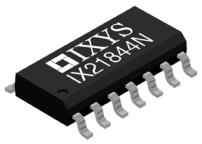
IXYS
INTEGRATED CIRCUITS DIVISION



IX21844
High Voltage Half-Bridge Gate Driver

Driver Characteristics

Parameter	Rating	Units
V_{OFFSET}	600	V
$I_{O +/-}$ (Source/Sink)	1.4 / 1.8	A
V_{BIAS}	10-20	V

Features

- Floating Channel for Bootstrap Operation to +600V with an Absolute Maximum Rating of +700V
- Programmable Dead-Time
- Outputs Can Source 1.4A and Sink 1.8A
- Gate Drive Supply Range From 10V to 20V
- Tolerant to Negative Voltage Transients: dV/dt Immune
- 3.3V and 5V Logic Compatible
- Undervoltage Lockout for Both High-side and Low-Side Outputs
- Matched Propagation Delays

Applications

- Switch Mode Power Supply
- Motor Driver Inverter
- DC/DC Converter
- Uninterruptible Power Supplies (UPS)

Description

The IX21844 is a high voltage IC that can drive high speed MOSFETs and IGBTs that operate up to +600V. The IX21844 is configured with dependent high-side and low side referenced output channels which can source 1.4A and sink 1.8A. The floating high-side channel can drive an N-channel power MOSFET or IGBT 600V from the common reference.

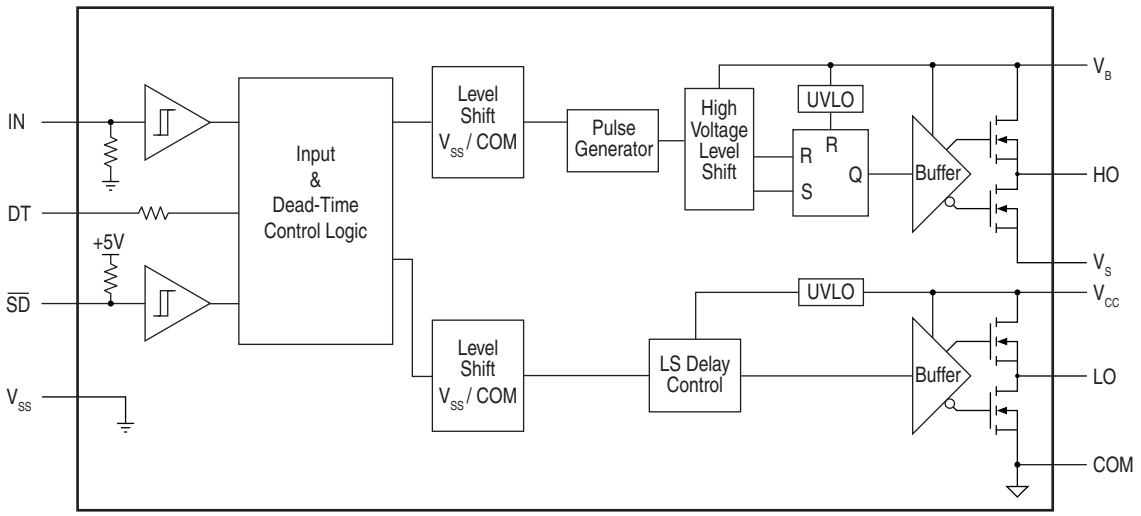
Manufactured on IXYS Integrated Circuits Division's proprietary high-voltage BCDMOS on SOI (silicon on isolator) process, the IX21844 is extremely robust and virtually immune to negative transients. The UVLO circuit prevents the turn-on of the MOSFET or IGBT until there is sufficient V_{BS} or V_{CC} supply voltage. A programmable dead-time can be set between 400ns and 5us to insure that both the high-side and low-side power MOSFET or IGBT are not enabled at the same time. Propagation delays are matched for use in high frequency applications.

The IX21844 is available in 14-pin DIP and 14-pin SOIC (narrow body) packages. The 14-pin SOIC (narrow body) package is also available in tape & reel.

Ordering Information

Part	Description
IX21844G	14-Pin DIP (25/Tube)
IX21844N	14-Pin SOIC (Narrow Body) (50/Tube)
IX21844NTR	14-Pin SOIC (Narrow Body) (2000/Reel)

IX21844 Functional Block Diagram



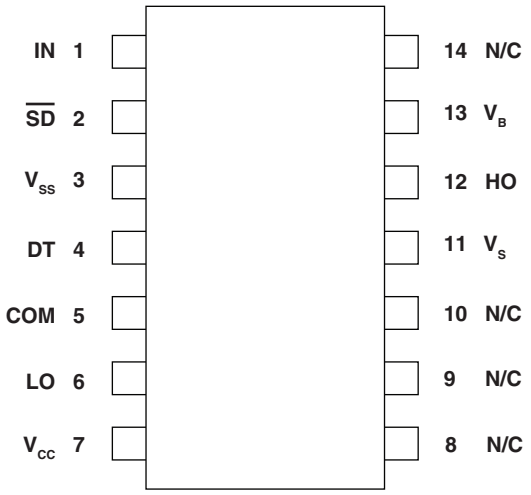
1. Specifications **3**
1.1 Package Pinout 3
1.2 Pin Description (DIP & SOIC) 3
1.3 Absolute Maximum Ratings 4
1.4 Recommended Operating Conditions 4
1.5 Static Electrical Characteristics 5
1.6 Dynamic Electrical Characteristics 5
1.7 Test Waveforms 6

2. Performance Characteristics **7**

3. Manufacturing Information **12**
3.1 Moisture Sensitivity 12
3.2 ESD Sensitivity 12
3.3 Reflow Profile 12
3.4 Board Wash 12
3.5 Mechanical Dimensions 13

1 Specifications

1.1 Package Pinout



1.2 Pin Description (DIP & SOIC)

Pin#	Name	Description
1	IN	Logic input for both high-side gate drive output (HO) and low-side gate drive output (LO). In phase with HO.
2	$\overline{SD}$	Shut-down logic input. Active low.
3	V_{SS}	Logic ground
4	DT	Programmable Dead-Time input
5	COM	Low-side return
6	LO	Low-side gate drive output
7	V_{CC}	Low-side and logic supply
8	N/C	No connection
9	N/C	No connection
10	N/C	No connection
11	V_S	High-side floating supply return
12	HO	High-side gate drive output
13	V_B	High-side floating supply
14	N/C	No connection

1.3 Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM.

Parameter		Symbol	Min	Max	Units
High-Side Floating Absolute Voltage		V_B	-0.3	700	V
High-Side Floating Supply Offset Voltage		V_S	V_B-20	V_B+0.3	
High-Side Floating Output Voltage		V_{HO}	V_S-0.3	V_B+0.3	
Low-Side and Logic Fixed Supply Voltage		V_{CC}	-0.3	20	
Low-Side Output Voltage		V_{LO}	-0.3	V_{CC}+0.3	
Programmable Dead-Time Pin Voltage		DT	V_{SS}-0.3	V_{CC}+0.3	
Logic Input Voltage		V_{IN}, $V_{\overline{SD}}$	V_{SS}-0.3	V_{CC}+0.3	
Logic ground		V_{SS}	V_{CC}-20	V_{CC}+0.3	
Allowable Offset Supply Voltage Transient		dV_S/dt	-	50	V/ns
Package Power Dissipation @ $T_A = 25°C$	14-Pin PDIP	PD	-	1.6	W
	14-Pin SOIC		-	1	
Thermal Resistance, Junction to Ambient	14-Pin PDIP	$R_{\theta JA}$	-	75	°C/W
	14-Pin SOIC		-	120	
Junction Temperature		T_J	-	150	°C
Storage Temperature		T_S	-50	150	
Lead Temperature (Soldering, 10 Seconds)		T_L	-	300	

1.4 Recommended Operating Conditions

For proper operation, the device should be used within the recommended conditions. The V_S and V_{SS} offset ratings are tested with all supplies biased at a 15V differential.

Parameter	Symbol	Min	Max	Units
High-Side Floating Supply Absolute Voltage	V_B	V_S+10	V_S+20	V
High-Side Floating Supply Offset Voltage	V_S	-5	600	
High-Side Floating Output Voltage	V_{HO}	V_S	V_B	
Low-Side and Logic Fixed Supply Voltage	V_{CC}	10	20	
Low-Side Output Voltage	V_{LO}	0	V_{CC}	
Logic Input Voltage	V_{IN}, $V_{\overline{SD}}$	V_{SS}	V_{SS} + 5	
Programmable Dead-Time Pin Voltage	DT	V_{SS}	V_{CC}	
Logic Ground	V_{SS}	-5	5	
Ambient Temperature	T_A	-40	+125	°C

1.5 Static Electrical Characteristics

V_{BIAS} (V_{CC}, V_{BS})=15V, V_{SS}=COM, DT=V_{SS}, and T_A=25°C unless otherwise specified. The V_{IL}, V_{IH}, and I_{IN} parameters are referenced to V_{SS}/COM and are applicable to the respective input leads: IN and $\overline{SD}$. V_O and I_O are referenced to COM and are applicable to the respective output leads: HO and LO.

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Logic "1" Input Voltage	V_{CC}=10V to 20V	V_{IH}	2	-	-	V
Logic "0" Input Voltage		V_{IL}	-	-	0.8	
SD Input Positive Going Threshold		$V_{SD,TH+}$	2	-	-	
SD Input Negative Going Threshold		$V_{SD,TH-}$	-	-	0.8	
High Level Output Voltage, V_{BIAS} - V_O	I_O=0A	V_{OH}	-	-	2.5	
Low Level Output Voltage, V_O	I_O=20mA	V_{OL}	-	-	0.2	
Offset Supply Leakage Current	V_B=V_S=600V	I_{LK}	-	33	60	µA
Quiescent V_{BS} Supply Current	V_{IN}=0V or 5V	I_{QBS}	20	87	150	
Quiescent V_{CC} Supply Current		I_{QCC}	0.4	1.8	2.2	mA
Logic "1" Input Bias Current	IN=5V	I_{IN+}	-	35	60	µA
Logic "0" Input Bias Current	IN=0V	I_{IN-}	-	-	1	
SD Logic "1" Input Bias Current	V_{SD}=5V	I_{SD+}	-	-	30	µA
SD Logic "0" Input Bias Current	V_{SD}=0V	I_{SD-}	-	15	60	µA
V_{CC} and V_{BS} Supply Under-voltage Positive Going Threshold	-	V_{CCUV+} V_{BSUV+}	8	8.6	9.8	V
V_{CC} and V_{BS} Supply Under-voltage Negative Going Threshold		V_{CCUV-} V_{BSUV-}	7.4	7.9	9	
Hysteresis		V_{CCUVH} V_{BSUVH}	0.3	0.7	-	
Output High Short Circuit Pulsed Current	V_O=0V, PW≤10µs	I_O+	1.4	2.2	-	A
Output Low Short Circuit Pulsed Current	V_O=15V, PW≤10µs	I_O-	1.8	2.5	-	

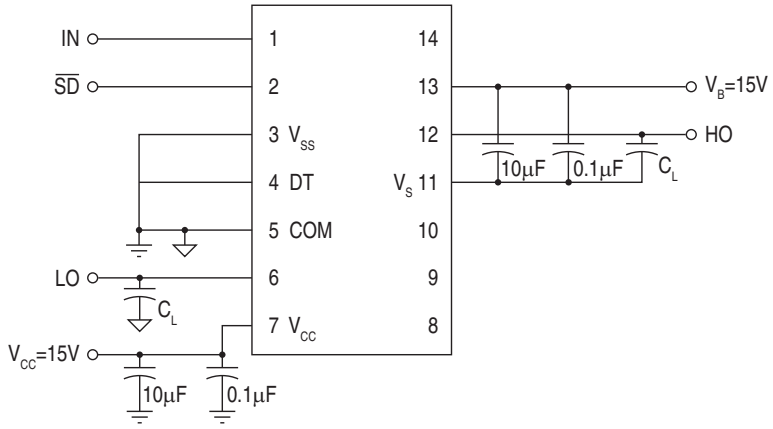
1.6 Dynamic Electrical Characteristics

V_{BIAS} (V_{CC}, V_{BS})=15V, C_L=1000pF, T_A=25°C, DT=V_{SS}, and V_{SS}=COM unless otherwise specified.

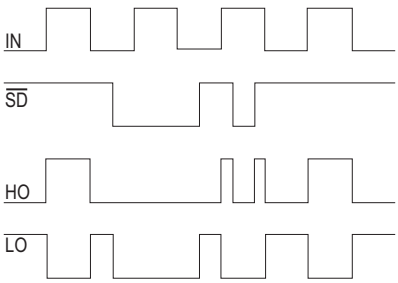
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Turn-On Propagation Delay	V_S=0V	t_{on}	-	560	900	ns
Turn-Off Propagation Delay	V_S=0V or 600V	t_{off}	-	200	400	
Shutdown propagation Delay	-	t_{SD}	-	225	400	
Delay Matching, HS & LS Turn-on		MTon	-	0	90	
Delay Matching, HS & LS Turn-off		MToff	-	0	40	
Turn-On Rise Time	V_S=0V	t_r	-	23	60	
Turn-Off Fall Time		t_f	-	14	35	
Dead-Time: LO Turn-off to HO Turn-on (DT_{LO-HO}) & HO Turn-off to LO Turn-on (DT_{HO-LO})	R_{DT}=0Ω	DT	280	355	520	
	R_{DT}=200kΩ		4	5	6	µs
Dead-Time Matching: (DT_{LO-HO}) - (DT_{HO-LO})	R_{DT}=0Ω	MDT	-	0	50	ns
	R_{DT}=200kΩ		-	0	600	

1.7 Test Waveforms

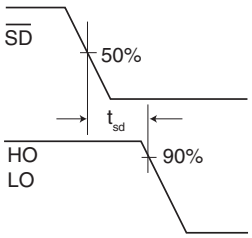
1.7.1 Switching Time Test Circuit



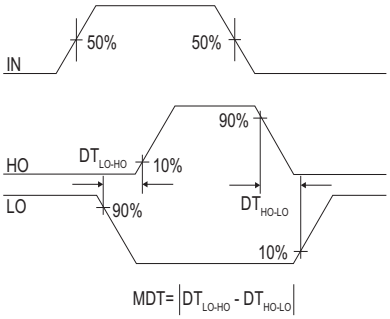
1.7.2 Input/Output Timing Diagram



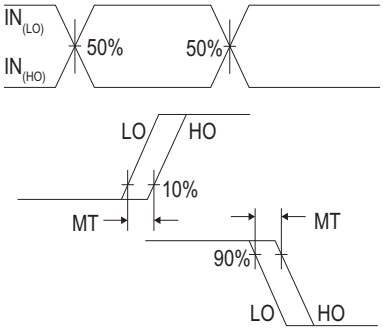
1.7.3 Shutdown Waveform Definition



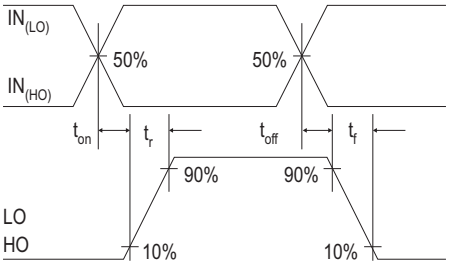
1.7.4 Dead-Time Waveform Definition



1.7.5 Delay Matching Waveform Definitions



1.7.6 Switching Time Waveform Definitions

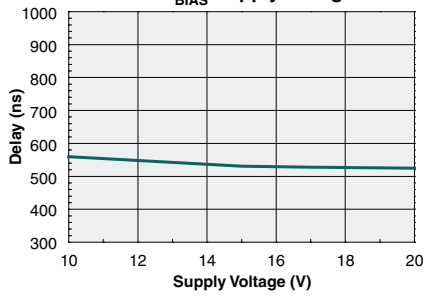


1.7.7 Truth Table

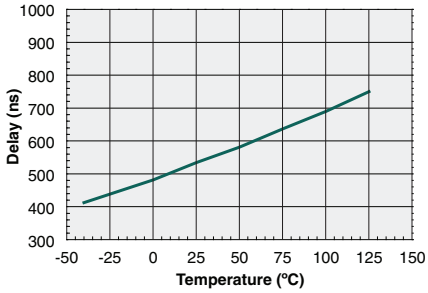
IN	$\overline{SD}$	HO	LO
1	1	H	L
0	1	L	H
X	0	L	L

2 Performance Characteristics

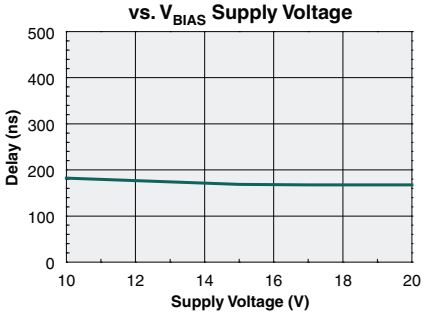
Turn-On Propagation Delay vs. V_{BIAS} Supply Voltage



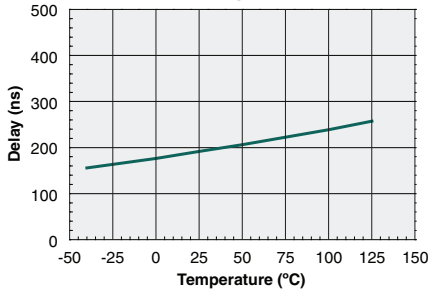
Turn-On Propagation Delay vs. Temperature



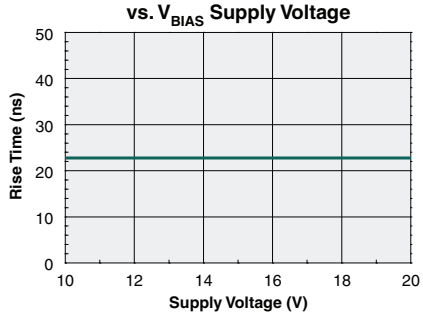
Turn-Off Propagation Delay vs. V_{BIAS} Supply Voltage



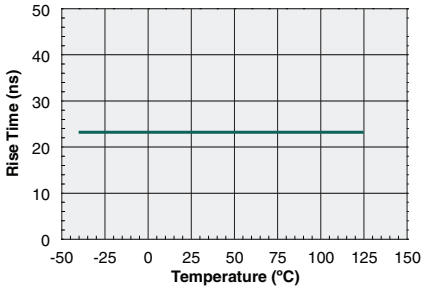
Turn-Off Propagation Delay vs. Temperature



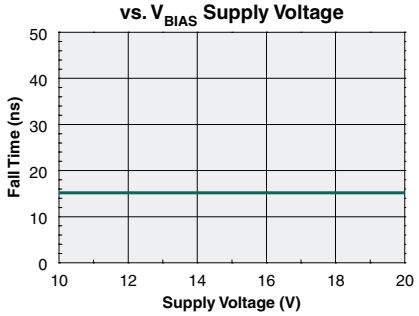
Turn-On Rise Time vs. V_{BIAS} Supply Voltage



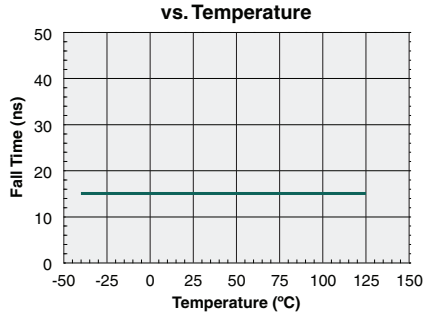
Turn-On Rise Time vs. Temperature



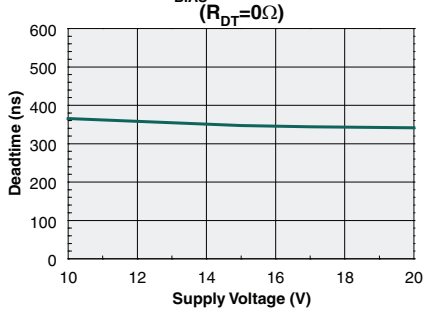
Turn-Off Fall Time vs. V_{BIAS} Supply Voltage



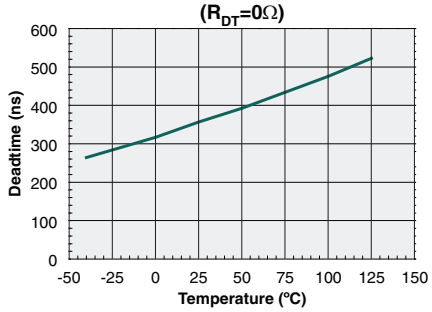
Turn-Off Fall Time vs. Temperature



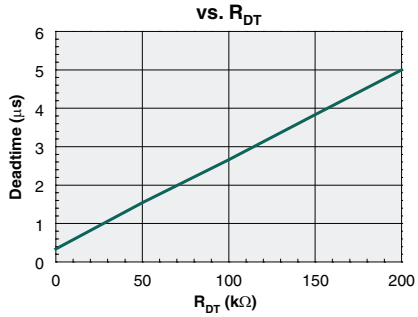
Deadtime vs. V_{BIAS} Supply Voltage (R_{DT}=0Ω)



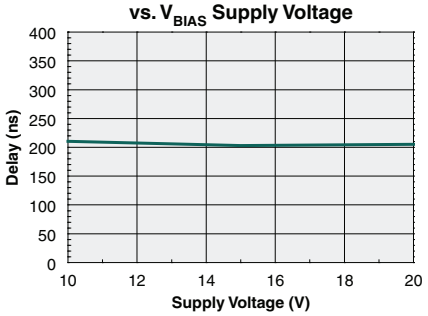
Deadtime vs. Temperature (R_{DT}=0Ω)



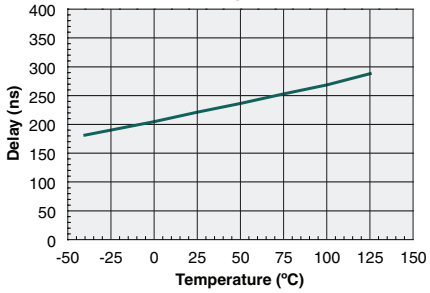
Deadtime vs. R_{DT}



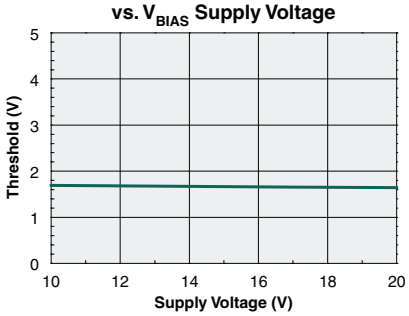
SD Propagation Delay vs. V_{BIAS} Supply Voltage



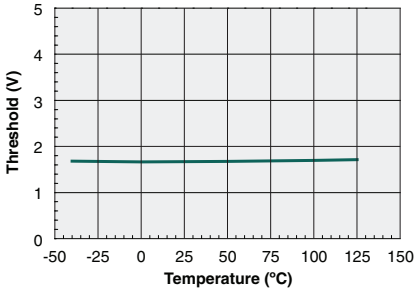
SD Propagation Delay vs. Temperature



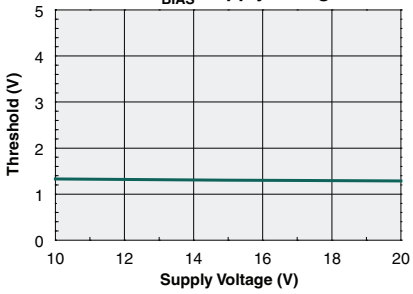
SD Input Positive Going Threshold vs. V_{BIAS} Supply Voltage



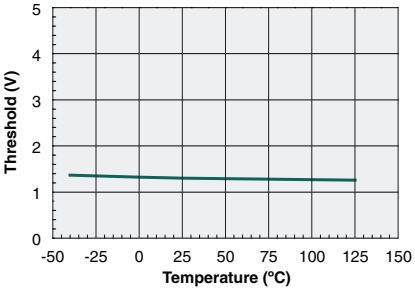
SD Input Positive Going Threshold vs. Temperature



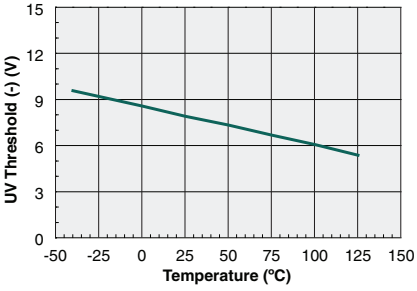
SD Input Negative Going Threshold vs. V_{BIAS} Supply Voltage



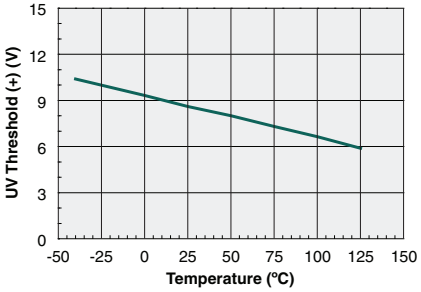
SD Input Negative Going Threshold vs. Temperature



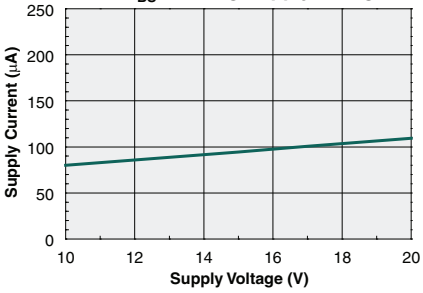
V_{CC} and V_{BS} Undervoltage Threshold (-) vs. Temperature



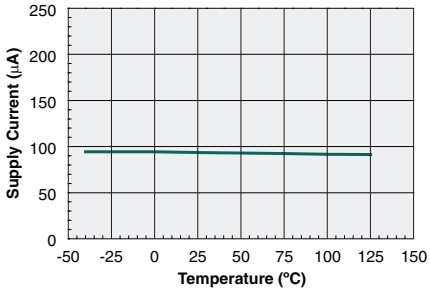
V_{CC} and V_{BS} Undervoltage Threshold (+) vs Temperature



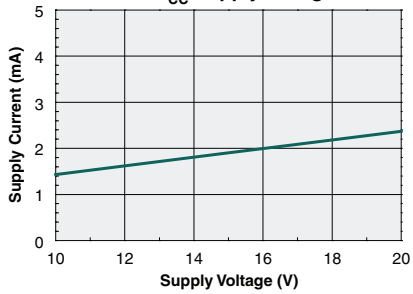
V_{BS} Floating Supply Current vs. V_{BS} Floating Supply Voltage



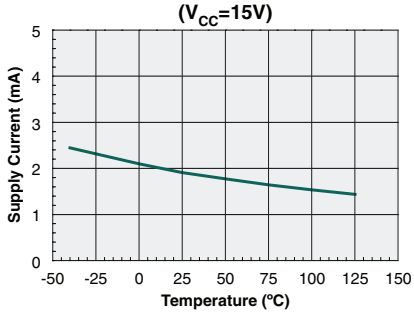
V_{BS} Supply Current vs. Temperature



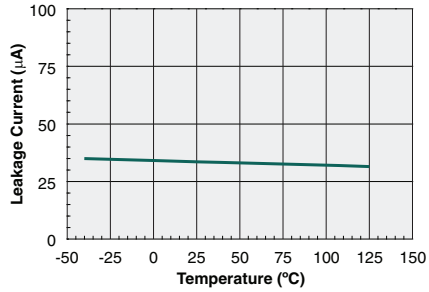
V_{CC} Supply Current vs. V_{CC} Supply Voltage



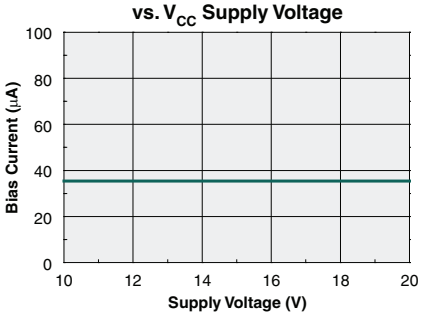
V_{CC} Supply Current vs. Temperature (V_{CC}=15V)



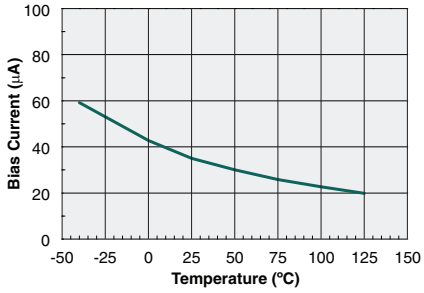
Offset Supply Leakage Current vs. Temperature



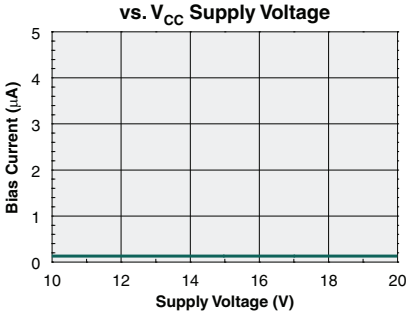
Logic "1" Input Bias Current vs. V_{CC} Supply Voltage



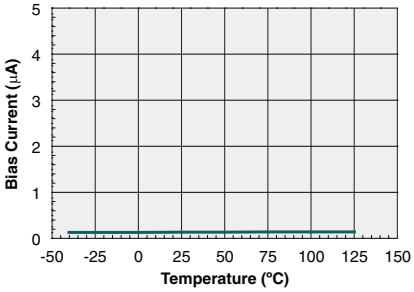
Logic "1" Input Bias Current vs. Temperature



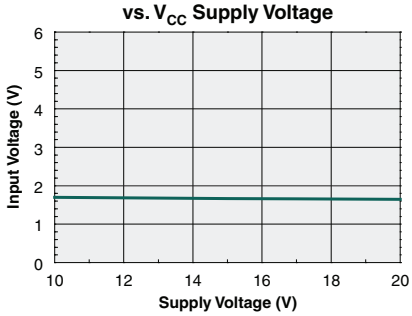
Logic "0" Input Bias Current vs. V_{CC} Supply Voltage



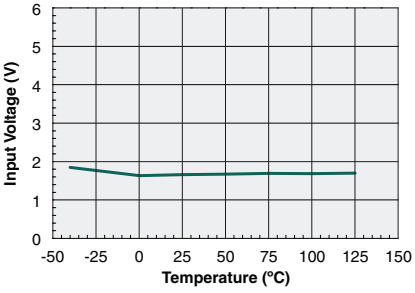
Logic "0" Input Bias Current vs. Temperature



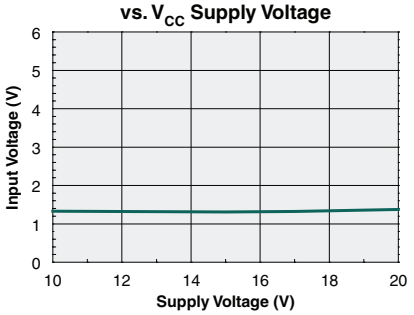
Logic "1" Input Voltage vs. V_{CC} Supply Voltage



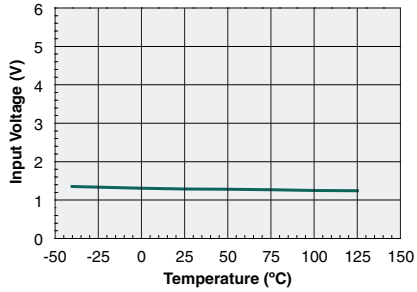
Logic "1" Input Voltage vs. Temperature



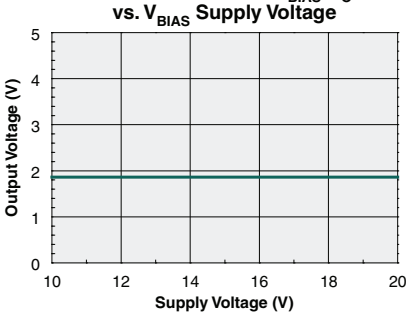
Logic "0" Input Voltage vs. V_{CC} Supply Voltage



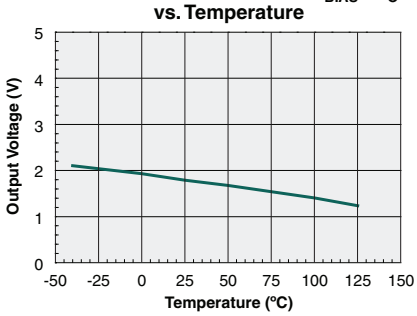
Logic "0" Input Voltage vs. Temperature



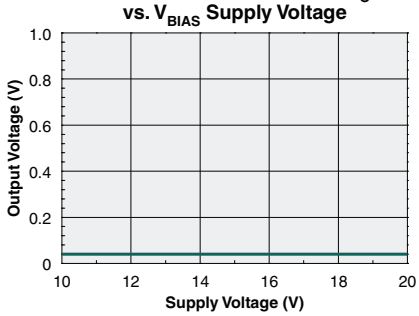
High Level Output (V_{BIAS}-V_O) vs. V_{BIAS} Supply Voltage



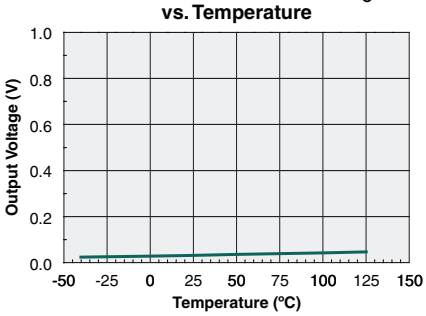
High Level Output Voltage (V_{BIAS} - V_O) vs. Temperature

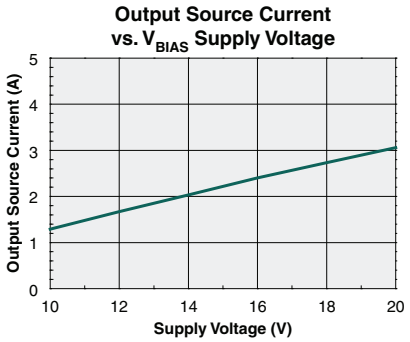


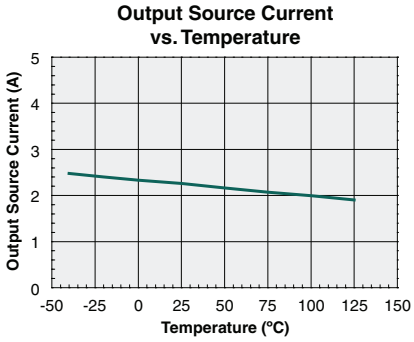
Low Level Output Voltage (V_O) vs. V_{BIAS} Supply Voltage

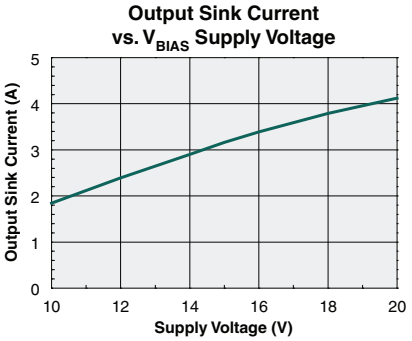


Low Level Output Voltage (V_O) vs. Temperature




Output Source Current
vs. V_{BIAS} Supply Voltage
Output Source Current (A)
0
1
2
3
4
5
10
12
14
16
18
20
Supply Voltage (V)


Output Source Current
vs. Temperature
Output Source Current (A)
0
1
2
3
4
5
-50
-25
0
25
50
75
100
125
150
Temperature (ºC)


Output Sink Current
vs. V_{BIAS} Supply Voltage
Output Sink Current (A)
0
1
2
3
4
5
10
12
14
16
18
20
Supply Voltage (V)

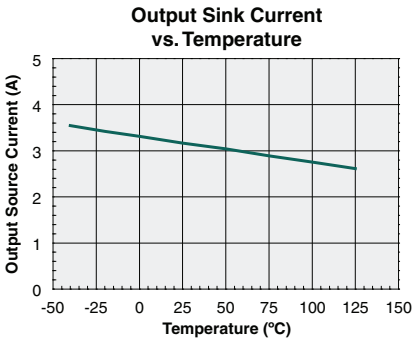
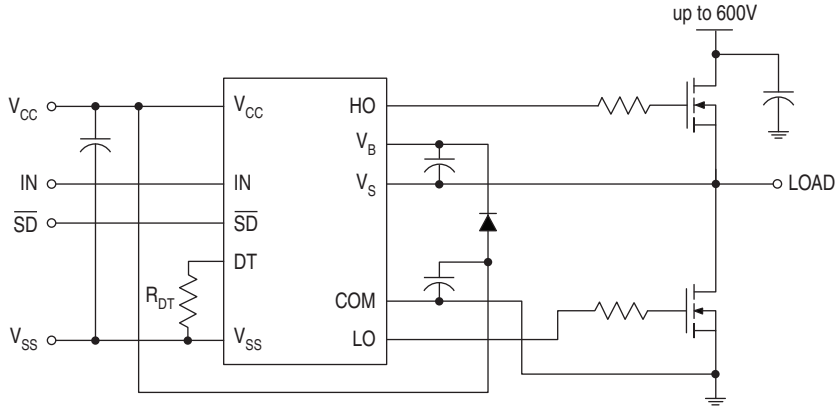

Output Sink Current
vs. Temperature
Output Source Current (A)
0
1
2
3
4
5
-50
-25
0
25
50
75
100
125
150
Temperature (ºC)

Figure 1. Typical Connection Diagram



3 Manufacturing Information

3.1 Moisture Sensitivity

All plastic encapsulated semiconductor packages are susceptible to moisture ingression. IXYS Integrated Circuits Division classified all of its plastic encapsulated devices for moisture sensitivity according to the latest version of the joint industry standard, **IPC/JEDEC J-STD-020**, in force at the time of product evaluation. We test all of our products to the maximum conditions set forth in the standard, and guarantee proper operation of our devices when handled according to the limitations and information in that standard as well as to any limitations set forth in the information or standards referenced below.

Failure to adhere to the warnings or limitations as established by the listed specifications could result in reduced product performance, reduction of operable life, and/or reduction of overall reliability.

This product carries a **Moisture Sensitivity Level (MSL) rating** as shown below, and should be handled according to the requirements of the latest version of the joint industry standard **IPC/JEDEC J-STD-033**.

Device	Moisture Sensitivity Level (MSL) Rating
IX21844G / IX21844N	MSL 1

3.2 ESD Sensitivity

This product is **ESD Sensitive**, and should be handled according to the industry standard **JESD-625**.

3.3 Reflow Profile

This product has a maximum body temperature and time rating as shown below. All other guidelines of **J-STD-020** must be observed.

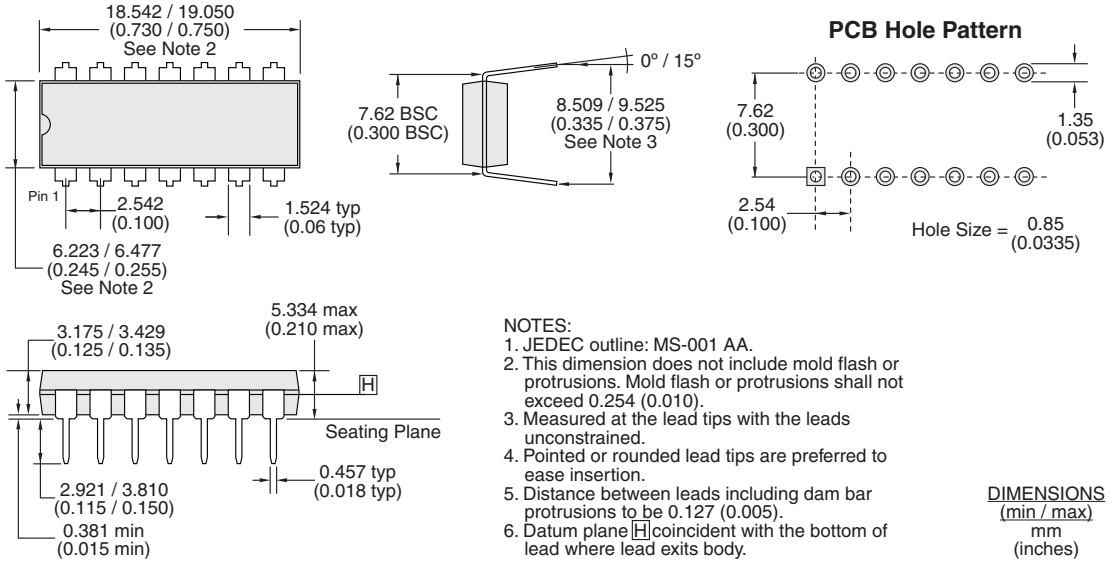
Device	Maximum Temperature x Time
IX21844G (DIP)	245°C for 30 seconds
IX21844N (SOIC)	260°C for 30 seconds

3.4 Board Wash

IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. However, board washing to remove flux residue is acceptable, and the use of a short drying bake may be necessary. Chlorine-based or Fluorine-based solvents or fluxes should not be used. Cleaning methods that employ ultrasonic energy should not be used.

3.5 Mechanical Dimensions

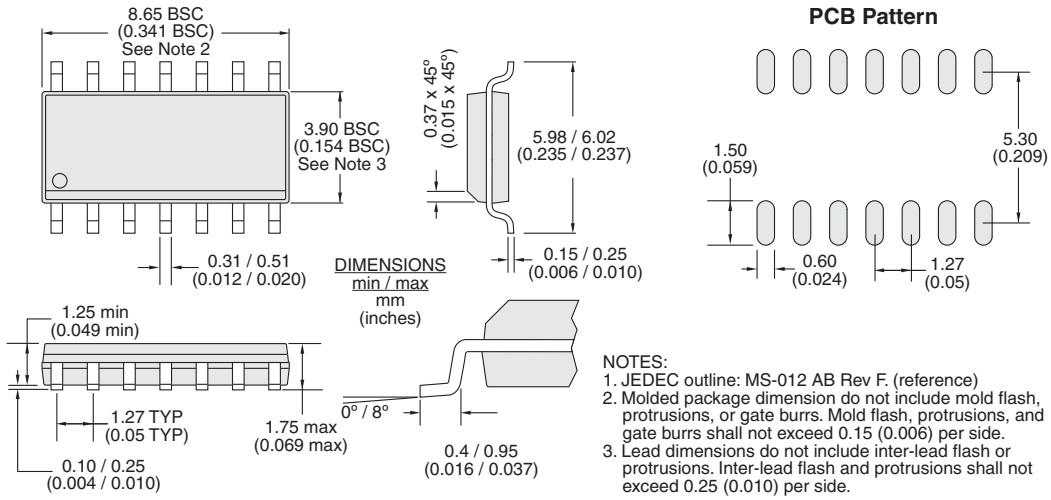
3.5.1 IX21844G 14-Pin DIP Package



NOTES:
1. JEDEC outline: MS-001 AA.
2. This dimension does not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.254 (0.010).
3. Measured at the lead tips with the leads unconstrained.
4. Pointed or rounded lead tips are preferred to ease insertion.
5. Distance between leads including dam bar protrusions to be 0.127 (0.005).
6. Datum plane H coincident with the bottom of lead where lead exits body.

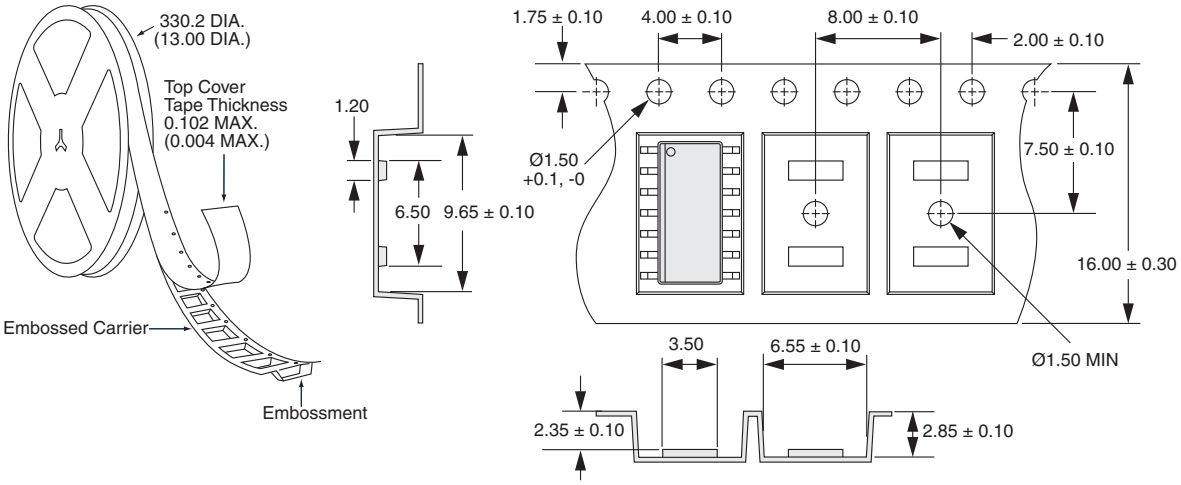
DIMENSIONS
(min / max)
mm
(inches)

3.5.2 IX21844N 14-Pin SOIC (Narrow Body) Package



NOTES:
1. JEDEC outline: MS-012 AB Rev F. (reference)
2. Molded package dimension do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, and gate burrs shall not exceed 0.15 (0.006) per side.
3. Lead dimensions do not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 0.25 (0.010) per side.

3.5.3 IX21844NTR Tape & Reel Packaging



NOTES:
1. All dimensions in millimeters
2. 10 sprocket hole pitch cumulative tolerance ± 0.20.
3. Carrier camber is within 1mm in 250mm.
4. Tape material : Black Conductive Polystyrene Alloy.
5. All dimensions meet EIA-481-C requirements.
6. Thickness : 0.30 ± 0.05mm.

For additional information please visit our website at: www.ixysic.com

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Specification: DS-IX21844-R01
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12/19/2013