LM3480 100 mA, SOT-23, Quasi Low-Dropout Linear Voltage Regulator

Check for Samples: LM3480

FEATURES

- **3.3, 5, 12, and 15V Versions Available**
- **Packaged in the Tiny 3-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 Ensured Maximum Dropout Over Full Load and Temperature Ranges**
- **100 mA Ensured Minimum Load Current**
- **±5% Ensured Output Voltage Tolerance Over Full Load and Temperature Ranges**
- **−40 to +125°C Junction Temperature Range for Operation**

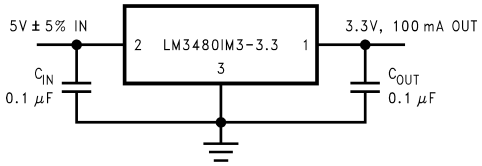
DESCRIPTION

The LM3480 is an integrated linear voltage regulator. It features operation from an input as high as 30V and a ensured maximum dropout of 1.2V at the full 100 mA load. Standard packaging for the LM3480 is the 3-lead SOT-23 package.

The 5, 12, and 15V members of the LM3480 series are intended as tiny alternatives to industry standard LM78LXX series and similar devices. The 1.2V quasi low dropout of LM3480 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 LM3480 series features a 3.3V member. The SOT-23 packaging and quasi low dropout features of the LM3480 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

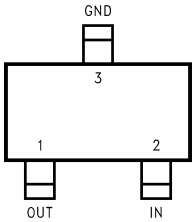


Figure 1. Top View
SOT-23 Package
Package Number DBZ0003A

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
Power Dissipation (3)	333mW
Junction Temp. (3)	+150°C
Ambient Storage Temp.	−65 to +150°C
Soldering Time, Temp. (4) Wave Infrared Vapor Phase	 4 sec., 260°C 10 sec., 240°C 75 sec., 219°C
ESD (5)	2kV

(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 ensured. Operating Ratings do not imply ensured performance limits. For ensured performance limits and associated test conditions, see the Electrical Characteristics.
(2) If Military/Aerospace specified devices are required, please contact the TI 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 333 mW rating results from substituting the Absolute Maximum junction temperature, 150°C, for T_J , 50°C for T_A, and 300°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 3.33 mW for each °C below 50°C ambient. It must be derated by 3.33 mW for each °C above 50°C ambient. A θ_{JA} of 300°C/W represents the worst-case condition of no heat sinking of the 3-lead plastic SOT-23 package. Heat sinking enables the safe dissipation of more power. The LM3480 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, refer to the *Packaging Databook* .
(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)

Max. Input Voltage (IN to GND)	30V
Junction Temp. (T_J)	−40 to +125°C
Max. Power Dissipation (2)	250mW

(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 ensured. Operating Ratings do not imply ensured performance limits. For ensured performance limits and associated test conditions, see the Electrical Characteristics.
(2) As with the Absolute Maximum power dissipation, the maximum power dissipation for operation depends on the ambient temperature. The 250 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 300°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 3.33 mW for each °C below 50°C ambient. It must be derated by 3.33 mW for each °C above 50°C ambient. A θ_{JA} of 300°C/W represents the worst-case condition of no heat sinking of the 3-lead plastic SOT-23 package. Heat sinking enables the dissipation of more power during operation.

Electrical Characteristics LM3480-3.3, LM3480-5.0

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	$V_{IN} = V_{NOM} + 1.5V$, $1\ mA \le I_{OUT} \le 100\ mA$	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	$V_{NOM} + 1.5V \le V_{IN} \le 30V$, $I_{OUT} = 1\ mA$	10	 **25**	12	 **25**	mV mV(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 ensured. All electrical characteristics having room-temperature limits are tested during production with $T_A = T_J = 25°C$. All hot and cold limits are ensured 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 LM3480-3.3, LM3480-5.0 (continued)

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	
ΔV_{OUT}	Load Regulation	$V_{IN} = V_{NOM} + 1.5V$, $10\ mA \le I_{OUT} \le 100\ mA$	20	 **40**	20	 **40**	mV mV(max)
I_{GND}	Ground Pin Current	$V_{NOM} + 1.5V \le V_{IN} \le 30V$, No Load	2	 **4**	2	 **4**	mA mA(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}

LM3480-12, LM3480-15

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	$V_{IN} = V_{NOM} + 1.5V$, $1\ mA \le I_{OUT} \le 100\ mA$	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	$V_{NOM} + 1.5V \le V_{IN} \le 30V$, $I_{OUT} = 1\ mA$	14	 **40**	16	 **40**	mV mV(max)
ΔV_{OUT}	Load Regulation	$V_{IN} = V_{NOM} + 1.5V$, $10\ mA \le I_{OUT} \le 100\ mA$	36	 **60**	45	 **75**	mV mV(max)
I_{GND}	Ground Pin Current	$V_{NOM} + 1.5V \le V_{IN} \le 30V$, No Load	2	 **4**	2	 **4**	mA mA(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}

(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 ensured. All electrical characteristics having room-temperature limits are tested during production with $T_A = T_J = 25°C$. All hot and cold limits are ensured 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

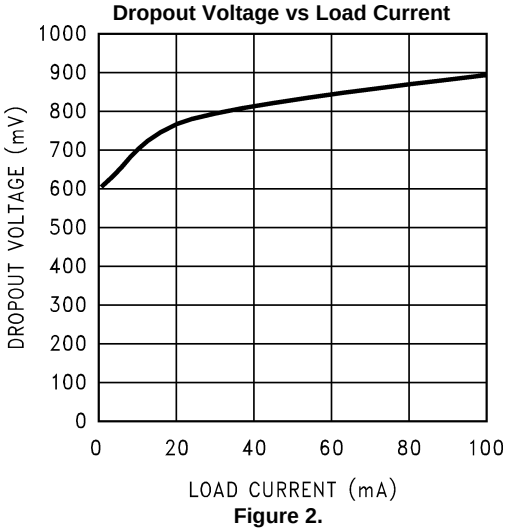


Figure 2.

Dropout Voltage vs Junction Temperature

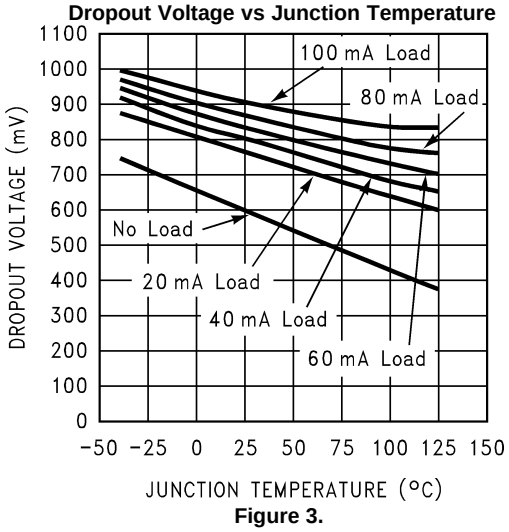


Figure 3.

Ground Pin Current vs Input Voltage

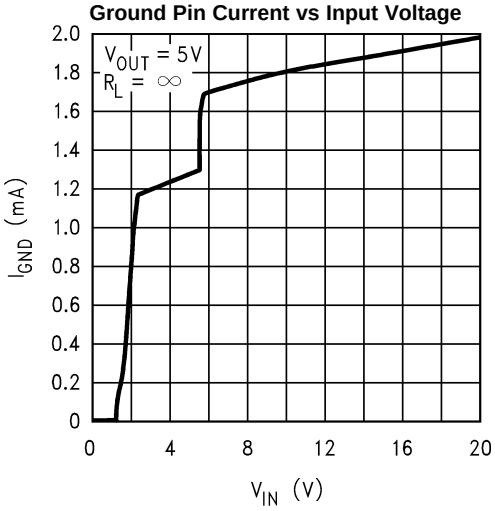


Figure 4.

Ground Pin Current vs Input Voltage

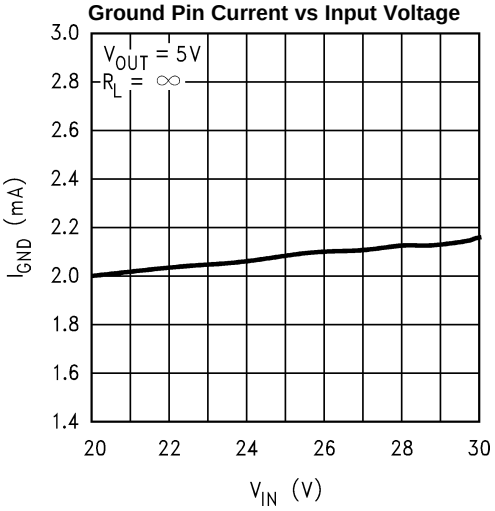


Figure 5.

Ground Pin Current vs Load Current

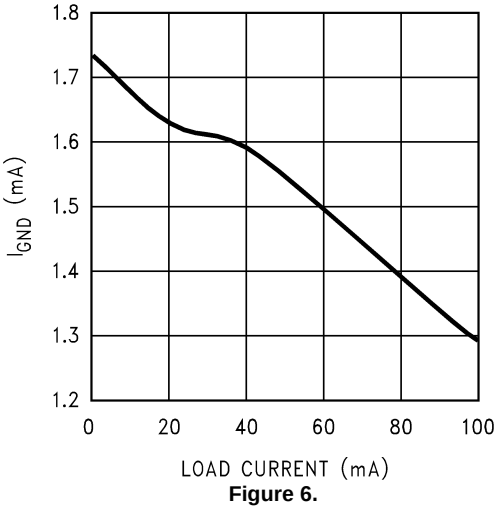


Figure 6.

Ground Pin Current vs Junction Temperature

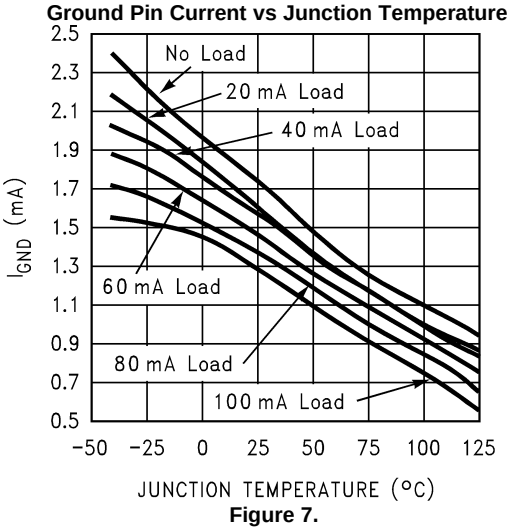


Figure 7.

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.

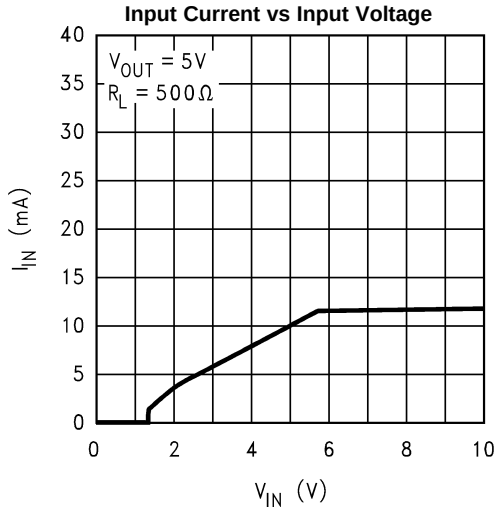


Figure 8.

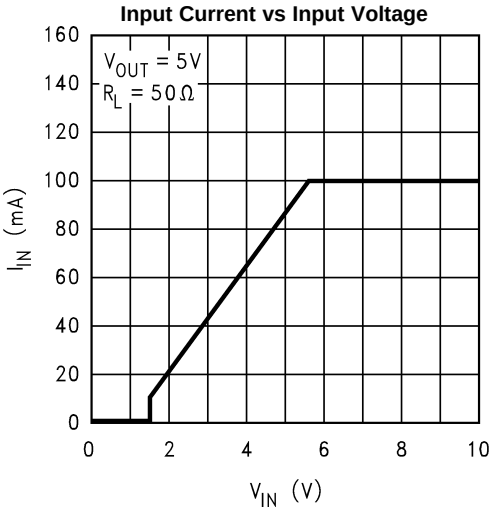


Figure 9.

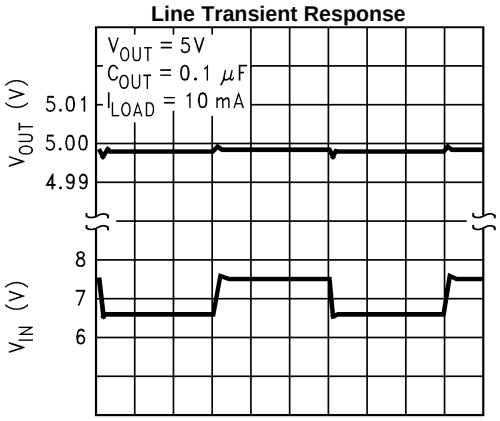


Figure 10.

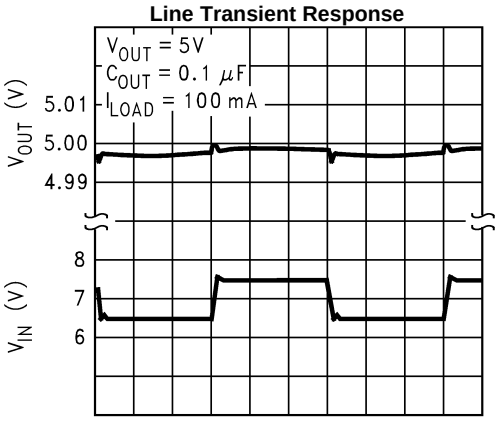


Figure 11.

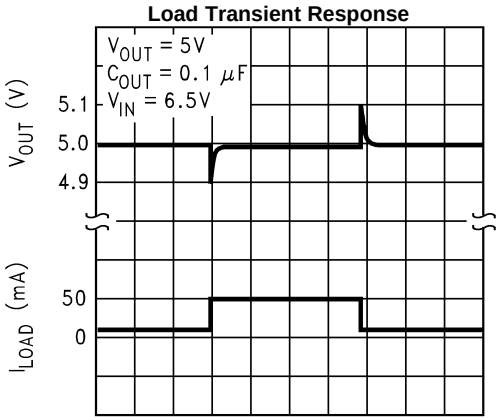


Figure 12.

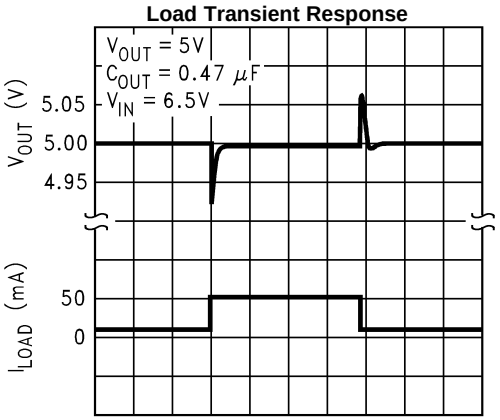


Figure 13.

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.

Load Transient Response

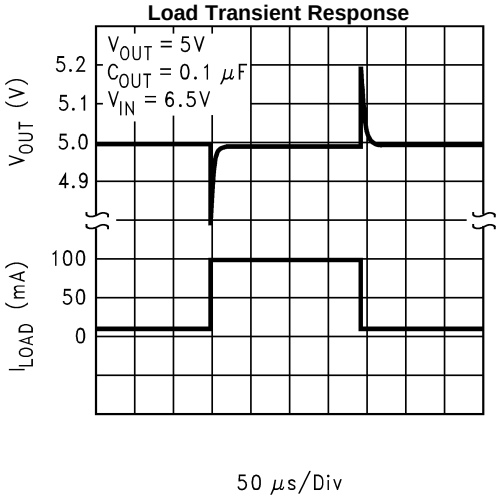


Figure 14.

Load Transient Response

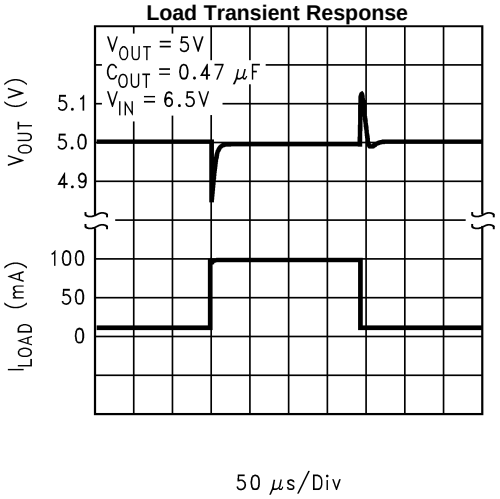


Figure 15.

Output Voltage vs Input Voltage

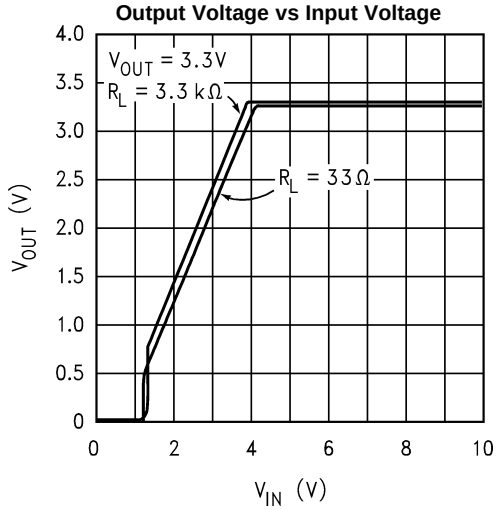


Figure 16.

Output Voltage vs Input Voltage

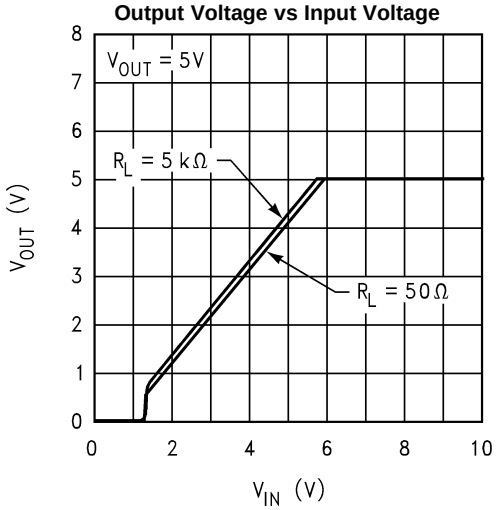


Figure 17.

Output Voltage vs Input Voltage

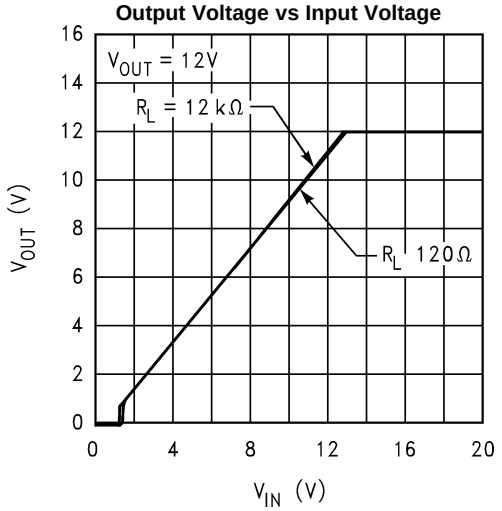


Figure 18.

Output Voltage vs Input Voltage

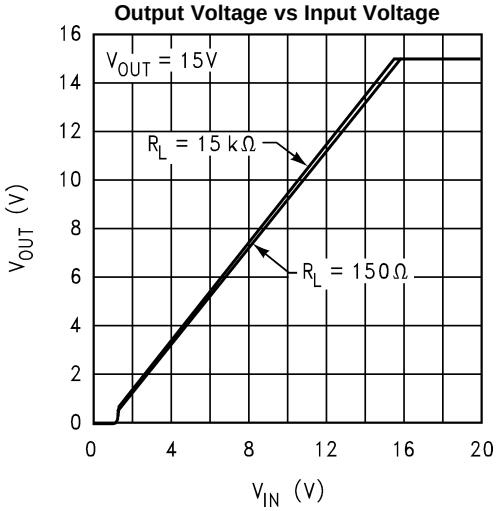


Figure 19.

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.

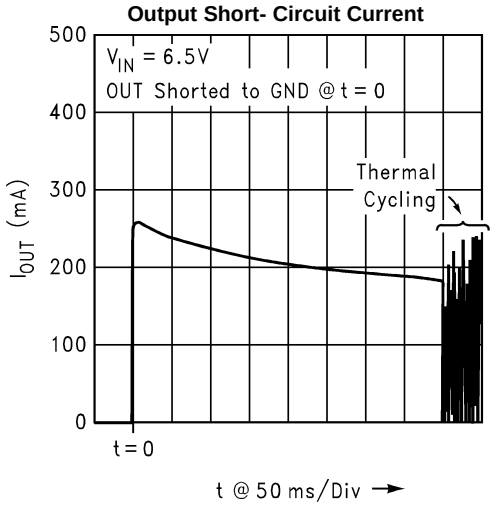


Figure 20.

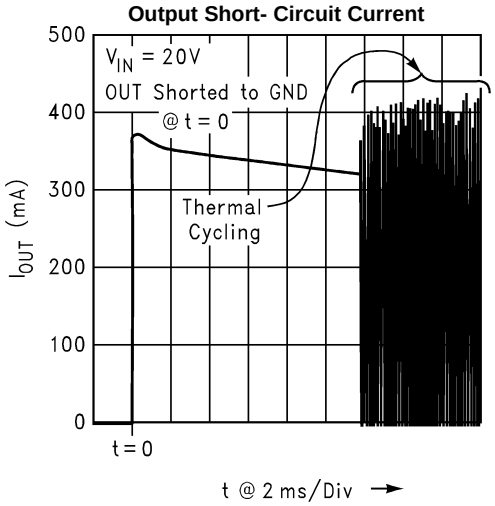


Figure 21.

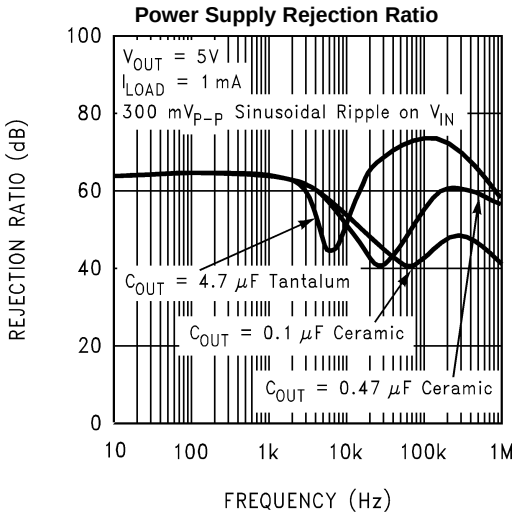


Figure 22.

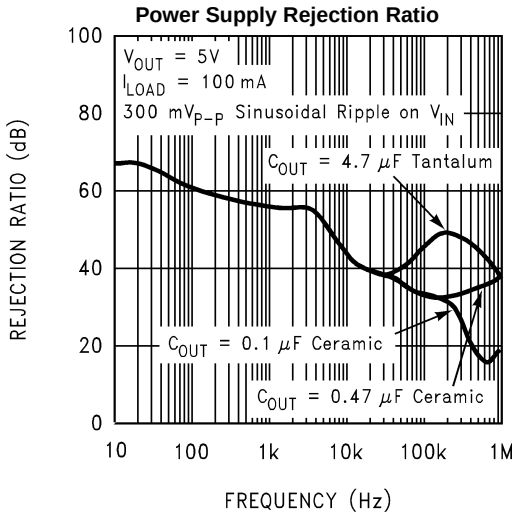


Figure 23.

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.

DC Load Regulation

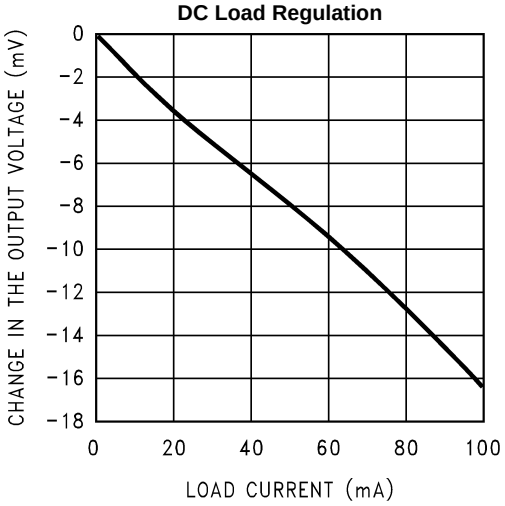


Figure 24.

REVISION HISTORY

Changes from Revision D (March 2013) to Revision E	Page
• Changed layout of National Data Sheet to TI format	7

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
LM3480IM3-12	ACTIVE	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 125	L0C	Samples
LM3480IM3-12/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L0C	Samples
LM3480IM3-15	ACTIVE	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 125	L0D	Samples
LM3480IM3-15/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L0D	Samples
LM3480IM3-3.3	ACTIVE	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 125	L0A	Samples
LM3480IM3-3.3/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L0A	Samples
LM3480IM3-5.0	ACTIVE	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 125	L0B	Samples
LM3480IM3-5.0/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L0B	Samples
LM3480IM3X-12	ACTIVE	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI	-40 to 125	L0C	Samples
LM3480IM3X-12/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L0C	Samples
LM3480IM3X-15	ACTIVE	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI	-40 to 125	L0D	Samples
LM3480IM3X-15/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L0D	Samples
LM3480IM3X-3.3	ACTIVE	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI	-40 to 125	L0A	Samples
LM3480IM3X-3.3/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L0A	Samples
LM3480IM3X-5.0	ACTIVE	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI	-40 to 125	L0B	Samples
LM3480IM3X-5.0/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	L0B	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) Only one of markings shown within the brackets will appear on the physical device.

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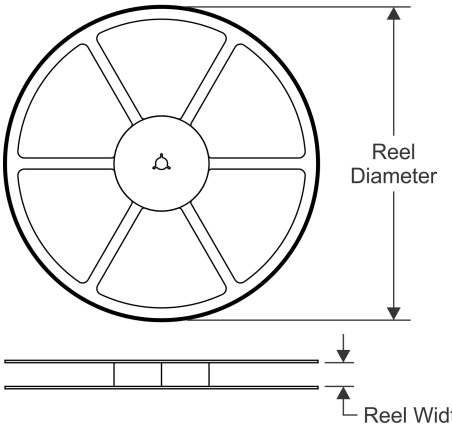
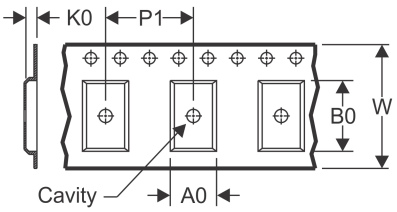
TAPE AND REEL INFORMATION

REEL DIMENSIONS

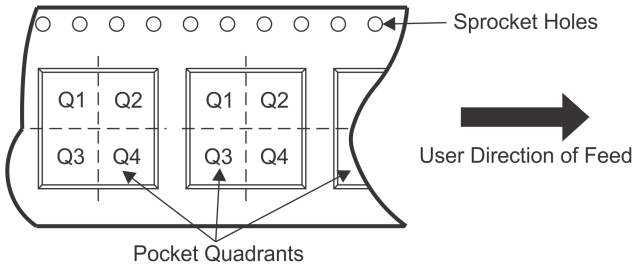


TAPE DIMENSIONS



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

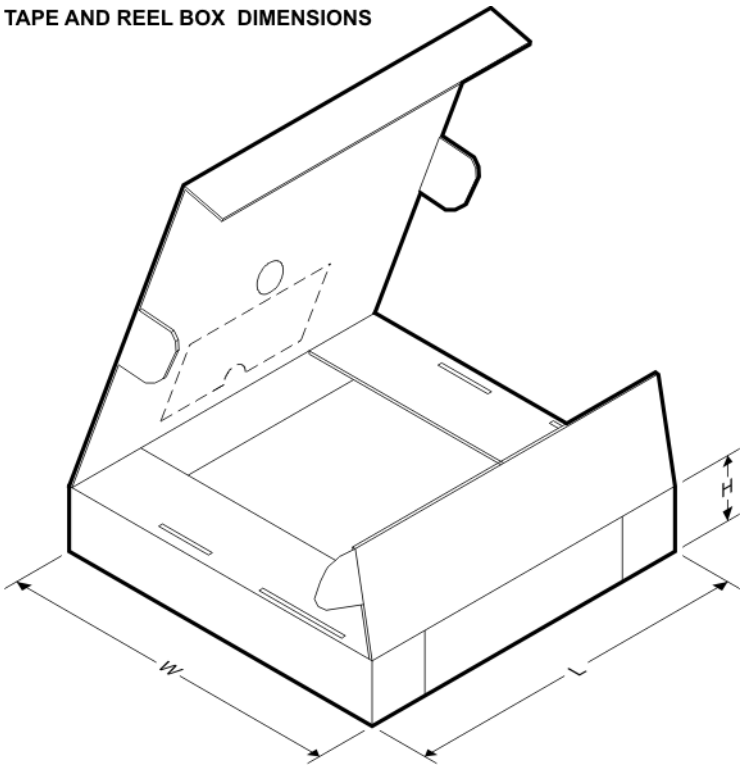
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
LM3480IM3-12	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3-12/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3-15	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3-15/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3-3.3	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3-3.3/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3-5.0	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3-5.0/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3X-12	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3X-12/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3X-15	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3X-15/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3X-3.3	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3X-3.3/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3X-5.0	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM3480IM3X-5.0/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3

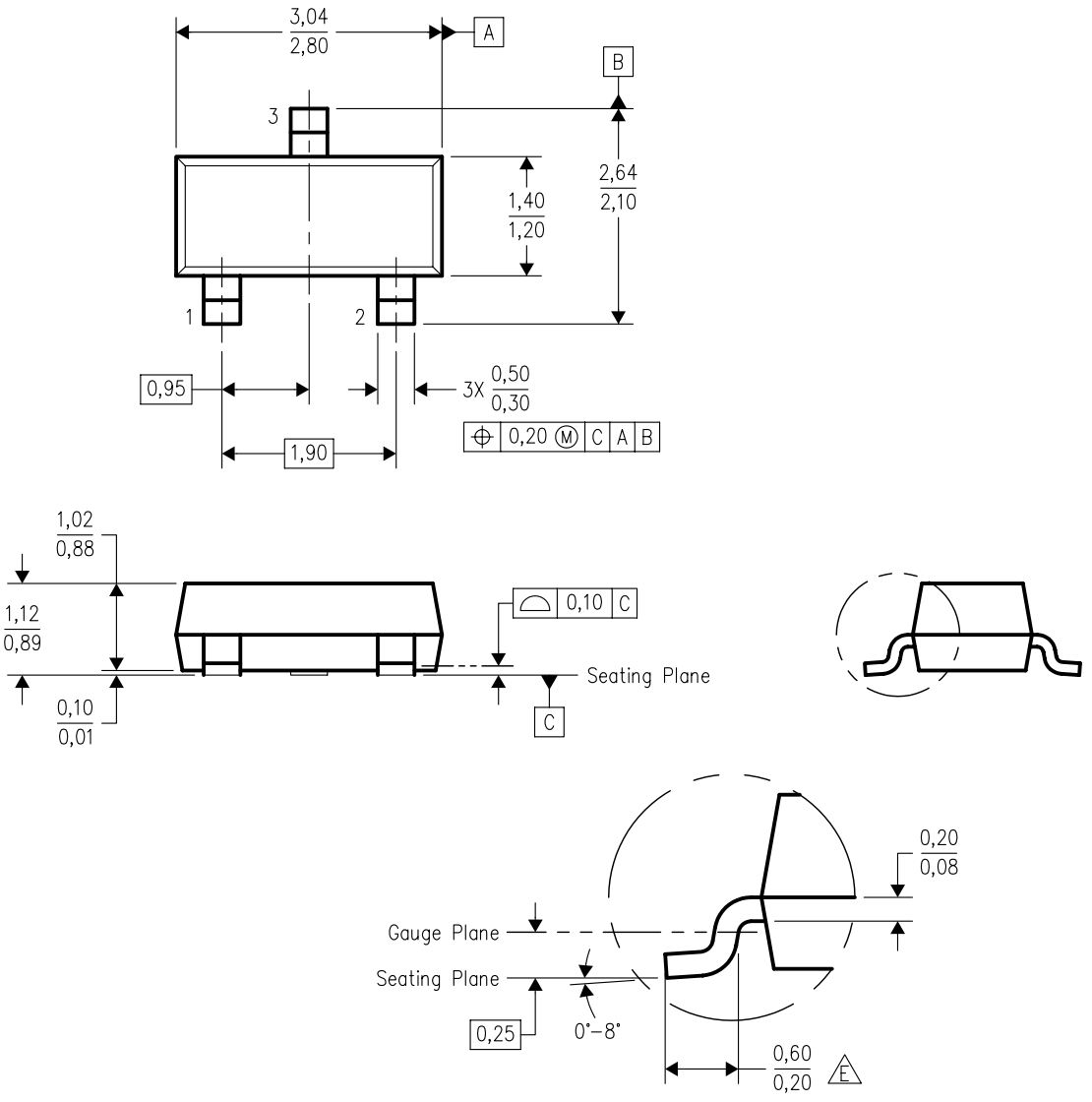
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM3480IM3-12	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM3480IM3-12/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM3480IM3-15	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM3480IM3-15/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM3480IM3-3.3	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM3480IM3-3.3/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM3480IM3-5.0	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM3480IM3-5.0/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM3480IM3X-12	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM3480IM3X-12/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM3480IM3X-15	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM3480IM3X-15/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM3480IM3X-3.3	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM3480IM3X-3.3/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM3480IM3X-5.0	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM3480IM3X-5.0/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0

DBZ (R–PDSO–G3) PLASTIC SMALL–OUTLINE



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Lead dimensions are inclusive of plating.
D. Body dimensions are exclusive of mold flash and protrusion. Mold flash and protrusion not to exceed 0.25 per side.
E. Falls within JEDEC TO–236 variation AB, except minimum foot length.

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- Консультации по применению компонента;
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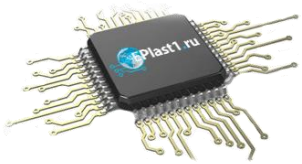

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