LM26 SOT-23, ±3°C Accurate, Factory Preset Thermostat

Check for Samples: LM26

FEATURES

- **Internal Comparator With Pin Programmable 2°C or 10°C Hysteresis**
- **No External Components Required**
- **Open Drain or Push-Pull Digital Output; Supports CMOS Logic Levels**
- **Internal Temperature Sensor With V_{TEMP} Output Pin**
- **V_{TEMP} Output Allows After-Assembly System Testing**
- **Internal Voltage Reference and DAC for Trip-Point Setting**
- **Currently Available in 5-pin SOT-23 Plastic Package**
- **Excellent Power Supply Noise Rejection**
- **UL Recognized Component**

APPLICATIONS

- **Microprocessor Thermal Management**
- **Appliances**
- **Portable Battery Powered Systems**
- **Fan Control**
- **Industrial Process Control**
- **HVAC Systems**
- **Remote Temperature Sensing**
- **Electronic System Protection**

KEY SPECIFICATIONS

- **Power Supply Voltage 2.7V to 5.5V**
- **Power Supply Current 40µA (max) 20µA (typ)**
- **Hysteresis Temperature 2°C or 10°C (typ)**

DESCRIPTION

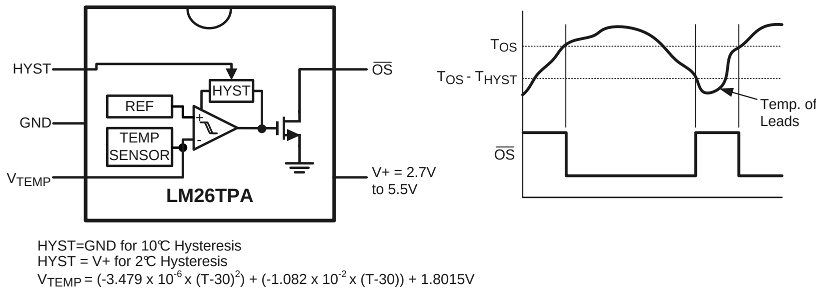
The LM26 is a precision, single digital-output, low-power thermostat comprised of an internal reference, DAC, temperature sensor and comparator. Utilizing factory programming, it can be manufactured with different trip points as well as different digital output functionality. The trip point (T_{OS}) can be preset at the factory to any temperature in the range of −55°C to +110°C in 1°C increments. The LM26 has one digital output (OS/$\overline{OS}$/US/$\overline{US}$), one digital input (HYST) and one analog output (V_{TEMP}). The digital output stage can be preset as either open-drain or push-pull. In addition, it can be factory programmed to be active HIGH or LOW. The digital output can be factory programmed to indicate an over temperature shutdown event (OS or $\overline{OS}$) or an under temperature shutdown event (US or $\overline{US}$). When preset as an overtemperature shutdown ($\overline{OS}$) it will go LOW to indicate that the die temperature is over the internally preset T_{OS} and go HIGH when the temperature goes below (T_{OS}–T_{HYST}). Similarly, when preprogrammed as an undertemperature shutdown (US) it will go HIGH to indicate that the temperature is below T_{US} and go LOW when the temperature is above (T_{US}+T_{HYST}). The typical hysteresis, T_{HYST}, can be set to 2°C or 10°C and is controlled by the state of the HYST pin. A V_{TEMP} analog output provides a voltage that is proportional to temperature and has a −10.82mV/°C output slope.

Available parts are detailed in the ordering information. For other part options, contact a Texas Instruments Distributor or Sales Representative for information on minimum order qualification. The LM26 is currently available in a 5-lead SOT-23 package.

Table 1. Temperature Trip Point Accuracy

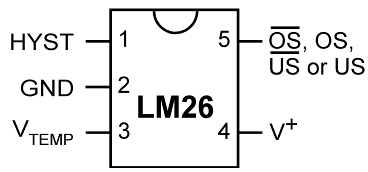
Temperature Range	LM26CIM
−55°C to +110°C	±3°C (max)
+120°C	±4°C (max)

LM26CIM5-TPA Simplified Block Diagram and Connection Diagram



The LM26CIM5-TPA has a fixed trip point of 85°C. For other trip point and output function availability, please see ordering information or contact Texas Instruments.

Connection Diagram



Pin Descriptions

Pin Number	Pin Name	Function	Connection
1	HYST	Hysteresis control, digital input	GND for 10°C or V^+ for 2°C
2	GND	Ground, connected to the back side of the die through lead frame.	System GND
3	V_{TEMP}	Analog output voltage proportional to temperature	Leave floating or connect to a high impedance node.
4	V^+	Supply input	2.7V to 5.5V with a 0.1µF bypass capacitor. For PSRR information see Section Titled NOISE CONSIDERATIONS.
5 (1)	$\overline{OS}$	Overtemperature Shutdown open-drain active low thermostat digital output	Controller interrupt, system or power supply shutdown; pull-up resistor ≥ 10kΩ
	OS	Overtemperature Shutdown push-pull active high thermostat digital output	Controller interrupt, system or power supply shutdown
	$\overline{US}$	Undertemperature Shutdown open-drain active low thermostat digital output	System or power supply shutdown; pull-up resistor ≥ 10kΩ
	US	Undertemperature Shutdown push-pull active high thermostat digital output	System or power supply shutdown

(1) Pin 5 functionality and trip point setting are programmed during LM26 manufacture.

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings [1]

Input Voltage	6.0V
Input Current at any pin [2]	5mA
Package Input Current [2]	20mA
Package Dissipation at T_A = 25°C [3]	500mW
Soldering Information [4] SOT-23 Package Vapor Phase (60 seconds) Infrared (15 seconds)	 215°C 220°C
Storage Temperature	−65°C to + 150°C
ESD Susceptibility [5] Human Body Model Machine Model	 2500V 250V

(1) *Absolute Maximum Ratings* indicate limits beyond which damage to the device may occur. *Operating Ratings* indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the *Electrical Characteristics*. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
(2) When the input voltage (V_I) at any pin exceeds the power supply (V_I < GND or $V_I > V^+$), the current at that pin should be limited to 5mA. The 20mA maximum package input current rating limits the number of pins that can safely exceed the power supplies with an input current of 5mA to four. Under normal operating conditions the maximum current that pins 2, 4 or 5 can handle is limited to 5mA each.
(3) The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{JMAX} (maximum junction temperature), $θ_{JA}$ (junction to ambient thermal resistance) and T_A (ambient temperature). The maximum allowable power dissipation at any temperature is $P_D = (T_{JMAX}–T_A) / θ_{JA}$ or the number given in the *Absolute Maximum Ratings*, whichever is lower. For this device, T_{JMAX} = 150°C. For this device the typical thermal resistance ($θ_{JA}$) of the different package types when board mounted follow:
(4) See the URL http://www.ti.com/packaging for other recommendations and methods of soldering surface mount devices.
(5) The human body model is a 100pF capacitor discharge through a 1.5kΩ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.

Operating Ratings [1]

Specified Temperature Range	**$T_{MIN} ≤ T_A ≤ T_{MAX}$**
LM26CIM	−55°C ≤ T_A ≤ +125°C
Positive Supply Voltage (V^+)	+2.7V to +5.5V
Maximum V_{OUT}	+5.5V

(1) *Absolute Maximum Ratings* indicate limits beyond which damage to the device may occur. *Operating Ratings* indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the *Electrical Characteristics*. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

LM26 Electrical Characteristics

The following specifications apply for $V^+ = 2.7V_{DC}$ to $5.5V_{DC}$, and V_{TEMP} load current = 0µA unless otherwise specified. **Boldface limits apply for $T_A = T_J = T_{MIN}$ to T_{MAX};** all other limits $T_A = T_J = 25°C$ unless otherwise specified.

Symbol	Parameter	Conditions	Typical (1)	LM26CIM Limits (2)	Units (Limits)
Temperature Sensor					
	Trip Point Accuracy (Includes V_{REF}, DAC, Comparator Offset, and Temperature Sensitivity errors)	-55°C ≤ T_A ≤ +110°C		±3	°C (max)
		+120°C		±4	°C (max)
	Trip Point Hysteresis	HYST = GND	11		°C
		HYST = V^+	2		°C
	V_{TEMP} Output Temperature Sensitivity		−10.82		mV/°C
	V_{TEMP} Temperature Sensitivity Error to Equation: $V_O = (-3.479\times10^{-6}\times(T-30)^2) + (-1.082\times10^{-2}\times(T-30)) + 1.8015V$	−30°C ≤ T_A ≤ 120°C, 2.7V ≤ V^+ ≤ 5.5V		**±3**	°C (max)
		−55°C ≤ T_A ≤ 120°C, 4.5V ≤ V^+ ≤ 5.5V		**±3**	°C (max)
		T_A = 30°C		±2.5	°C (max)
	V_{TEMP} Load Regulation	Source ≤ 1 µA	0.070		mV
		Sink ≤ 40 µA		**0.7**	mV (max)
	V_{TEMP} Line Regulation	+2.7V ≤ V^+ ≤ +5.5V, −30°C ≤ T_A ≤ +120°C	−0.2		mV/V
I_S	Supply Current		16	20 **40**	µA (max) µA (max)
Digital Output and Input					
$I_{OUT(“1”)}$	Logical “1” Output Leakage Current (3)	V^+ = +5.0V	0.001	1	µA (max)
$V_{OUT(“0”)}$	Logical “0” Output Voltage	I_{OUT} = +1.2mA and V^+≥2.7V; I_{OUT} = +3.2mA and V^+≥4.5V; (4)		**0.4**	V (max)
$V_{OUT(“1”)}$	Logical “1” Push-Pull Output Voltage	I_{SOURCE} = 500µA, V^+ ≥ 2.7V		**0.8 × V^+**	V (min)
		I_{SOURCE} = 800µA, V^+≥4.5V		**V^+ − 1.5**	V (min)
V_{IH}	HYST Input Logical ”1“ Threshold Voltage			**0.8 × V^+**	V (min)
V_{IL}	HYST Input Logical ”0“ Threshold Voltage			**0.2 × V^+**	V (max)

(1) Typicals are at $T_J = T_A = 25°C$ and represent most likely parametric norm.
(2) Limits are guaranteed to TI's AOQL (Average Outgoing Quality Level).
(3) The 1µA limit is based on a testing limitation and does not reflect the actual performance of the part. Expect to see a doubling of the current for every 15°C increase in temperature. For example, the 1nA typical current at 25°C would increase to 16nA at 85°C.
(4) Care should be taken to include the effects of self heating when setting the maximum output load current. The power dissipation of the LM26 would increase by 1.28mW when I_{OUT} = 3.2mA and V_{OUT} = 0.4V. With a thermal resistance of 250°C/W, this power dissipation would cause an increase in the die temperature of about 0.32°C due to self heating. Self heating is not included in the trip point accuracy specification.

Package Type	θ_{JA}
SOT-23 5 pin, DBV0005B	250°C/W

Part Number Template

The series of digits labeled xyz in the part number LM26CIM-xyz, describe the set point value and the function of the output as follows:

The place holders xy describe the set point temperature as shown in the following table.

x (10x)	y (1x)	Temperature (°C)
A	-	−5
B	-	−4
C	-	−3
D	-	−2
E	-	−1
F	-	−0
H	H	0
J	J	1
K	K	2
L	L	3
N	N	4
P	P	5
R	R	6
S	S	7
T	T	8
V	V	9
X	-	10
Y	-	11
Z	-	12

The value of z describes the assignment/function of the output as shown in the following table:

Active-$\overline{\text{Low}}$/High	$\overline{\text{Open-Drain}}$/ Push-Pull	$\overline{\text{OS}}$/US	Value of z	Digital Output Function
0	0	0	A	Active-Low, Open-Drain, $\overline{\text{OS}}$ output
0	0	1	B	Active-Low, Open-Drain, $\overline{\text{US}}$ output
1	1	0	C	Active-High, Push-Pull, OS output
1	1	1	D	Active-High, Push-Pull, US output

For example:

- the part number LM26CIM5-TPA has T_{OS} = 85°C, and programmed as an active-low open-drain overtemperature shutdown output.
- the part number LM26CIM5-FPD has T_{US} = −5°C, and programmed as an active-high, push-pull undertemperature shutdown output.

Active-high open-drain and active-low push-pull options are available, please contact Texas Instruments for more information.

FUNCTIONAL DESCRIPTION

LM26 OPTIONS

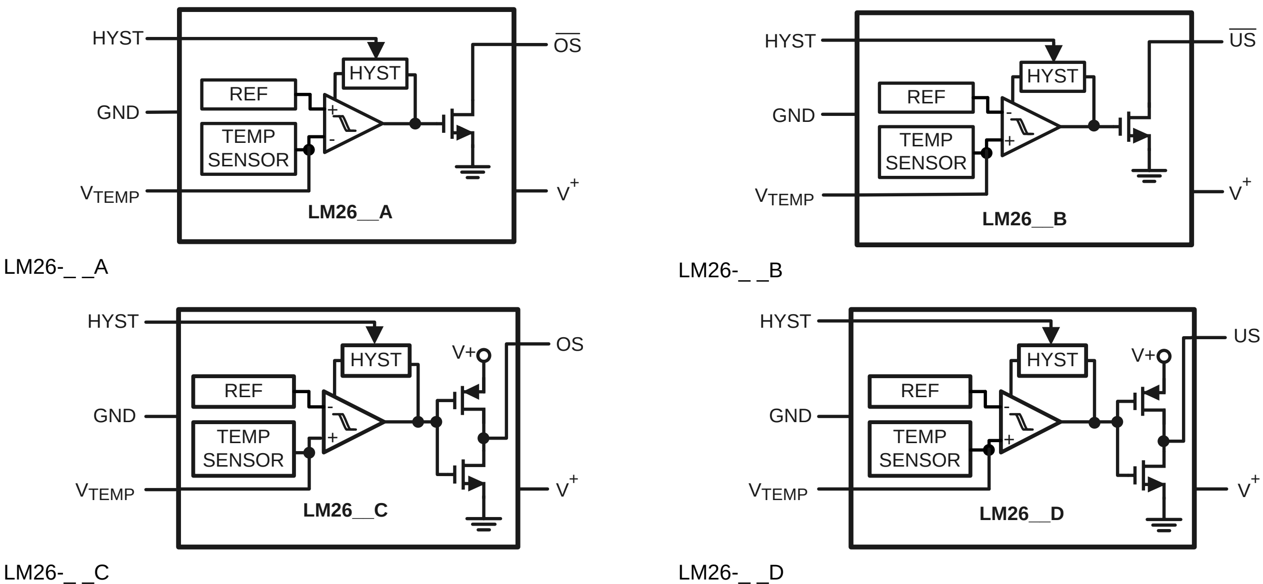


Figure 1. Output Pin Block Diagram

The LM26 can be factory programmed to have a trip point anywhere in the range of −55°C to +110°C.

Applications Hints

AFTER-ASSEMBLY PCB TESTING

The LM26's V_{TEMP} output allows after-assembly PCB testing by following a simple test procedure. Simply measuring the V_{TEMP} output voltage will verify that the LM26 has been assembled properly and that its temperature sensing circuitry is functional. The V_{TEMP} output has very weak drive capability that can be overdriven by 1.5mA. Therefore, one can simply force the V_{TEMP} voltage to cause the digital output to change state, thereby verifying that the comparator and output circuitry function after assembly. Here is a sample test procedure that can be used to test the LM26CIM5-TPA which has an 85°C trip point.

1. Turn on V^+ and measure V_{TEMP}. Then calculate the temperature reading of the LM26 using the equation:

$$V_O = (-3.47 \times 10^{-6} \times (T - 30)^2) + (-1.082 \times (T - 30)) + 1.8015V \quad (1)$$

   or

$$T = -1525.04 + \sqrt{2.4182 \times 10^6 + \frac{1.8015 - V_{TEMP}}{3.479 \times 10^{-6}}} \quad (2)$$

2. Verify that the temperature measured in step one is within (±3°C + error of reference temperature sensor) of the ambient/board temperature. The ambient/board temperature (reference temperature) should be measured using an extremely accurate calibrated temperature sensor.
3.
   (a) Observe that $\overline{OS}$ is high.
   (b) Drive V_{TEMP} to ground.
   (c) Observe that $\overline{OS}$ is now low.
   (d) Release the V_{TEMP} pin.
   (e) Observe that $\overline{OS}$ is now high.
4.
   (a) Observe that $\overline{OS}$ is high.
   (b) Drive V_{TEMP} voltage down gradually.

(c) When $\overline{OS}$ goes low, note the V_{TEMP} voltage.
(d) V_{TEMP}Trig = V_{TEMP} at $\overline{OS}$ trigger (HIGH->LOW)
(e) Calculate Trig using Equation 2.

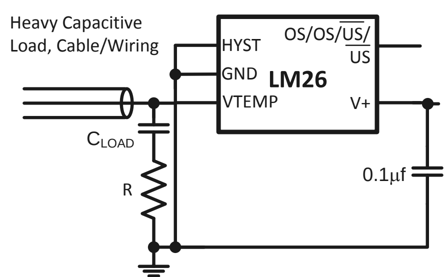
5.
(a) Gradually raise V_{TEMP} until $\overline{OS}$ goes HIGH. Note V_{TEMP}.
(b) Calculate T_{HYST} using Equation 2.

V_{TEMP} LOADING

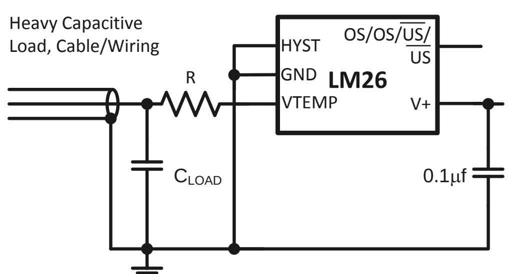
The V_{TEMP} output has very weak drive capability (1 µA source, 40 µA sink). So care should be taken when attaching circuitry to this pin. Capacitive loading may cause the V_{TEMP} output to oscillate. Simply adding a resistor in series as shown in Figure 2 will prevent oscillations from occurring. To determine the value of the resistor follow the guidelines given in Table 2. The same value resistor will work for either placement of the resistor. If an additional capacitive load is placed directly on the LM26 output, rather than across C_{LOAD}, it should be at least a factor of 10 smaller than C_{LOAD}.

Table 2. Resistive compensation for capacitive loading of V_{TEMP}

C_{LOAD}	R (Ω)
≤100pF	0
1nF	8200
10nF	3000
100nF	1000
≥1µF	430



a) R in series with capacitor



b) R in series with signal path

Figure 2. Resistor placement for capacitive loading compensation of V_{TEMP}

NOISE CONSIDERATIONS

The LM26 has excellent power supply noise rejection. Listed below is a variety of signals used to test the LM26 power supply rejection. False triggering of the output was not observed when these signals where coupled into the V+ pin of the LM26.

- square wave 400kHz, 1Vp-p
- square wave 2kHz, 200mVp-p
- sine wave 100Hz to 1MHz, 200mVp-p

Testing was done while maintaining the temperature of the LM26 one degree centigrade way from the trip point with the output not activated.

MOUNTING CONSIDERATIONS

The LM26 can be applied easily in the same way as other integrated-circuit temperature sensors. It can be glued or cemented to a surface. The temperature that the LM26 is sensing will be within about +0.06°C of the surface temperature to which the LM26's leads are attached to.

This presumes that the ambient air temperature is almost the same as the surface temperature; if the air temperature were much higher or lower than the surface temperature, the actual temperature measured would be at an intermediate temperature between the surface temperature and the air temperature.

To ensure good thermal conductivity, the backside of the LM26 die is directly attached to the GND pin (pin 2). The temperatures of the lands and traces to the other leads of the LM26 will also affect the temperature that is being sensed.

Alternatively, the LM26 can be mounted inside a sealed-end metal tube, and can then be dipped into a bath or screwed into a threaded hole in a tank. As with any IC, the LM26 and accompanying wiring and circuits must be kept insulated and dry, to avoid leakage and corrosion. This is especially true if the circuit may operate at cold temperatures where condensation can occur. Printed-circuit coatings and varnishes such as Humiseal and epoxy paints or dips are often used to ensure that moisture cannot corrode the LM26 or its connections.

The junction to ambient thermal resistance (θ_{JA}) is the parameter used to calculate the rise of a part's junction temperature due to its power dissipation. For the LM26 the equation used to calculate the rise in the die junction temperature is as follows:

$$T_J = T_A + \Theta_{JA}\left(V^+ - V_{TEMP}\right)I_{L\_TEMP} + V_{DO}I_{DO}) \quad (3)$$

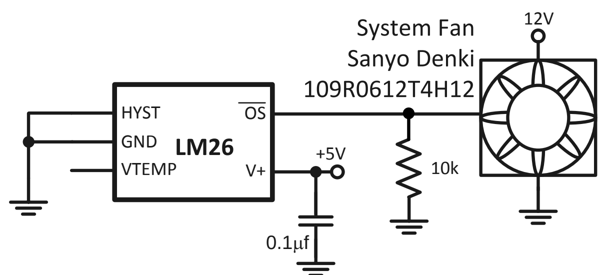
where T_A is the ambient temperature, V^+ is the power supply voltage, I_Q is the quiescent current, I_{L_TEMP} is the load current on the V_{TEMP} output, V_{DO} is the voltage on the digital output, and I_{DO} is the load current on the digital output. Since the LM26's junction temperature is the actual temperature being measured, care should be taken to minimize the load current that the LM26 is required to drive.

Table 3 summarizes the thermal resistance for different conditions and the rise in die temperature of the LM26 without any loading on V_{TEMP} and a 10k pull-up resistor on an open-drain digital output with a 5.5V power supply.

Table 3. Thermal resistance (θ_{JA}) and temperature rise due to self heating (T_J−T_A)

	SOT-23 5 pin no heat sink		SOT-23 5-pin small heat sink	
	θ_{JA} (°C/W)	T_J−T_A (°C)	θ_{JA} (°C/W)	T_J−T_A (°C)
Still Air	250	0.11	TBD	TBD
Moving Air	TBD	TBD	TBD	TBD

Typical Applications



Note: The fan's control pin has internal pull-up. The 10k pull-down sets a slow fan speed. When the output of the LM26 goes low, the fan will speed up.

Figure 3. Two Speed Fan Speed Control

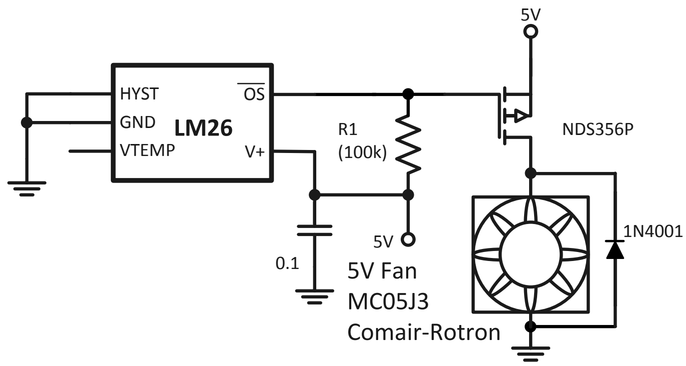


Figure 4. Fan High Side Drive

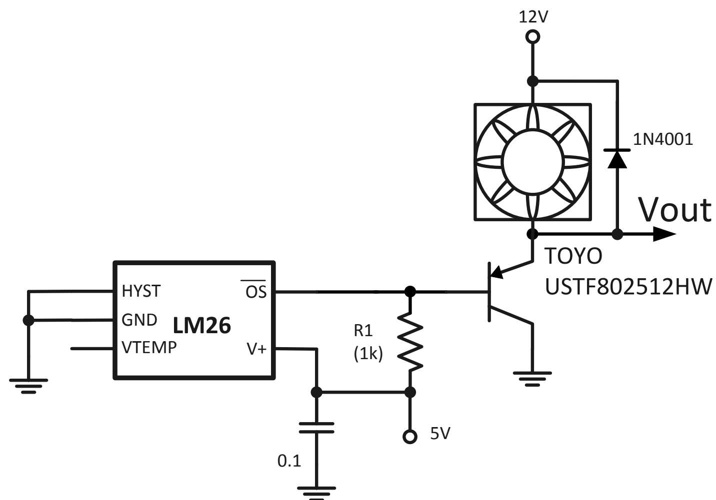


Figure 5. Fan Low Side Drive

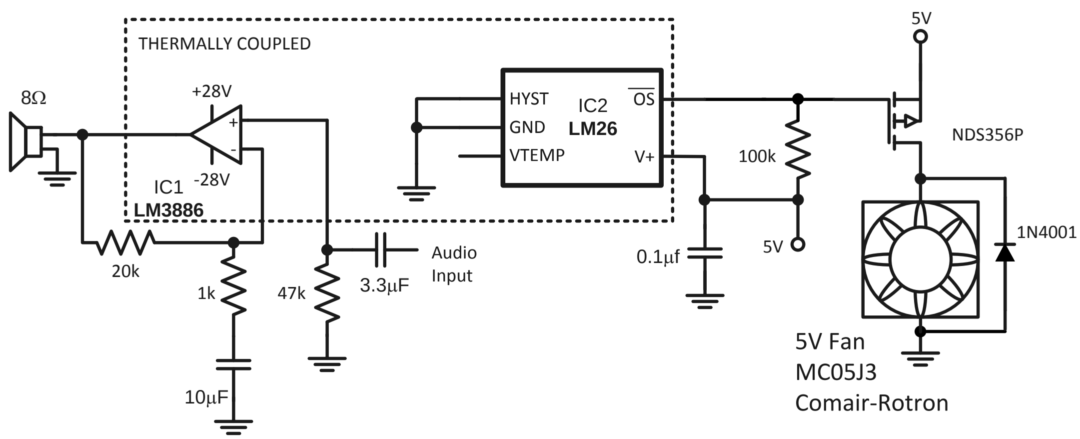


Figure 6. Audio Power Amplifier Thermal Protection

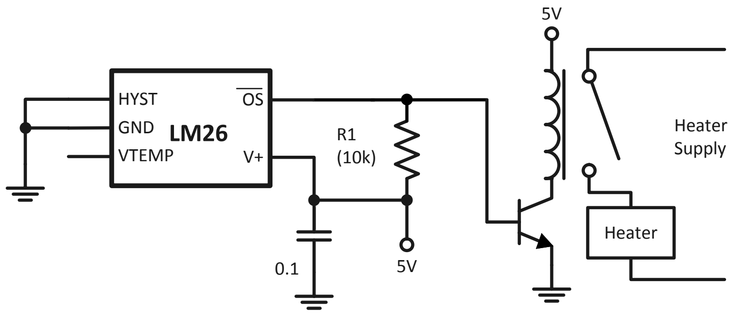


Figure 7. Simple Thermostat

REVISION HISTORY

Changes from Revision Q (February 2013) to Revision R	Page
• Changed layout of National Data Sheet to TI format	10

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM26CIM5-BPB/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM		TBPB	Samples
LM26CIM5-DPB/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TDPB	Samples
LM26CIM5-HHD/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	THHD	Samples
LM26CIM5-NPA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TNPA	Samples
LM26CIM5-PHA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TPHA	Samples
LM26CIM5-RPA	NRND	SOT-23	DBV	5	1000	TBD	Call TI	Call TI	-55 to 125	TRPA	
LM26CIM5-RPA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TRPA	Samples
LM26CIM5-SHA	NRND	SOT-23	DBV	5	1000	TBD	Call TI	Call TI	-55 to 125	TSHA	
LM26CIM5-SHA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TSHA	Samples
LM26CIM5-SPA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TSPA	Samples
LM26CIM5-TPA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TTPA	Samples
LM26CIM5-VHA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TVHA	Samples
LM26CIM5-VPA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TVPA	Samples
LM26CIM5-XHA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TXHA	Samples
LM26CIM5-XPA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TXPA	Samples
LM26CIM5-YHA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TYHA	Samples
LM26CIM5-YPA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TYPA	Samples
LM26CIM5-ZHA	NRND	SOT-23	DBV	5	1000	TBD	Call TI	Call TI	-55 to 125	TZHA	

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM26CIM5-ZHA/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TZHA	Samples
LM26CIM5X-DPB/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TDPB	Samples
LM26CIM5X-HHD	NRND	SOT-23	DBV	5	3000	TBD	Call TI	Call TI	-55 to 125	THHD	
LM26CIM5X-HHD/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	THHD	Samples
LM26CIM5X-NPA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TNPA	Samples
LM26CIM5X-PHA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TPHA	Samples
LM26CIM5X-RPA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TRPA	Samples
LM26CIM5X-SHA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TSHA	Samples
LM26CIM5X-SPA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TSPA	Samples
LM26CIM5X-TPA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TTPA	Samples
LM26CIM5X-VHA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TVHA	Samples
LM26CIM5X-VPA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TVPA	Samples
LM26CIM5X-XHA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TXHA	Samples
LM26CIM5X-XPA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TXPA	Samples
LM26CIM5X-YHA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TYHA	Samples
LM26CIM5X-YPA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TYPA	Samples
LM26CIM5X-ZHA/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-55 to 125	TZHA	Samples

(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.
OBSOLETE: 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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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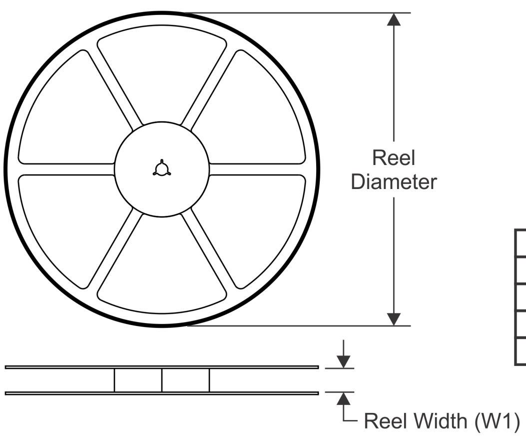
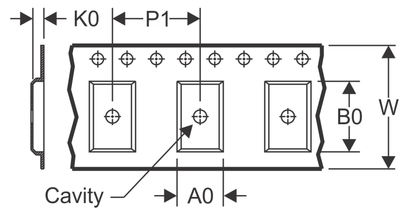
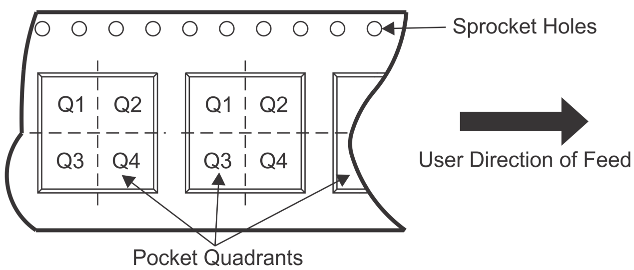
TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

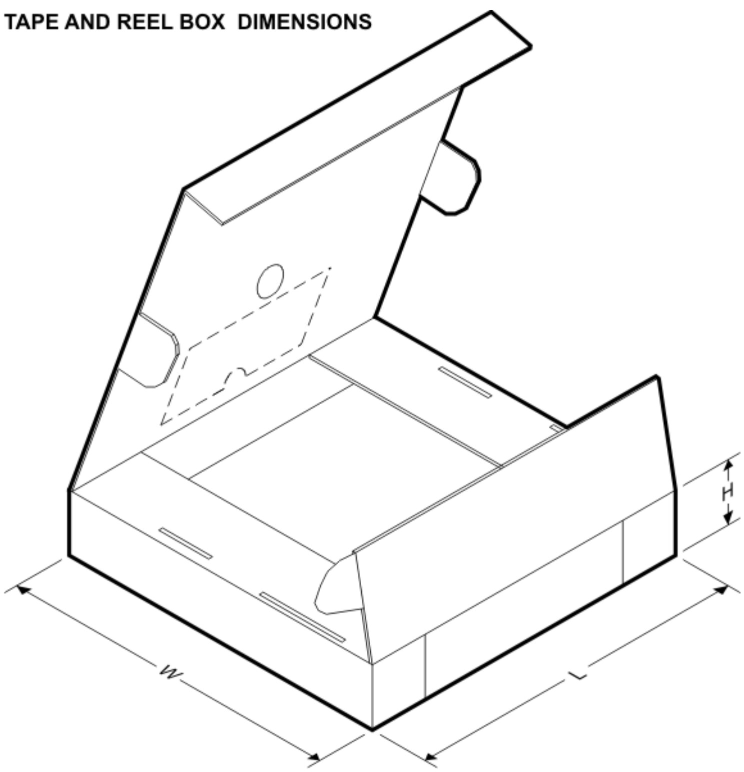


*All dimensions are nominal

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
LM26CIM5-BPB/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-DPB/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-HHD/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-NPA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-PHA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-RPA	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-RPA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-SHA	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-SHA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-SPA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-TPA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-VHA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-VPA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-XHA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-XPA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-YHA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-YPA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5-ZHA	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3

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
LM26CIM5-ZHA/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-DPB/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-HHD	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-HHD/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-NPA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-PHA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-RPA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-SHA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-SPA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-TPA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-VHA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-VPA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-XHA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-XPA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-YHA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-YPA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM26CIM5X-ZHA/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3

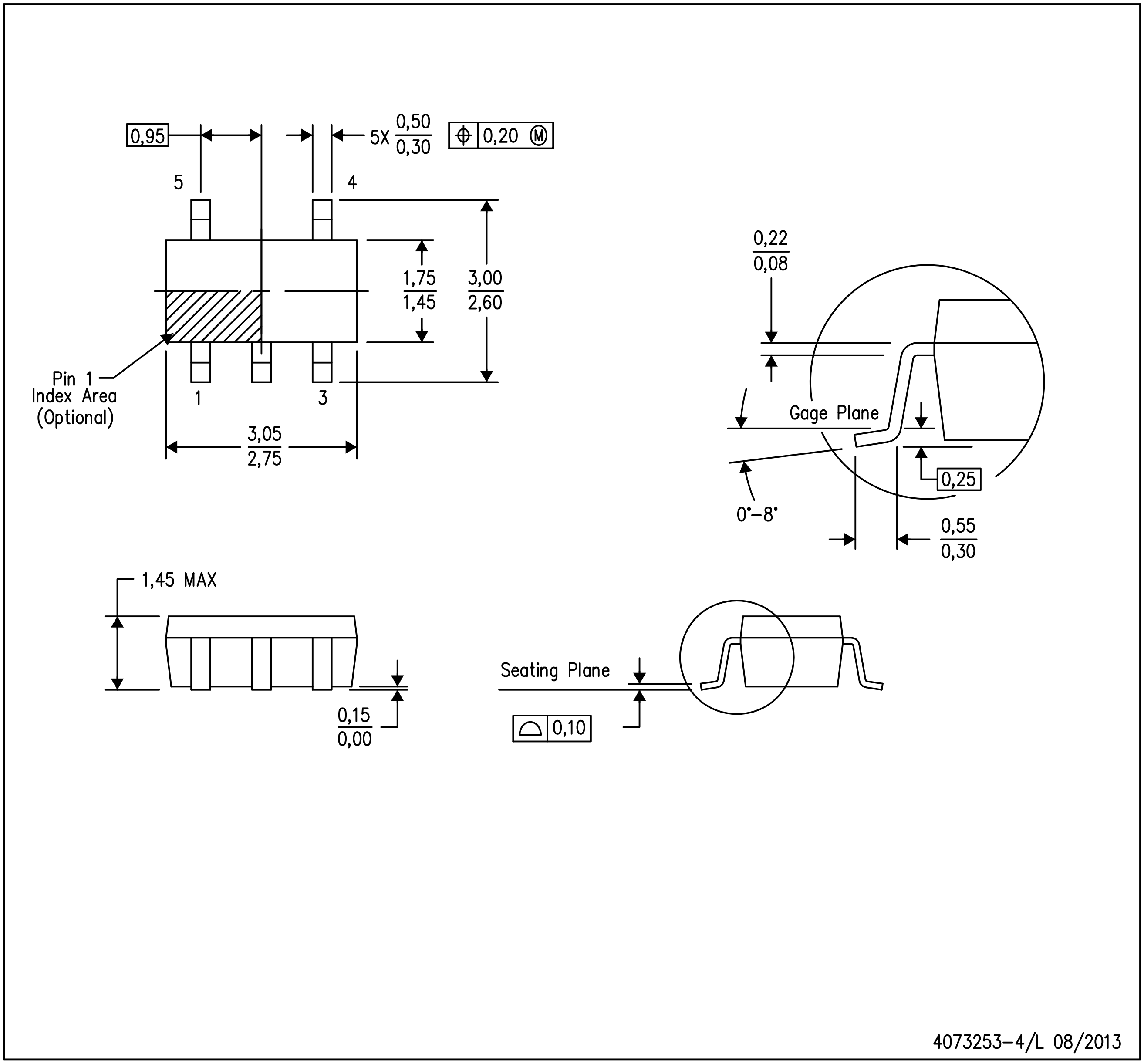
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

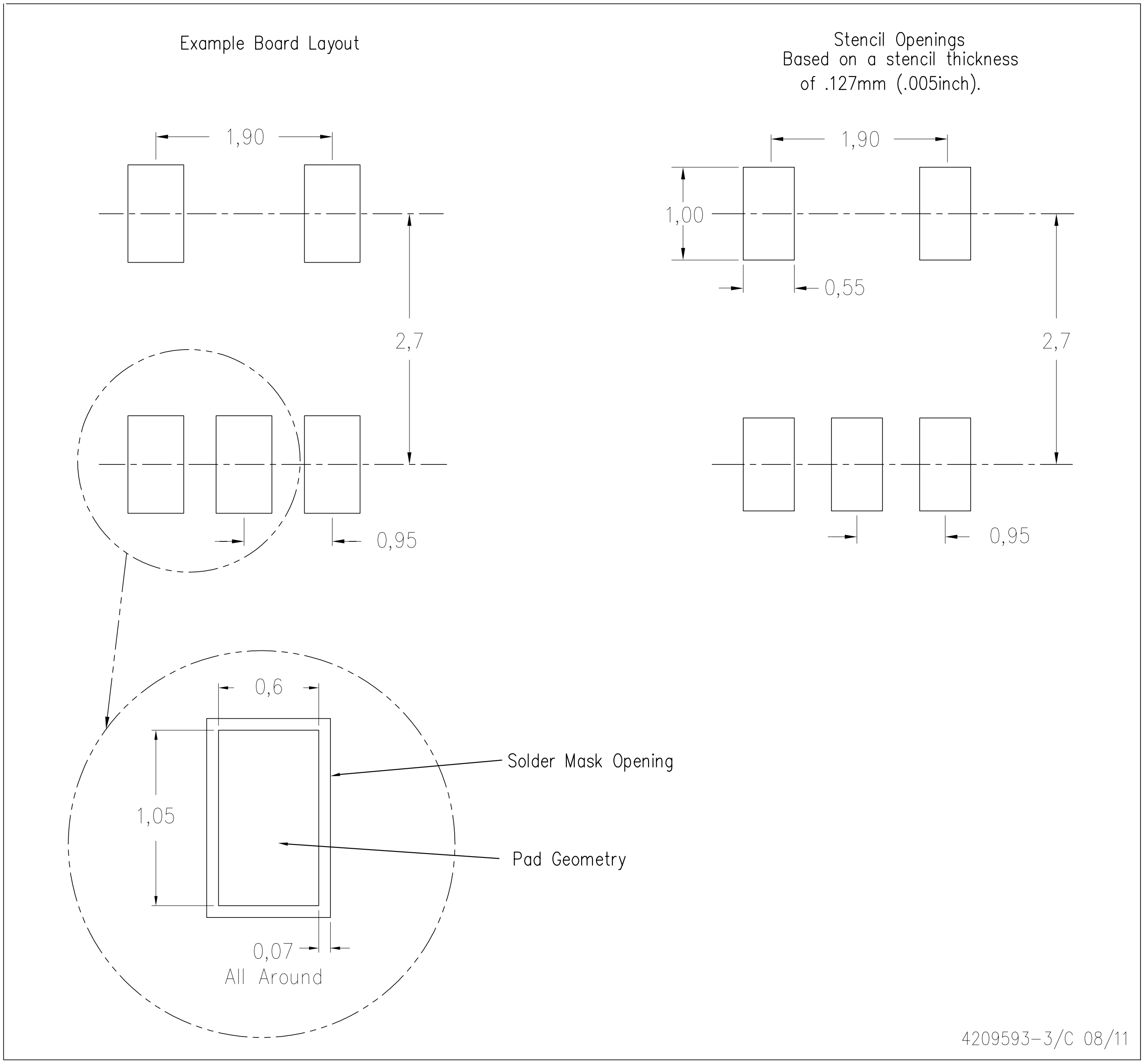
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM26CIM5-BPB/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-DPB/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-HHD/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-NPA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-PHA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-RPA	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-RPA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-SHA	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-SHA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-SPA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-TPA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-VHA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-VPA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-XHA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-XPA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-YHA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-YPA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-ZHA	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5-ZHA/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM26CIM5X-DPB/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-HHD	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-HHD/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-NPA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-PHA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-RPA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-SHA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-SPA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-TPA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-VHA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-VPA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-XHA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-XPA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-YHA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-YPA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM26CIM5X-ZHA/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0

DBV (R-PDSO-G5) PLASTIC SMALL-OUTLINE PACKAGE



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO-178 Variation AA.

DBV (R–PDSO–G5) PLASTIC SMALL OUTLINE



NOTES:
- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
- D. Publication IPC–7351 is recommended for alternate designs.
- E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC–7525 for other stencil recommendations.

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