LM3490 100 mA, SOT-23, Quasi Low-Dropout Linear Voltage Regulator with Logic-Controlled ON/OFF

Check for Samples: LM3490

FEATURES

- **3.3, 5, 12, and 15V Versions Available**
- **Logic-Controlled ON/OFF**
- **Packaged in the Tiny 5-Lead SOT-23 Package**

APPLICATIONS

- **Tiny Alternative to LM78LXX Series and Similar Devices**
- **Tiny 5V±5% to 3.3V, 100 mA Converter**
- **Post Regulator for Switching DC/DC Converter**
- **Bias Supply for Analog Circuits**

KEY SPECIFICATIONS

- **30V Maximum Input for Operation**
- **1.2V Specified Maximum Dropout over Full Load and Temperature Ranges**
- **100 mA Specified Load Current**
- **±5% Specified Output Voltage Tolerance over Full Load and Temperature Ranges**
- **−40 to +125°C Junction Temperature Range for Operation**

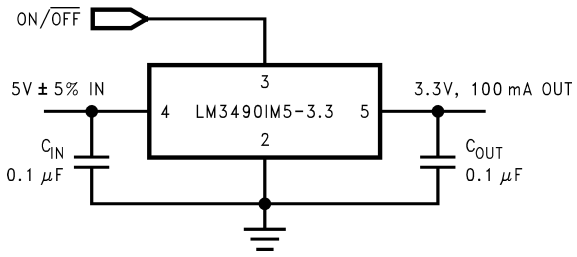
DESCRIPTION

The LM3490 is an integrated linear voltage regulator. It features operation from an input as high as 30V and a specified maximum dropout of 1.2V at the full 100 mA load. Standard packaging for the LM3490 is the 5-lead SOT-23 package. A logic-controlled ON/OFF feature makes the LM3490 ideal for powering subsystems ON and OFF as needed.

The 5, 12, and 15V members of the LM3490 series are intended as tiny alternatives to industry standard LM78LXX series and similar devices. The 1.2V quasi low dropout of LM3490 series devices makes them a nice fit in many applications where the 2 to 2.5V dropout of LM78LXX series devices precludes their (LM78LXX series devices) use.

The LM3490 series features a 3.3V member. The SOT packaging and quasi low dropout features of the LM3490 series converge in this device to provide a very nice, very tiny 3.3V, 100 mA bias supply that regulates directly off the system 5V±5% power supply.

Typical Application Circuit



Connection Diagram

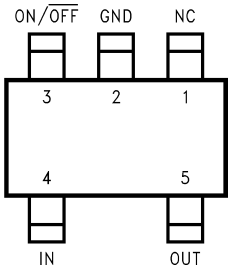


Figure 1. Top View
SOT-23 Package
5-Lead, Molded-Plastic Small-Outline Transistor (SOT) Package
Package Code DBV0005A

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)(2)

Input Voltage (IN to GND)		35V
Voltage ON/$\overline{\text{OFF}}$ to GND		5.5V
Power Dissipation(3)		400 mW
Junction Temp. (T_J)(3)		+150°C
Ambient Storage Temp.		−65 to +150°C
Soldering Time, Temp.(4)	Wave	4sec., 260°C
	Infrared	10sec., 240°C
	Vapor Phase	75sec., 219°C
ESD(5)	ON/$\overline{\text{OFF}}$	1.0kV
	All Other Pins	2.0kV

(1) Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Ratings are conditions under which operation of the device is specified. Operating Ratings do not imply ensured performance limits. For ensured performance limits and associated test conditions, see the Electrical Characteristics tables.
(2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.
(3) The Absolute Maximum power dissipation depends on the ambient temperature and can be calculated using $P = (T_J - T_A)/\theta_{JA}$ where T_J is the junction temperature, T_A is the ambient temperature, and θ_{JA} is the junction-to-ambient thermal resistance. The 400 mW rating results from substituting the Absolute Maximum junction temperature, 150°C, for T_J , 50°C for T_A, and 250°C/W for θ_{JA}. More power can be safely dissipated at lower ambient temperatures. Less power can be safely dissipated at higher ambient temperatures. The Absolute Maximum power dissipation can be increased by 4 mW for each °C below 50°C ambient. It must be derated by 4 mW for each °C above 50°C ambient. A θ_{JA} of 250°C/W represents the worst-case condition of no heat sinking of the 5-lead plastic SOT-23 package. Heat sinking enables the safe dissipation of more power. The LM3490 actively limits its junction temperature to about 150°C.
(4) Times shown are dwell times. Temperatures shown are dwell temperatures. For detailed information on soldering plastic small-outline packages, see http://www.ti.com.
(5) For testing purposes, ESD was applied using the human-body model, a 100 pF capacitor discharged through a 1.5 kΩ resistor.

OPERATING RATINGS(1)

Maximum Input Voltage (IN to GND)	30V
Voltage ON/$\overline{\text{OFF}}$ to GND	0 to 5V
Junction Temperature (T_J)	−40 to +125°C
Maximum Power Dissipation(2)	300 mW

(1) Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Ratings are conditions under which operation of the device is specified. Operating Ratings do not imply ensured performance limits. For ensured performance limits and associated test conditions, see the Electrical Characteristics tables.
(2) As with the Absolute Maximum power dissipation, the maximum power dissipation for operation depends on the ambient temperature. The 300 mW rating appearing under Operating Ratings results from substituting the maximum junction temperature for operation, 125°C, for T_J, 50°C for T_A, and 250°C/W for θ_{JA} in $P = (T_J - T_A)/\theta_{JA}$. More power can be dissipated at lower ambient temperatures. Less power can be dissipated at higher ambient temperatures. The maximum power dissipation for operation appearing under Operating Ratings can be increased by 4 mW for each °C below 50°C ambient. It must be derated by 4 mW for each °C above 50°C ambient. A θ_{JA} of 250°C/W represents the worst-case condition of no heat sinking of the 5-lead plastic SOT-23 package. Heat sinking enables the dissipation of more power during operation.

ELECTRICAL CHARACTERISTICS LM3490-3.3, LM3490-5.0

$V_{IN} = V_{NOM} + 1.5V$ unless otherwise noted. Typicals and limits appearing in normal type apply for $T_A = T_J = 25°C$. Limits appearing in boldface type apply over the entire junction temperature range for operation, −40 to +125°C (1)(2)(3)

Nominal Output Voltage (V_{NOM})			3.3V		5.0V		Units
Symbol	Parameter	Conditions	Typical	Limit	Typical	Limit	
V_{OUT}	Output Voltage	1 mA ≤ I_{OUT} ≤ 100 mA	3.30	 3.17 **3.14** 3.43 **3.46**	5.00	 4.80 **4.75** 5.20 **5.25**	V V(min) V(min) V(max) V(max)
ΔV_{OUT}	Line Regulation	V_{NOM} + 1.5V ≤ V_{IN} ≤ 30V, I_{OUT} = 1 mA	7	 **25**	9	 **25**	mV mV(max)
ΔV_{OUT}	Load Regulation	10 mA ≤ I_{OUT} ≤ 100 mA	15	 **40**	15	 **40**	mV mV(max)
I_{GND}	Ground Pin Current	V_{NOM} + 1.5V ≤ V_{IN} ≤ 30V, No Load					
		$V_{ON/\overline{OFF}}$ = 5V	2	 **4**	2	 **4**	mA mA(max)
		$V_{ON/\overline{OFF}}$ = 0V	0.1	 **5**	0.1	 **5**	µA µA(max)
V_{IN} - V_{OUT}	Dropout Voltage	I_{OUT} = 10 mA	0.7	 0.9 **1.0**	0.7	 0.9 **1.0**	V V(max) V(max)
		I_{OUT} = 100 mA	0.9	 1.1 **1.2**	0.9	 1.1 **1.2**	V V(max) V(max)
e_n	Output Noise Voltage	V_{IN} = 10V, Bandwidth: 10 Hz to 100 kHz	100		150		μV_{rms}
V_{IL}	Maximum Low Level Input Voltage at ON/$\overline{OFF}$			**0.2**		**0.2**	V(max)
V_{IH}	Minimum High Level Input Voltage at ON/$\overline{OFF}$			**2.0**		**2.0**	V(min)
I_{IL}		$V_{ON/\overline{OFF}}$ = 0V		**−1**		**−1**	µA(max)
I_{IH}		$V_{ON/\overline{OFF}}$ = 5V	1	 **20**	1	 **20**	µA µA(max)

(1) A typical is the center of characterization data taken with $T_A = T_J = 25°C$. Typicals are not ensured.
(2) All limits are specified. All electrical characteristics having room-temperature limits are tested during production with $T_A = T_J = 25°C$. All hot and cold limits are specified by correlating the electrical characteristics to process and temperature variations and applying statistical process control.
(3) All voltages except dropout are with respect to the voltage at the GND pin.

ELECTRICAL CHARACTERISTICS LM3490-12, LM3490-15

V_{IN} = V_{NOM} + 1.5V unless otherwise noted. Typicals and limits appearing in normal type apply for T_A = T_J = 25°C. Limits appearing in boldface type apply over the entire junction temperature range for operation, −40 to +125°C(1)(2)(3)

Nominal Output Voltage (V_{NOM})			12V		15V		Units
Symbol	Parameter	Conditions	Typical	Limit	Typical	Limit	
V_{OUT}	Output Voltage	1 mA ≤ I_{OUT} ≤ 100 mA	12.00	 11.52 **11.40** 12.48 **12.60**	15.00	 14.40 **14.25** 15.60 **15.75**	V V(min) V(min) V(max) V(max)
ΔV_{OUT}	Line Regulation	V_{NOM} + 1.5V ≤ V_{IN} ≤ 30V, I_{OUT} = 1 mA	14	 **40**	16	 **40**	mV mV(max)
ΔV_{OUT}	Load Regulation	10 mA ≤ I_{OUT} ≤ 100 mA	36	 **60**	45	 **75**	mV mV(max)
I_{GND}	Ground Pin Current	V_{NOM} + 1.5V ≤ V_{IN} ≤ 30V, No Load					
		$V_{ON/\overline{OFF}}$ = 5V	2	 **4**	2	 **4**	mA mA(max)
		$V_{ON/\overline{OFF}}$ = 0V	0.1	 **5**	0.1	 **5**	µA µA(max)
V_{IN} - V_{OUT}	Dropout Voltage	I_{OUT} = 10 mA	0.7	 0.9 **1.0**	0.7	 0.9 **1.0**	V V(max) V(max)
		I_{OUT} = 100 mA	0.9	 1.1 **1.2**	0.9	 1.1 **1.2**	V V(max) V(max)
e_n	Output Noise Voltage	V_{IN} = 10V, Bandwidth: 10 Hz to 100 kHz	360		450		μV_{rms}
V_{IL}	Maximum Low Level Input Voltage at ON/$\overline{OFF}$			**0.2**		**0.2**	V(max)
V_{IH}	Minimum High Level Input Voltage at ON/$\overline{OFF}$			**2.0**		**2.0**	V(min)
I_{IL}		$V_{ON/\overline{OFF}}$ = 0V		**−1**		**−1**	µA(max)
I_{IH}		$V_{ON/\overline{OFF}}$ = 5V	1	 **20**	1	 **20**	µA µA(max)

(1) A typical is the center of characterization data taken with T_A = T_J = 25°C. Typicals are not ensured.
(2) All limits are specified. All electrical characteristics having room-temperature limits are tested during production with T_A = T_J = 25°C. All hot and cold limits are specified by correlating the electrical characteristics to process and temperature variations and applying statistical process control.
(3) All voltages except dropout are with respect to the voltage at the GND pin.

TYPICAL PERFORMANCE CHARACTERISTICS

Unless indicated otherwise, $V_{IN} = V_{NOM} + 1.5V$, $C_{IN} = 0.1\ \mu F$, $C_{OUT} = 0.1\ \mu F$, and T_A =25°C.

Dropout Voltage vs Load Current

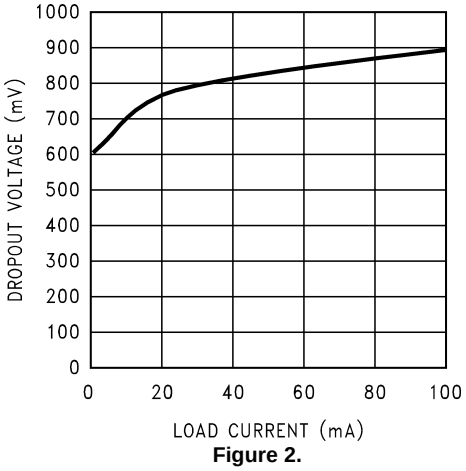


Figure 2.

Dropout Voltage vs Junction Temperature

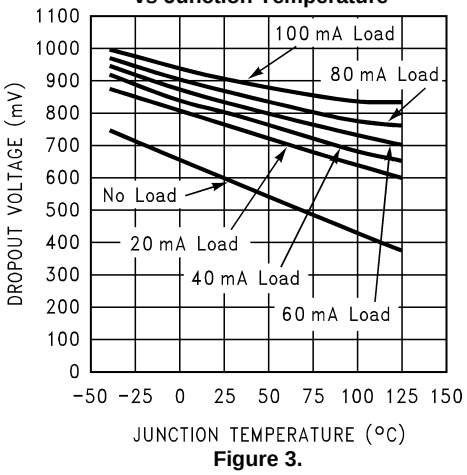


Figure 3.

Ground Pin Current vs Input Voltage

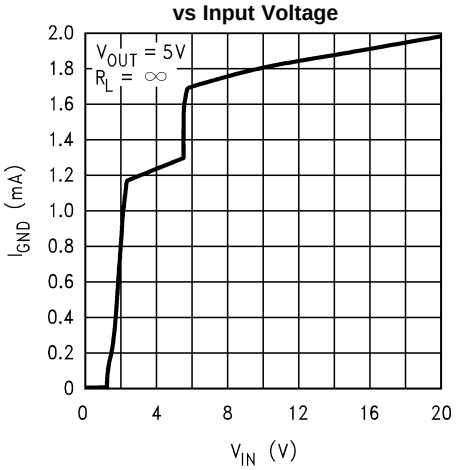


Figure 4.

Ground Pin Current vs Input Voltage

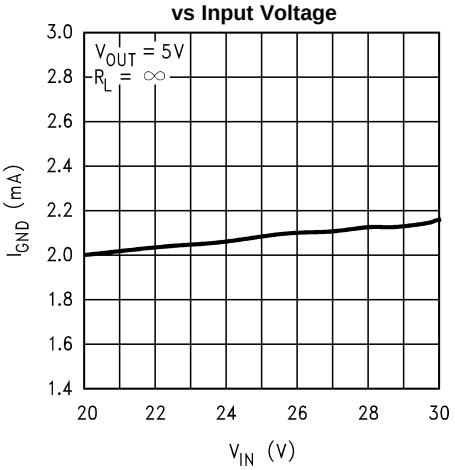


Figure 5.

Ground Pin Current vs Load Current

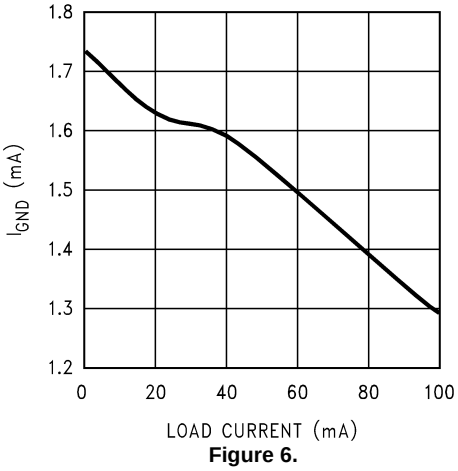


Figure 6.

Ground Pin Current vs Junction Temperature

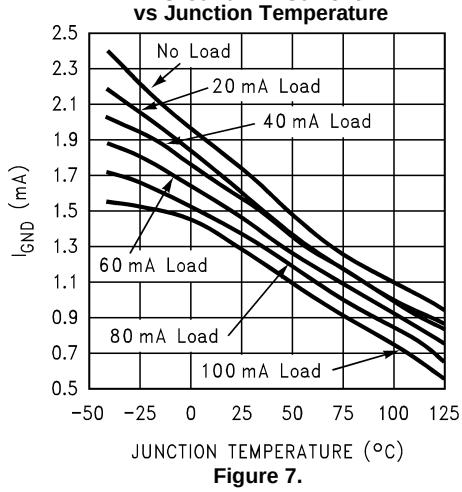
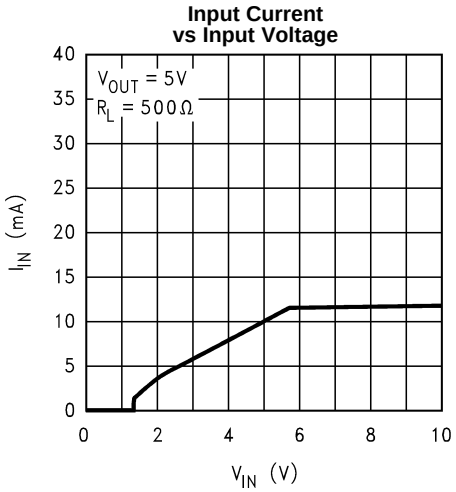


Figure 7.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Unless indicated otherwise, $V_{IN} = V_{NOM} + 1.5V$, $C_{IN} = 0.1\ \mu F$, $C_{OUT} = 0.1\ \mu F$, and T_A =25°C.



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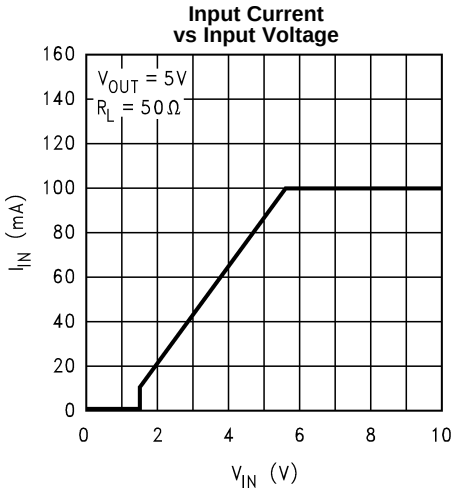


Figure 9.

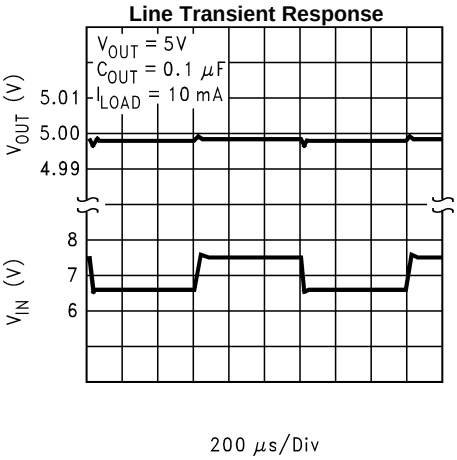


Figure 10.

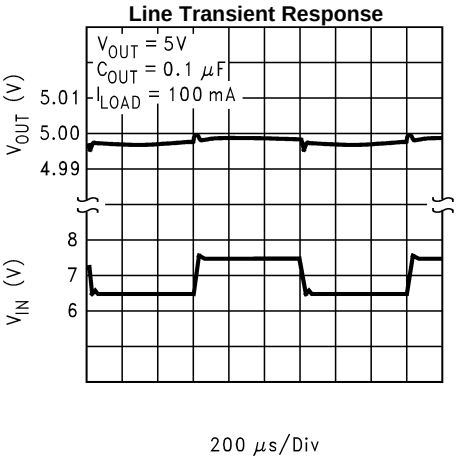


Figure 11.

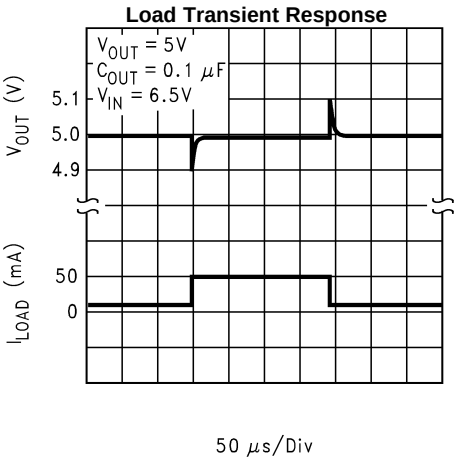


Figure 12.

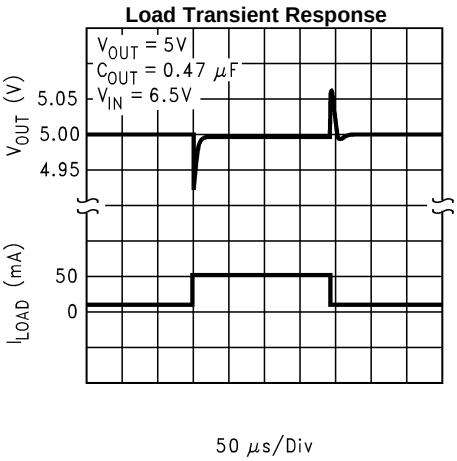


Figure 13.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Unless indicated otherwise, $V_{IN} = V_{NOM} + 1.5V$, $C_{IN} = 0.1\ \mu F$, $C_{OUT} = 0.1\ \mu F$, and T_A =25°C.

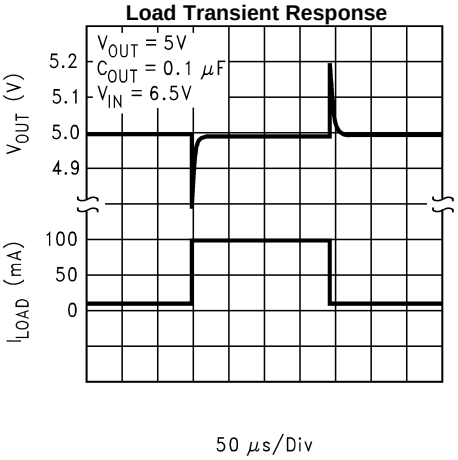


Figure 14.

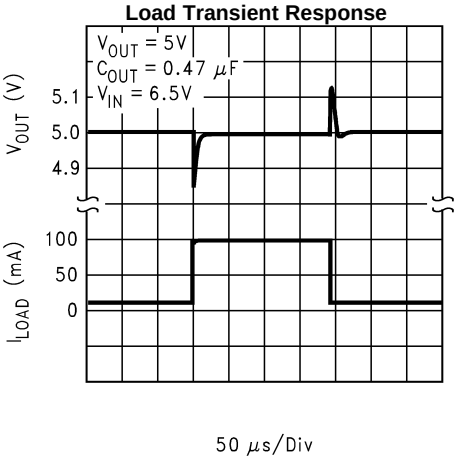


Figure 15.

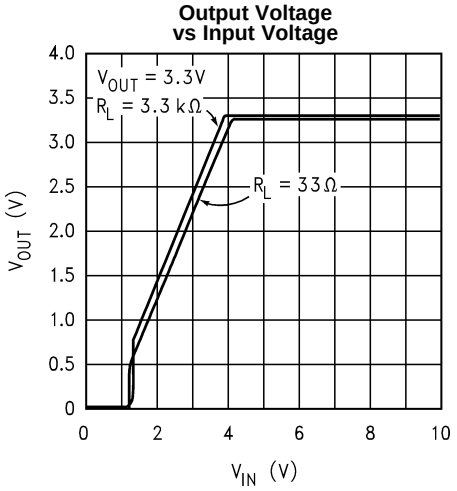


Figure 16.

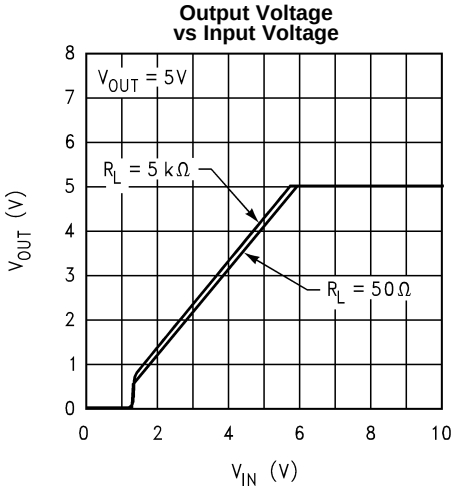


Figure 17.

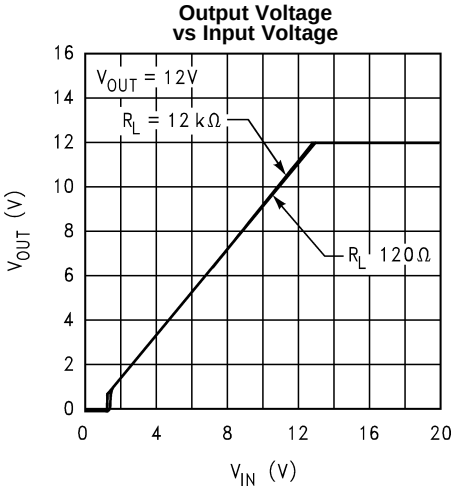


Figure 18.

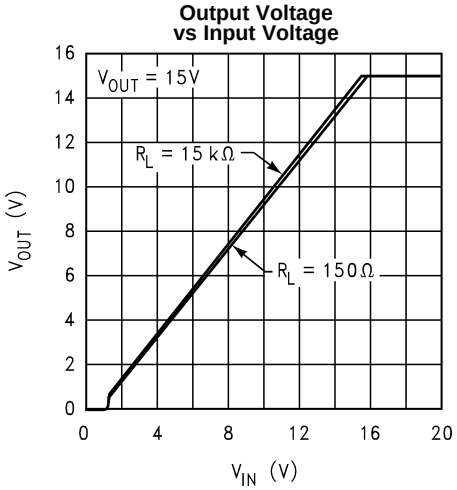


Figure 19.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Unless indicated otherwise, $V_{IN} = V_{NOM} + 1.5V$, $C_{IN} = 0.1\ \mu F$, $C_{OUT} = 0.1\ \mu F$, and T_A =25°C.

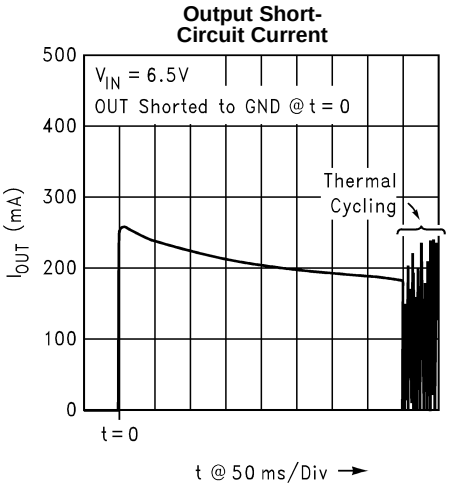


Figure 20.

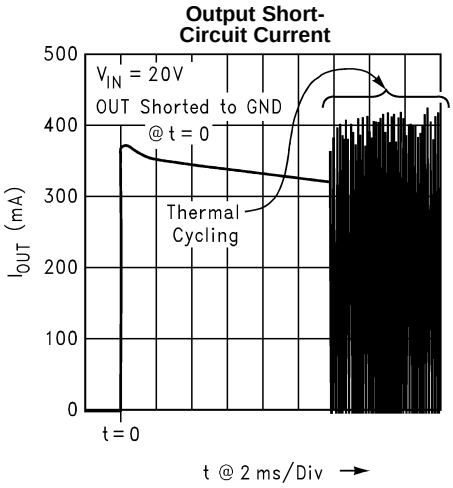


Figure 21.

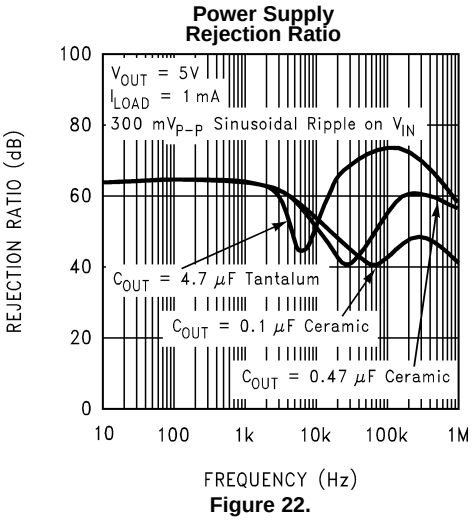


Figure 22.

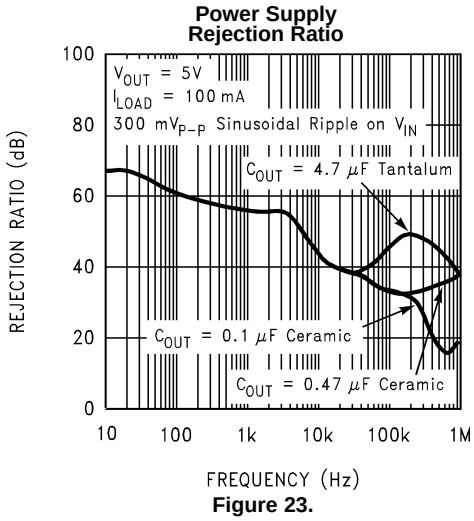


Figure 23.

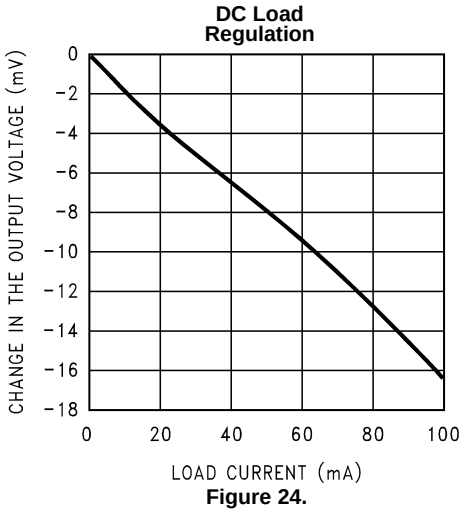


Figure 24.

APPLICATIONS INFORMATION

ON/$\overline{\text{OFF}}$ Pin

The LM3490 features a logic controlled ON/$\overline{\text{OFF}}$ pin that will allow the output voltage to be disabled, or enabled, as needed. The defined operating voltage range for this pin is 0.0V to 5.0V. The ON/$\overline{\text{OFF}}$ pin can not be left floating, as the output status cannot be ensured. Additionally, the ON/$\overline{\text{OFF}}$ pin should not be biased below ground potential as unpredictable device behavior may occur.

Pulling the ON/$\overline{\text{OFF}}$ pin voltage to a value between the V_{IH} threshold and 5.0V will enable the output voltage. Pulling the ON/OFF pin voltage to a value between the V_{IL} threshold and Ground potential will disable the output voltage. Although the ON/$\overline{\text{OFF}}$ threshold is typically 725mV, and has no hysteresis, the ON/$\overline{\text{OFF}}$ signal must rise and fall, cleanly and promptly, from voltage levels that are below the V_{IL} threshold and above the V_{IH} threshold.

The ON/$\overline{\text{OFF}}$ pin has no internal pull-up or pull-down to establish a default condition and, as a result, this pin must be terminated, either actively or passively, to an appropriate voltage level.

REVISION HISTORY

Changes from Revision D (April 2013) to Revision E	Page
• Changed layout of National Data Sheet to TI format	9

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM3490IM5-12	ACTIVE	SOT-23	DBV	5	1000	TBD	Call TI	Call TI	-40 to 125	L80B	Samples
LM3490IM5-12/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L80B	Samples
LM3490IM5-3.3	ACTIVE	SOT-23	DBV	5	1000	TBD	Call TI	Call TI	-40 to 125	L78B	Samples
LM3490IM5-3.3/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L78B	Samples
LM3490IM5-5.0	ACTIVE	SOT-23	DBV	5	1000	TBD	Call TI	Call TI	-40 to 125	L79B	Samples
LM3490IM5-5.0/NOPB	ACTIVE	SOT-23	DBV	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L79B	Samples
LM3490IM5X-12	ACTIVE	SOT-23	DBV	5	3000	TBD	Call TI	Call TI	-40 to 125	L80B	Samples
LM3490IM5X-12/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L80B	Samples
LM3490IM5X-5.0	ACTIVE	SOT-23	DBV	5	3000	TBD	Call TI	Call TI	-40 to 125	L79B	Samples
LM3490IM5X-5.0/NOPB	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L79B	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.

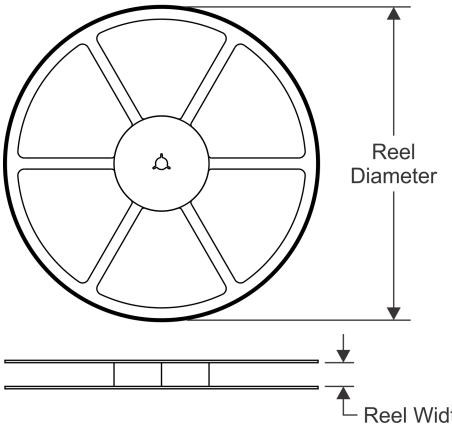
(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been 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.

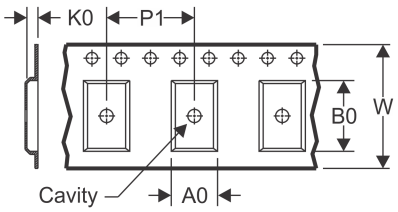
(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

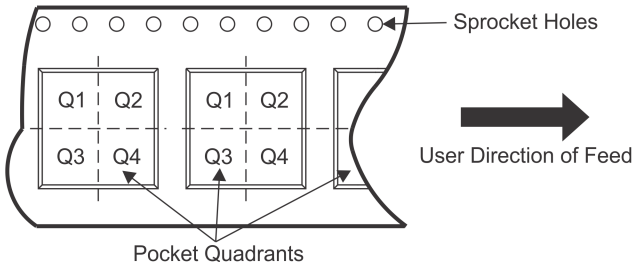


TAPE DIMENSIONS



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

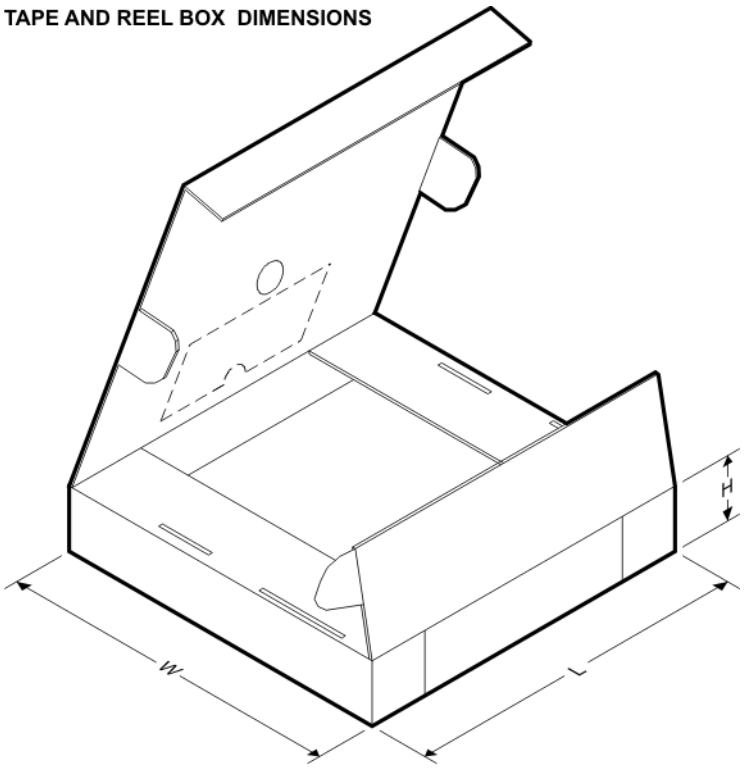
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
LM3490IM5-12	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5-12/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5-3.3	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5-3.3/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5-5.0	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5-5.0/NOPB	SOT-23	DBV	5	1000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5X-12	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5X-12/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5X-5.0	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
LM3490IM5X-5.0/NOPB	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3

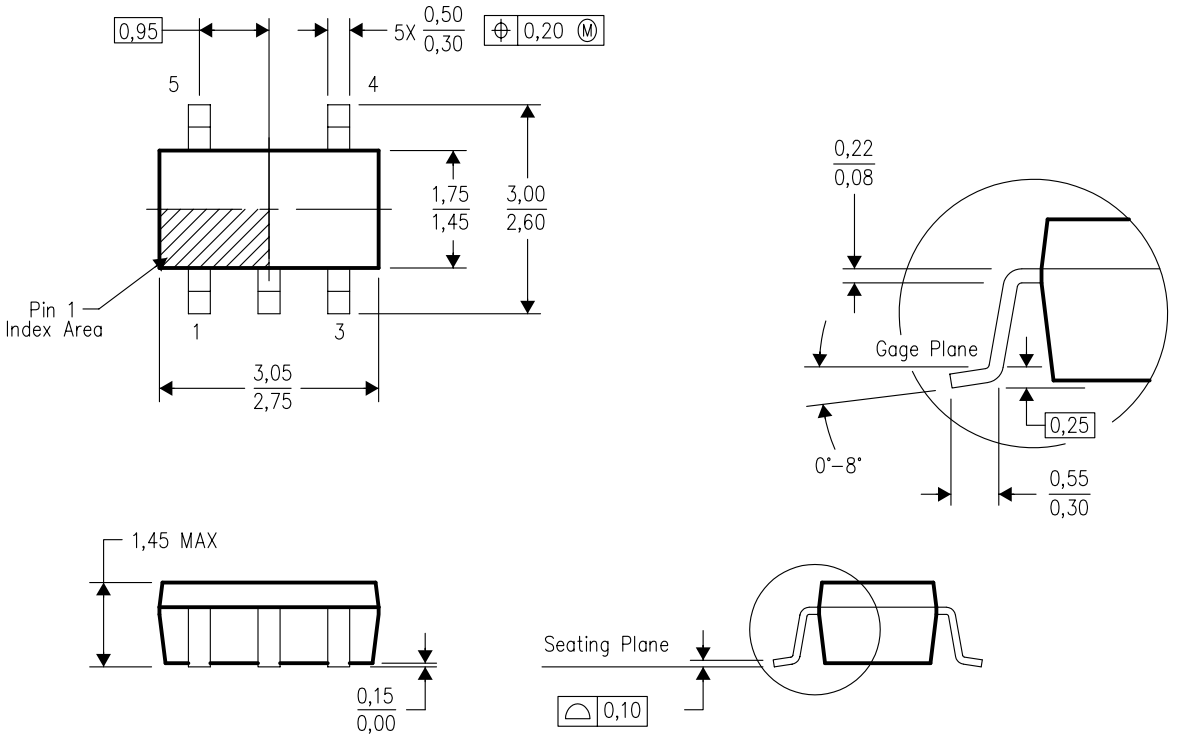
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM3490IM5-12	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM3490IM5-12/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM3490IM5-3.3	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM3490IM5-3.3/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM3490IM5-5.0	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM3490IM5-5.0/NOPB	SOT-23	DBV	5	1000	210.0	185.0	35.0
LM3490IM5X-12	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM3490IM5X-12/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM3490IM5X-5.0	SOT-23	DBV	5	3000	210.0	185.0	35.0
LM3490IM5X-5.0/NOPB	SOT-23	DBV	5	3000	210.0	185.0	35.0

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



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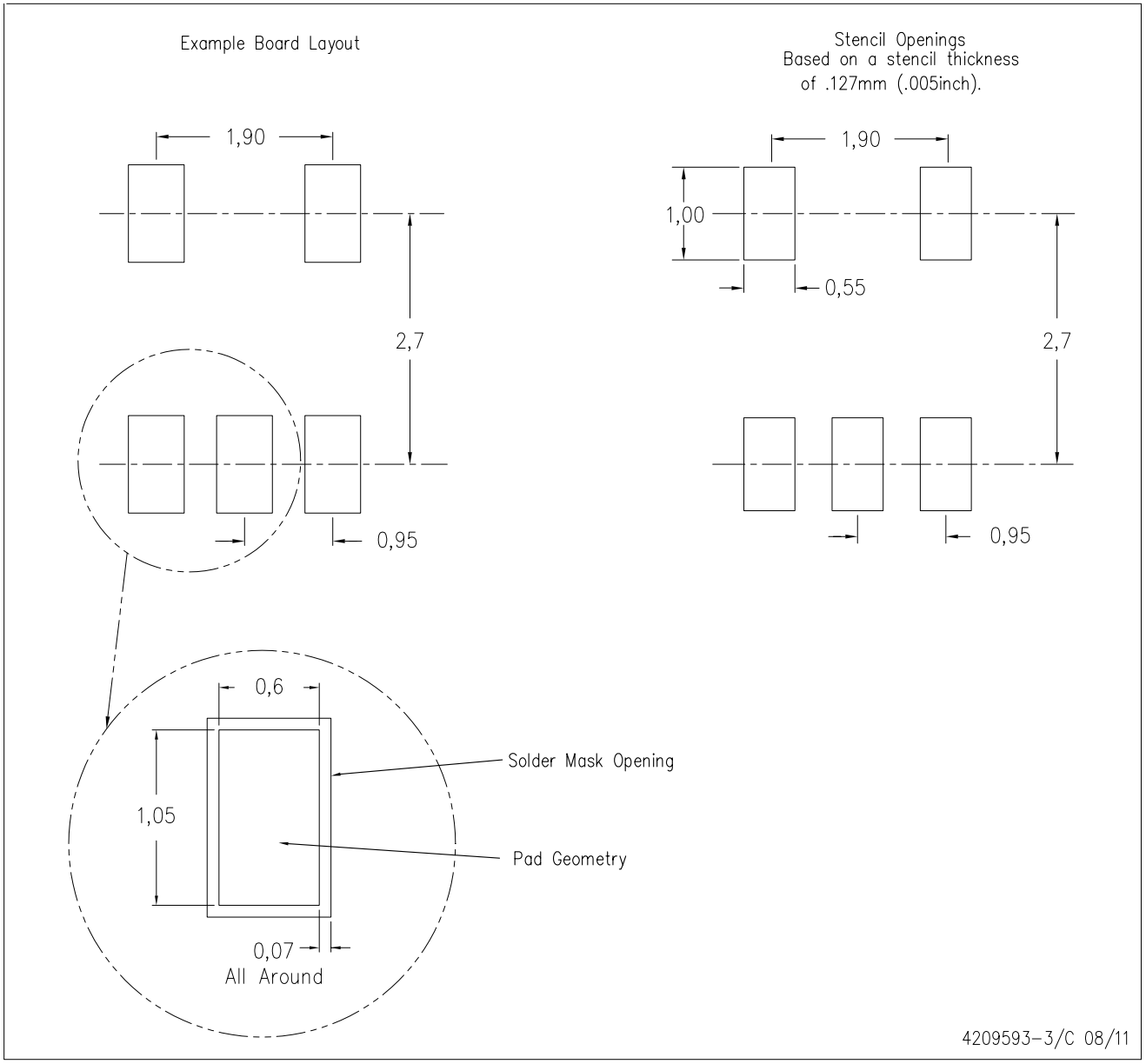
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO–178 Variation AA.

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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