DATA SHEET

SA57700-XX
DC vibrator motor driver

Product data

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Philips
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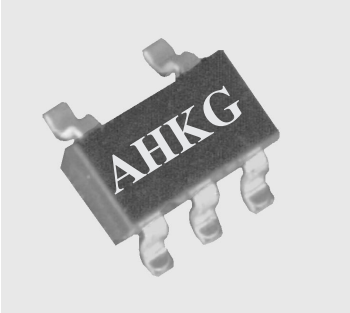
DC vibrator motor driver SA57700-XX

GENERAL DESCRIPTION

The SA57700 allows for a constant vibration force while operating from a –0.3 V to 12.0 V input range and delivering up to 150 mA. The Ground Current is only 80 µA typical independent of the load. The output is turned off when input voltage drops below detection voltage at 2.1 V. To minimize battery drain, (ON = low) SA57700 supply current drops to 0.1 µA max. Other features include thermal shutdown protection, short circuit protection. The SA57700 is available in a 5-pin SOT23 package.



FEATURES

- Compact package for small mounting area
- Good ripple rejection: 70 dB typical
- Preset output voltage from 1.2 V to 2.0 V in 0.1 V step
- High precision output voltage: ±3%
- Output current capacity: 200 mA
- Low consumption current: 0.1 mA max. (when off)
- Low temperature drift co-efficient to V_{OUT}: ±100 ppm/°C
- Thermal Shutdown
- Wide Operating Temperature Range: –20 to 75°C
- Three voltage options: 1.3, 1.5, 1.8 V

APPLICATIONS

- Wireless Handset Vibrator Motor Drivers
- Pager Vibrator Motor Drivers

SIMPLIFIED APPLICATION DIAGRAM

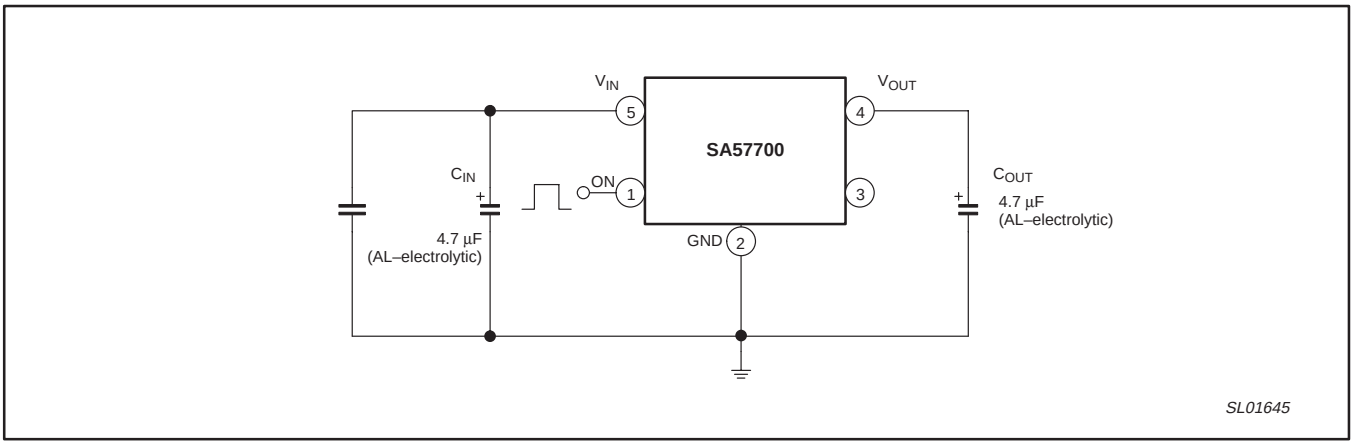


Figure 1. Simplified application diagram.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		TEMPERATURE RANGE
	NAME	DESCRIPTION	
SA57700-XXD	SOT23–5	5-pin small outline plastic	–40 °C to +85 °C

NOTE:
The device has one detection voltage option, indicated by the XX on the ‘Type number’.

XX	DETECT VOLTAGE (Typical)
–13	1.3 V
–15	1.5 V
–18	1.8 V

Part number marking

The package is marked with a four letter code in the first line to the right of the logo. The first three letters designate the product. The fourth letter, represented by ‘x’, is a date tracking code. The remaining two or three lines of characters are internal manufacturing codes.

Part number	Marking
SA57700-13	A H K x
SA57700-15	A H M x
SA57700-18	A H R x

PIN CONFIGURATION

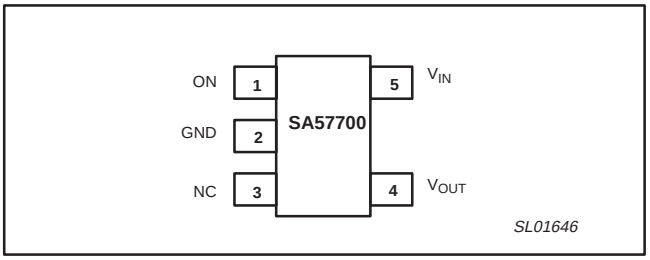


Figure 2. Pin configuration.

PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	ON	Active-HIGH ON/$\overline{\text{OFF}}$ input. Apply a logic HIGH to deliver power to the load. Apply a logic LOW to disconnect the load and reduce the supply current to 0.1 μA max.
2	GND	Ground. This pin also functions as a heatsink. Solder to large pads or the circuit board ground plane to maximize thermal dissipation.
3	NC	Not connected.
4	V_{OUT}	Regulator Output. Fixed 1.3 V and sources up to 150 mA. Bypass with 4.7 μF, <0.2 W typical ESR capacitor to GND
5	V_{IN}	Regulator Input. Supply voltage can range up to 12 V. Bypass with 4.7 μF to GND.

MAXIMUM RATINGS

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
T_{opr}	Operating temperature	–20	+75	°C
T_{stg}	Storage temperature	–40	+125	°C
V_{CC}	Supply voltage	–0.3	+12	V
I_{OUT}	Output current		200	mA
P_D	Power dissipation		150	mW

DC ELECTRICAL CHARACTERISTICS

T_{amb} = 25 °C, V_{CC} = 2.6 V, unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_O	Output voltage	V_{IN} = 3.5 V; I_O = 30 mA	–3%	V_O	+3%	V
Iccq1	No-Load input current	V_{IN} = 3.5 V; I_O = 0 mA		120	240	µA
Iccq2	Input current 1 (OFF)	V_{IN} = 1.8 V; V_{ON} = 1.6 V		80	160	µA
Iccq3	Input current 2 (OFF)	V_{IN} = 3.5 V; V_{ON} = 0 V			0.1	µA
ΔV1	Line regulation	V_{IN} = 3 V; ~5 V I_O = 30 mA		10	20	mV
ΔV2	Load regulation	V_{IN} = 3.5 V; I_O = 0~100 mA		30	60	mV
$\Delta V_O/DT$	Vo temperature coefficient	Tj = –20 ~+75 °C; V_{IN} = 3.5 V; I_O = 30 mA		100		ppm/°C
RR	Ripple rejection	V_{IN} = 3.5V; f = 120 Hz V_{RIPPLE} = 1 V_{P-P}; I_O = 30 mA	55	70		dB
V_{LDET}	V_{IN} low detector voltage	V_{IN} = H→L; I_O = 30 mA	2.0	2.1	2.2	V
V_{HDET}	V_{IN} high detector voltage	V_{IN} = L→H; I_O = 30 mA		2.6	2.8	V
$\Delta V_{LDET}/\Delta T$	V_{IN} low detector voltage temperature coefficient	T_j = –20~+75 °C; V_{IN} = H→L; I_O = 30 mA		200		ppm/°C
Vonh	High threshold voltage	V_{IN} = H→L, L→H		500		mV
I_{ON}	ON terminal current	V_{IN} = 1.6 V		5	10	µA
ON_H	ON High threshold voltage		1.6		V_{IN}+0.3	V
ON_L	ON Low threshold voltage	–0.3	–0.3		0.4	V

TECHNICAL DESCRIPTION

ON pin

Drive ON high to provide power to the load. Drive ON low to disable power to the load and reduce the supply current to maximum 0.1 µA. Assume V_{IN} is greater than VHDET 2.6 V, when ON goes HIGH, output current rises to the current limit until V_{OUT} reaches regulation. While in regulation the output current drops to a lower value sufficient to maintain motor speed. When ON goes LOW, the regulator turns off, however, inertial energy in the motor exhibits a slow output voltage decline. The SA57700 is designed to withstand this condition with no negative effects. Connect ON terminal to V_{IN} when it is not used.

V_{IN} pin

Input voltage drops below VLDET 2.1 V, which sets the output voltage stop regulating while ON input is HIGH. The consumption current flows even when output voltage is OFF due to input voltage detection. Turn output off with the ON terminal in order to suppress consumption current completely.

Regulator stability and capacitor selection

Phase compensation is made for securing stable operation even if the load current varies. For this reason, an output capacitor with good frequency characteristics is needed. Set it as close to the circuit as possible and make the wiring as short as possible. Use a 4.7 µF capacitor on the input and 4.7 µF capacitor on the output of the SA57700. For a fast load transient response requires a larger output capacitor value.

Current Limit

The SA57700 includes a current limiter that monitors and controls the pass transistor's gate voltage, estimating the output current and limiting it to about 270 mA. The output can be shorted to ground for an infinite time period without damaging the part.

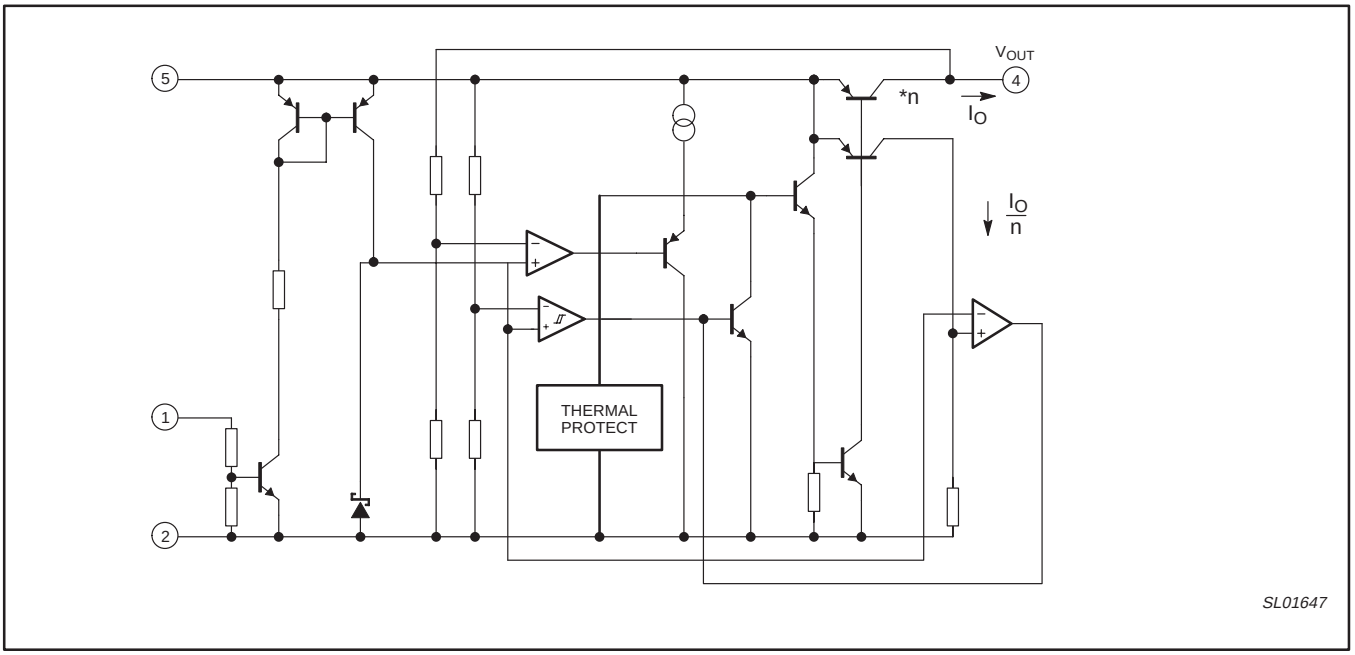


Figure 3. Functional diagram.

TYPICAL PERFORMANCE CURVES

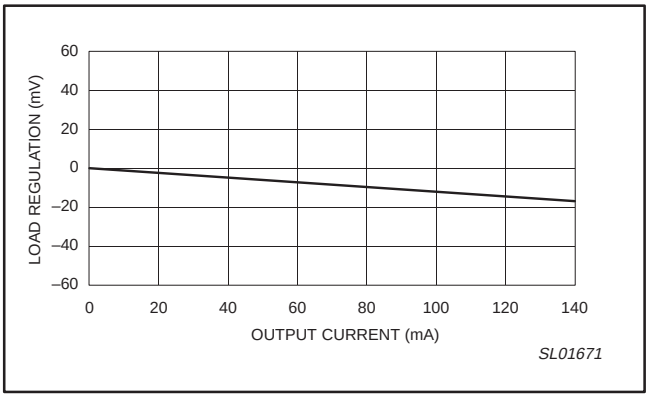


Figure 4. Load regulation.

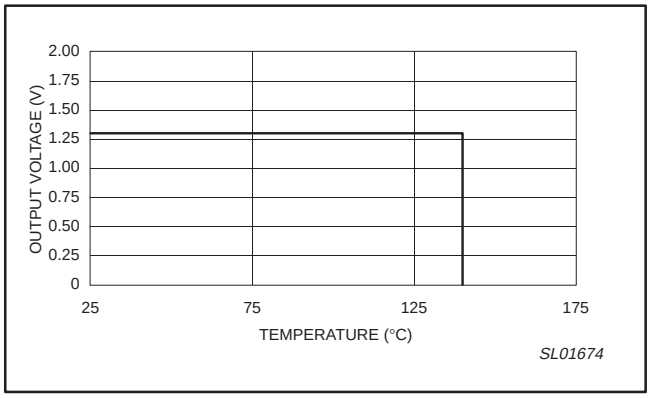


Figure 7. Thermal shutdown.

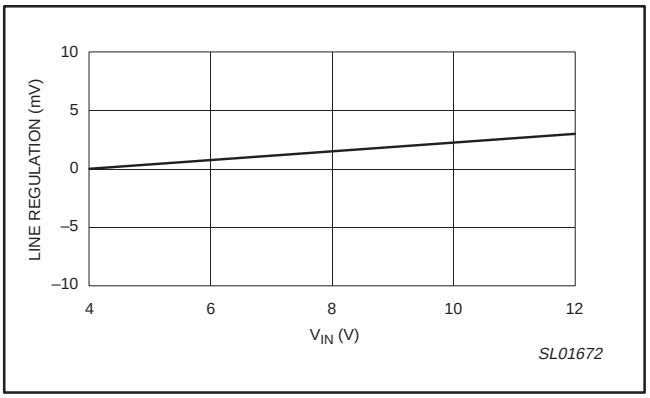


Figure 5. Line regulation.

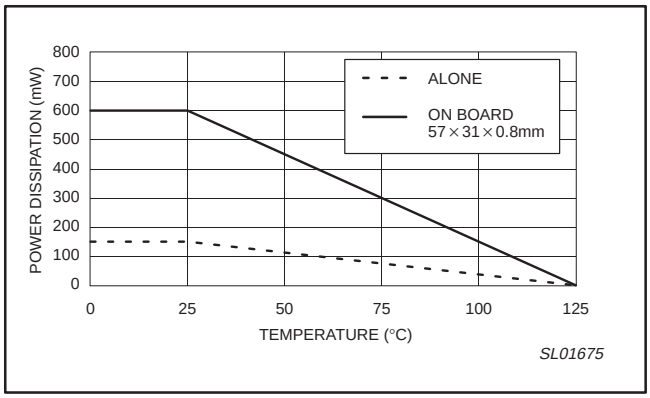


Figure 8. Power dissipation.

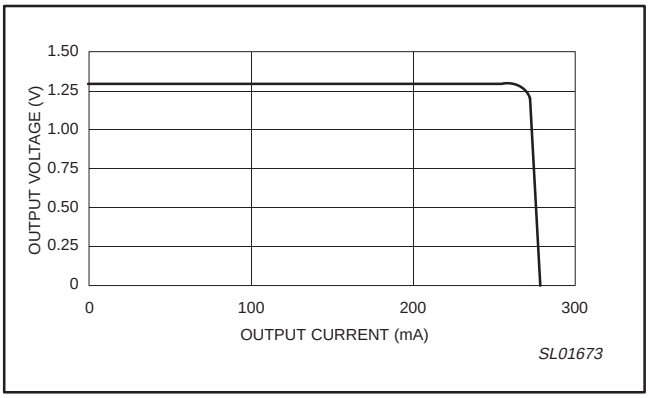


Figure 6. Current limit.

Timing diagram

The timing diagram shown in Figure 9 depicts the operation of the device.

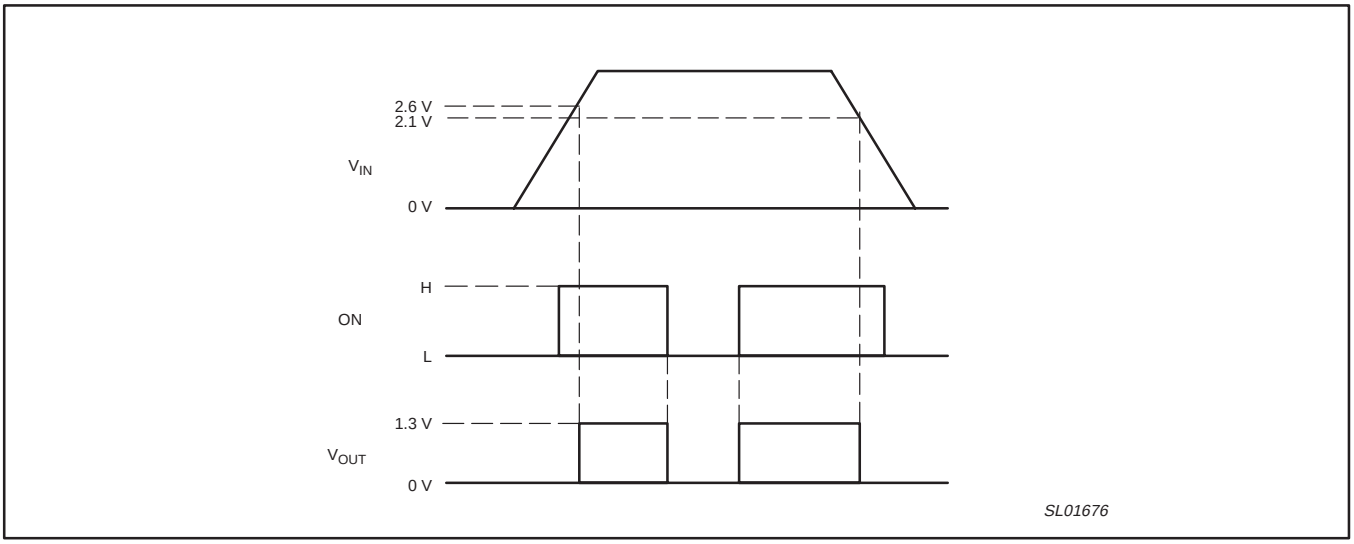


Figure 9. Timing diagram.

APPLICATION INFORMATION

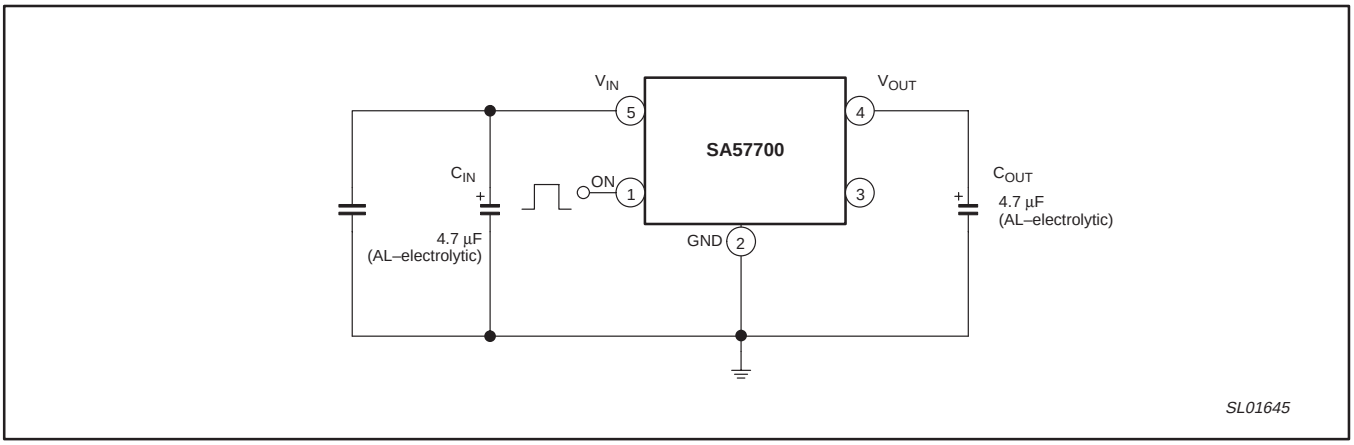


Figure 10. Typical application circuit.

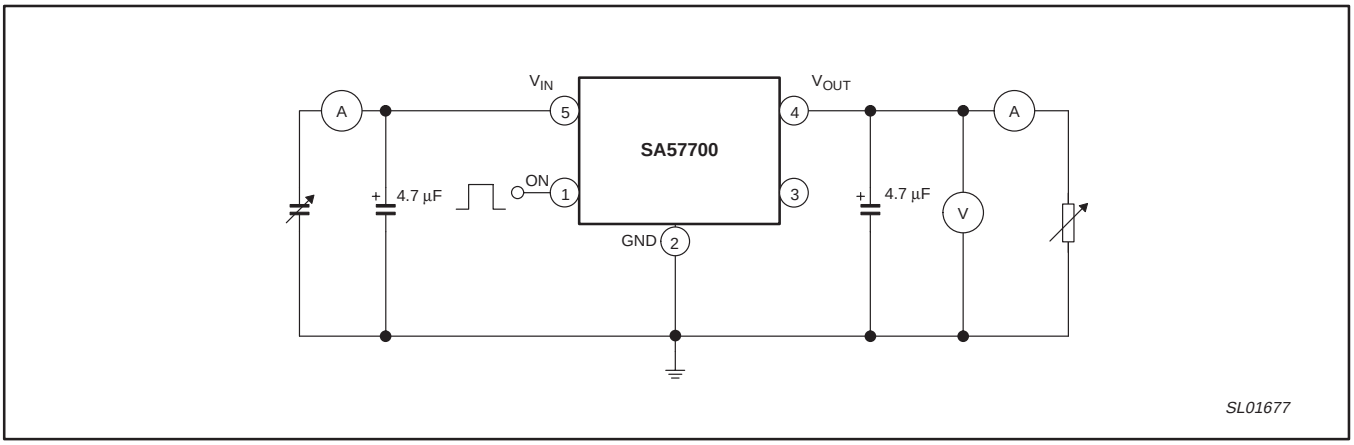


Figure 11. Test circuit.

PACKING METHOD

The SA57700 is packed in reels, as shown in Figure 12.

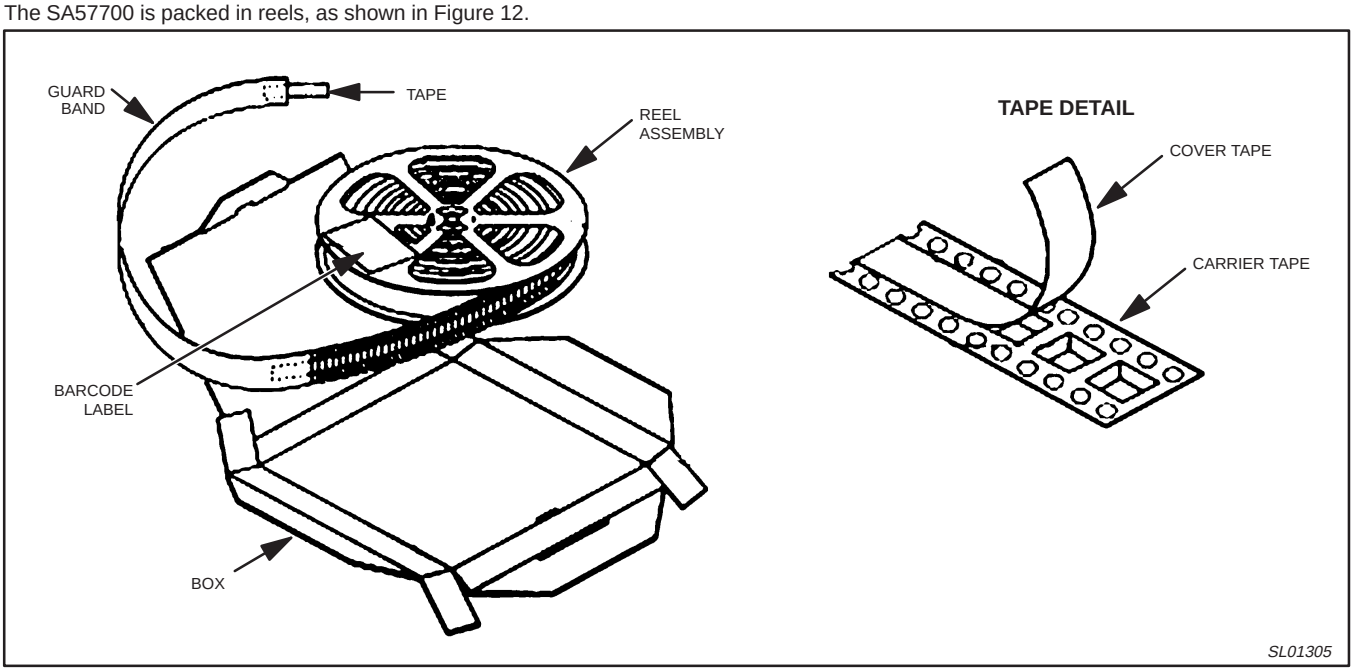
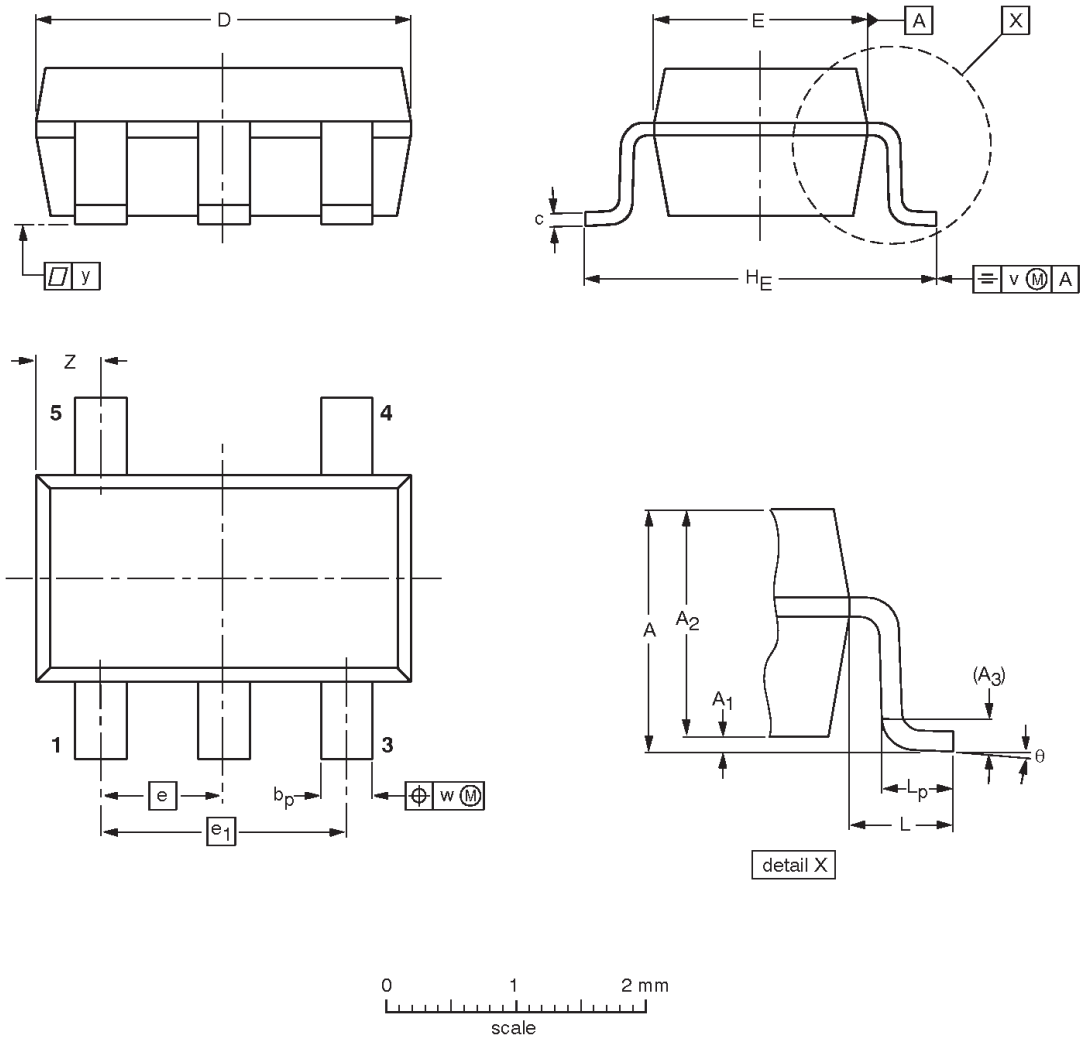


Figure 12. Tape and reel packing method.

SOT23-5: plastic small outline package; 5 leads; body width 1.5 mm



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	e_1	H_E	L	L_p			y		θ
mm	1.35	0.05 0.15	1.2 1.0	0.025	0.55 0.41	0.22 0.08	3.00 2.70	1.70 1.50	0.95	1.90	3.00 2.60	0.60	0.55 0.35			0.1		8^o 0^o

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES			
	IEC	JEDEC	EIAJ	
		MO-178		

Data sheet status

Data sheet status [1]	Product status [2]	Definitions
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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