}}$  level. All detection voltages on the VCC pin are derived from an integrated temperature compensated band gap voltage.

### 8.2 Detection

During the switching of the primary controller in the flyback application, the capacitor connected between the secondary winding of the transformer and the CAP pin is charged. The capacitor is charged using the body diode of the integrated switch. The switching of the primary side is monitored using a circuit on the CAP pin of the TEA1705.

When the switching has stopped for  $t_{\text{blank}}$  and the monitored VCC voltage is lower than the  $V_{\text{det}}$  level, the integrated switch is turned on for a duration of  $t_{\text{on}}$ . The external capacitor discharges through the secondary transformer winding. On the primary side of the transformer a wake-up pulse is detected by using a primary control IC like the TEA1720xT. The primary IC exits the energy save state and starts to deliver output power.

### 8.3 MOSFET-switch

Generating the transient interrupt signal is enabled by using an internal MOSFET-switch between the CAP and GND pins to discharge the external capacitor. The integrated body diode of this switch is used to charge the external capacitor when the primary switch in the flyback application is switching again.

### 8.4 Clamp

An integrated clamp function is present on the VCC pin. If the voltage on the VCC pin exceeds  $V_{\text{clamp(VCC)}}$ , the clamp circuit drains away the current. The clamp circuit has an impedance of  $R_{\text{clamp}}$ . It helps to prevent an overvoltage on the output capacitors.

## 9. Limiting values

**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134). All voltages are measured with respect to GND; positive currents flow into the IC. The voltage ratings and current ratings are valid provided the other ratings are not violated.

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Voltages</b>					
$V_{CC}$	supply voltage		-0.3	+7	V
$V_{CAP}$	voltage on pin CAP		-	+50	V
<b>Currents</b>					
$I_{CC}$	supply current		0	50	mA
$I_{CAP}$	current on pin CAP	Repetitive; pulse width $\leq 1 \mu\text{s}$ ; repetition time $\geq 50 \mu\text{s}$	-2.5	+2.5	A
		Non-repetitive; pulse width $\leq 1 \mu\text{s}$	-3.5	-	A
<b>General</b>					
$T_{stg}$	storage temperature		-55	+150	$^{\circ}\text{C}$
$T_j$	junction temperature		-40	+150	$^{\circ}\text{C}$
$V_{ESD}$	electrostatic discharge voltage	human body model <sup>[1]</sup>	-2000	+2000	V
		Charged device model	-500	+500	V

[1] Equivalent to discharging a 100 pF capacitor through a 1.5 k $\Omega$  series resistor.

## 10. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	<sup>[1]</sup> 300	K/W

[1] Device mounted on an FR-4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

## 11. Characteristics

**Table 6. Characteristics**

$V_{CC} = 5\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ; all voltages referenced to GND; positive currents flow into the IC, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>High voltage (pin CAP)</b>						
$I_{leak(CAP)}$	leakage current on pin CAP	$V_{CAP} = 50\text{ V}$	-	-	1	$\mu\text{A}$
<b>Supply (pin VCC)</b>						
$V_{startup}$	start-up voltage		4.3	4.4	4.5	V
$V_{CC(stop)}$	stop supply voltage		3.9	4.0	4.1	V
$V_{CC(hys)}$	hysteresis of supply voltage	$V_{CC(hys)} = V_{startup} - V_{CC(stop)}$	0.35	0.4	0.45	V
$I_{CC}$	supply current	$V_{CC} = 5.5\text{ V}$ ; current decreases slightly at lower supply voltages	85	97	110	$\mu\text{A}$
<b>Detection (pin VCC)</b>						
$V_{det}$	detection voltage		4.8	4.9	5.0	V
<b>Switch (pin CAP)</b>						
$t_{on}$	on-time		-	1.1	-	$\mu\text{s}$
$R_{on}$	on-state resistance	$I_{CAP} = 100\text{ mA}$	-	2	-	$\Omega$
<b>Timer (pin CAP)</b>						
$t_{blank}$	blanking time	$V_{CC} = 4.8\text{ V}$ ; after last primary stroke	-	65	-	$\mu\text{s}$
<b>Clamp (pin VCC)</b>						
$V_{clamp(VCC)}$	clamp voltage on pin VCC	clamp start voltage; $I_{VCC} = 1\text{ mA}$	5.80	5.92	6.05	V
$R_{clamp}$	clamp resistance	differential measurement between $V_{CC} = 7\text{ V}$ and $V_{CC} = V_{clamp(VCC)}$	-	26	-	$\Omega$

## 12. Application information

A switched mode power supply application, using the TEA1705 transient controller is shown in [Figure 3](#). On the secondary side the output voltage is monitored by the TEA1705. The TEA1705 works in combination with a primary-side controller.

See for more information the *TEA1720xT data sheets*.

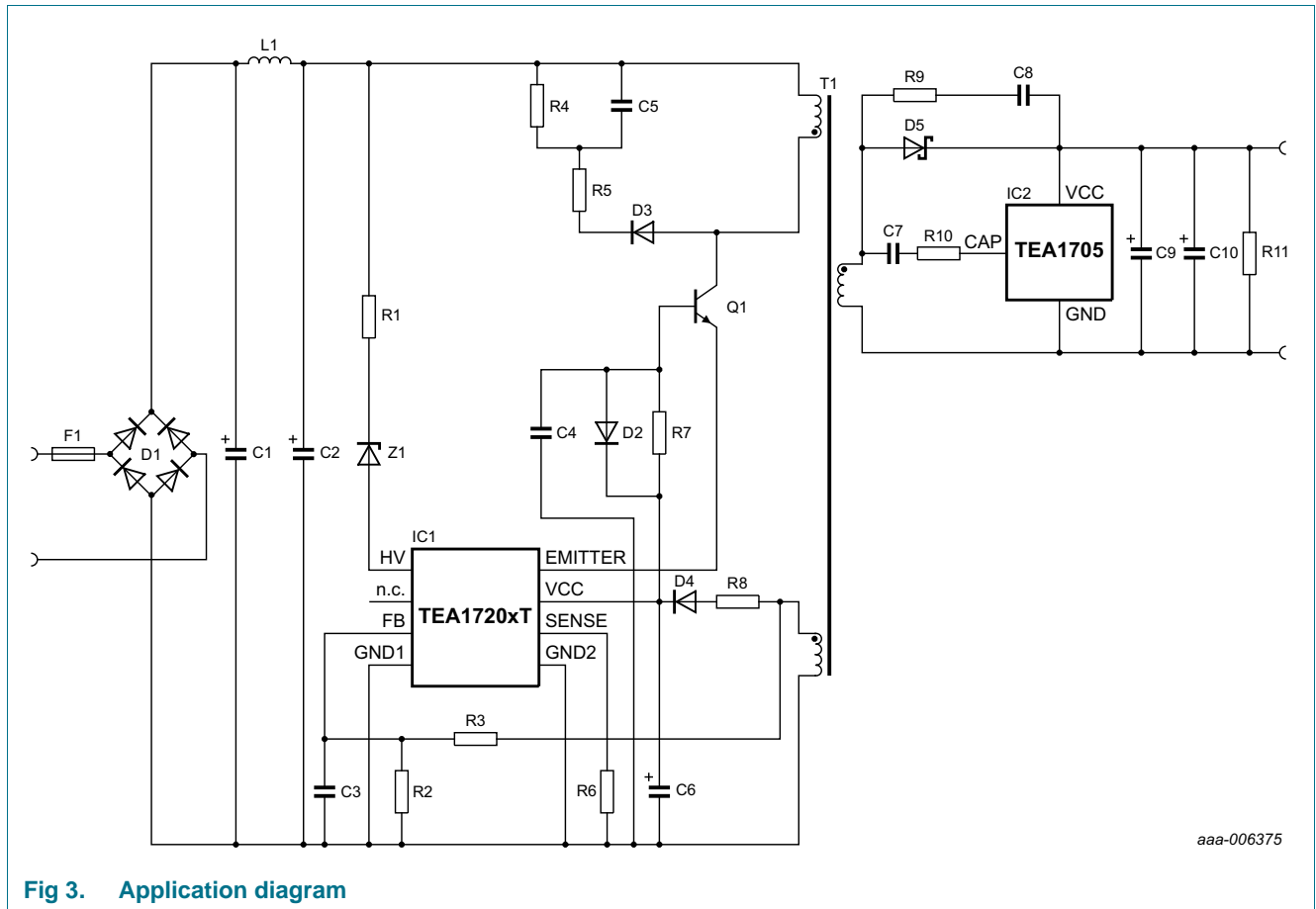


Fig 3. Application diagram

13. Package outline

Plastic surface-mounted package; 3 leads

SOT23

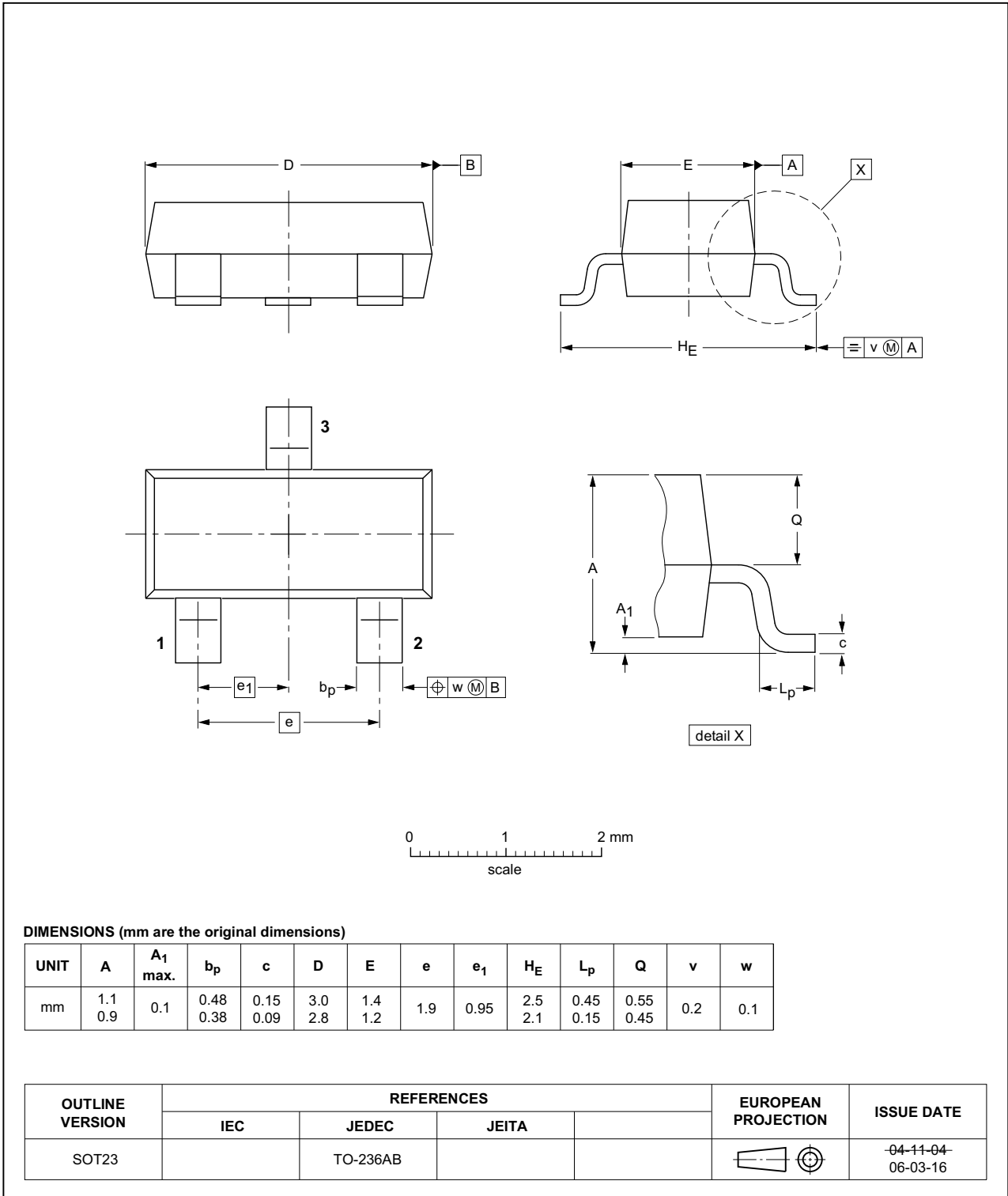


Fig 4. Package outline SOT23

## 14. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
TEA1705 v.2	20131212	Product data sheet	-	TEA1705 v.1
Modifications:	• The data sheet status has changed from preliminary to product.			
TEA1705 v.1	20131203	Preliminary data sheet	-	-



## 15. Legal information

### 15.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

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