

### Features

- 14A Peak Source/Sink Drive Current
- Wide Operating Voltage Range: 4.5V to 35V
- -40°C to +125°C Extended Operating Temperature Range
- Logic Input Withstands Negative Swing of up to 5V
- Low Propagation Delay Time
- Low, 10µA Supply Current
- Low Output Impedance

### Applications

- Efficient Power MOSFET and IGBT Switching
- Switch Mode Power Supplies
- Motor Controls
- DC to DC Converters
- Class-D Switching Amplifiers
- Pulse Transformer Driver

### Description

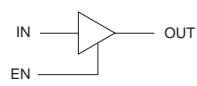
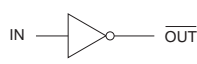
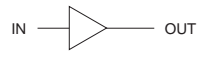
The IXDD614 / IXDI614 / IXDN614 high-speed gate drivers are especially well suited for driving the latest IXYS MOSFETs and IGBTs. Each output can source and sink 14A of peak current while producing voltage rise and fall times of less than 30ns. Internal circuitry eliminates cross-conduction and current "shoot-through," making the driver virtually immune to latch up. Low propagation delay with fast rise and fall times make the IXD\_614 family ideal for high-frequency and high-power applications.

The IXDD614 is configured as a non-inverting driver with an enable. The IXDN614 is configured as a non-inverting driver, and the IXDI614 is configured as an inverting driver.

The IXD\_614 family is available in an 8-pin DIP (PI), an 8-pin Power SOIC with an exposed metal back (SI), a 5-pin TO-220 (CI), and a 5-pin TO-263 (YI) package.



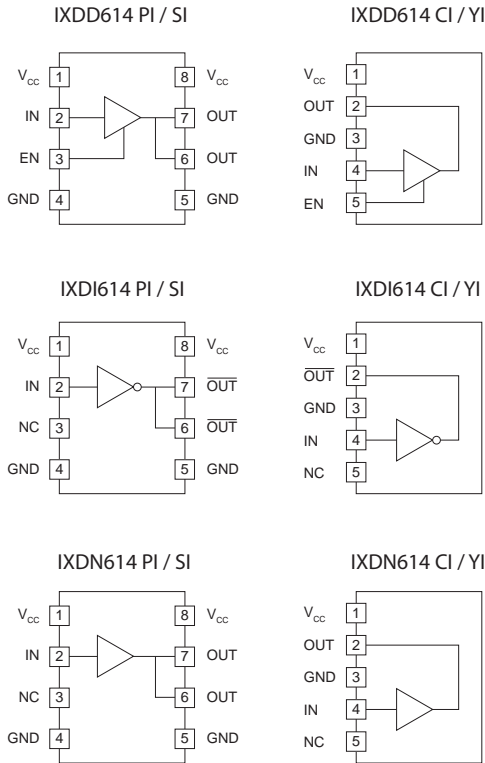
### Ordering Information

Part Number	Logic Configuration	Package Type	Packing Method	Quantity
IXDD614PI		8-Pin DIP	Tube	50
IXDD614SI		8-Pin Power SOIC with Exposed Metal Back	Tube	100
IXDD614SITR		8-Pin Power SOIC with Exposed Metal Back	Tape & Reel	2000
IXDD614CI		5-Pin TO-220	Tube	50
IXDD614YI		5-Pin TO-263	Tube	50
IXDI614PI		8-Pin DIP	Tube	50
IXDI614SI		8-Pin Power SOIC with Exposed Metal Back	Tube	100
IXDI614SITR		8-Pin Power SOIC with Exposed Metal Back	Tape & Reel	2000
IXDI614CI		5-Pin TO-220	Tube	50
IXDI614YI		5-Pin TO-263	Tube	50
IXDN614PI		8-Pin DIP	Tube	50
IXDN614SI		8-Pin Power SOIC with Exposed Metal Back	Tube	100
IXDN614SITR		8-Pin Power SOIC with Exposed Metal Back	Tape & Reel	2000
IXDN614CI		5-Pin TO-220	Tube	50
IXDN614YI		5-Pin TO-263	Tube	50

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# 1 Specifications

## 1.1 Pin Configurations



## 1.2 Pin Definitions

Pin Name	Description
IN	Logic Input
EN	Output Enable - Drive pin low to disable output, and force output to a high impedance state
OUT	Output - Sources or sinks current to turn-on or turn-off a discrete MOSFET or IGBT
$\overline{\text{OUT}}$	Inverted Output - Sources or sinks current to turn-on or turn-off a discrete MOSFET or IGBT
V <sub>CC</sub>	Supply Voltage - Provides power to the device
GND	Ground - Common ground reference for the device
NC	Not connected

**Note:** IXYS Integrated Circuits Division recommends that the exposed metal pad on the back of the “SI” package be connected to GND. The pad is not suitable for carrying current.

## 1.3 Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Supply Voltage	V <sub>CC</sub>	-0.3	40	V
Input Voltage	V <sub>IN</sub> , V <sub>EN</sub>	-5	V <sub>CC</sub> +0.3	V
Output Current	I <sub>OUT</sub>	-	±14	A
Junction Temperature	T <sub>J</sub>	-55	+150	°C
Storage Temperature	T <sub>STG</sub>	-65	+150	°C

Unless stated otherwise, absolute maximum electrical ratings are at 25°C

*Absolute maximum ratings are stress ratings. Stresses in excess of these ratings can cause permanent damage to the device. Functional operation of the device at conditions beyond those indicated in the operational sections of this data sheet is not implied.*

## 1.4 Recommended Operating Conditions

Parameter	Symbol	Range	Units
Supply Voltage	V <sub>CC</sub>	4.5 to 35	V
Operating Temperature Range	T <sub>A</sub>	-40 to +125	°C

**1.5 Electrical Characteristics:  $T_A = 25^\circ\text{C}$** 

 Test Conditions:  $4.5\text{V} \leq V_{CC} \leq 35\text{V}$  (unless otherwise noted).

Parameter	Conditions	Symbol	Minimum	Typical	Maximum	Units
Input Voltage, High	$4.5\text{V} \leq V_{CC} \leq 18\text{V}$	$V_{IH}$	3.0	-	-	V
Input Voltage, Low	$4.5\text{V} \leq V_{CC} \leq 18\text{V}$	$V_{IL}$	-	-	0.8	
Input Current	$0\text{V} \leq V_{IN} \leq V_{CC}$	$I_{IN}$	-	-	$\pm 10$	$\mu\text{A}$
EN Input Voltage, High	IXDD614 only	$V_{ENH}$	$2/3V_{CC}$	-	-	V
EN Input Voltage, Low	IXDD614 only	$V_{ENL}$	-	-	$1/3V_{CC}$	
Output Voltage, High	-	$V_{OH}$	$V_{CC}-0.025$	-	-	V
Output Voltage, Low	-	$V_{OL}$	-	-	0.025	
Output Resistance, High State	$V_{CC}=18\text{V}, I_{OUT}=-100\text{mA}$	$R_{OH}$	-	0.4	0.8	$\Omega$
Output Resistance, Low State	$V_{CC}=18\text{V}, I_{OUT}=100\text{mA}$	$R_{OL}$	-	0.3	0.6	
Output Current, Continuous	Limited by package power dissipation	$I_{DC}$	-	-	$\pm 4$	A
Rise Time	$C_{LOAD}=15\text{nF}, V_{CC}=18\text{V}$	$t_R$	-	25	35	ns
Fall Time	$C_{LOAD}=15\text{nF}, V_{CC}=18\text{V}$	$t_F$	-	18	25	
On-Time Propagation Delay	$C_{LOAD}=15\text{nF}, V_{CC}=18\text{V}$	$t_{ONDELAY}$	-	50	70	
Off-Time Propagation Delay	$C_{LOAD}=15\text{nF}, V_{CC}=18\text{V}$	$t_{OFFDELAY}$	-	50	70	
Enable to Output-High Delay Time	IXDD614 only	$t_{ENOH}$	-	31	60	
Disable to High Impedance State Delay Time	IXDD614 only	$t_{DOLD}$	-	44	70	
Enable Pull-Up Resistor	IXDD614 only	$R_{EN}$	-	200	-	$\text{k}\Omega$
Power Supply Current	$V_{CC}=18\text{V}, V_{IN}=3.5\text{V}$	$I_{CC}$	-	1	2	mA
	$V_{CC}=18\text{V}, V_{IN}=0\text{V}$		-	<1	10	
	$V_{CC}=18\text{V}, V_{IN}=V_{CC}$		-	<1	10	$\mu\text{A}$

**1.6 Electrical Characteristics:  $T_A = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$** 

 Test Conditions:  $4.5\text{V} \leq V_{CC} \leq 35\text{V}$ .

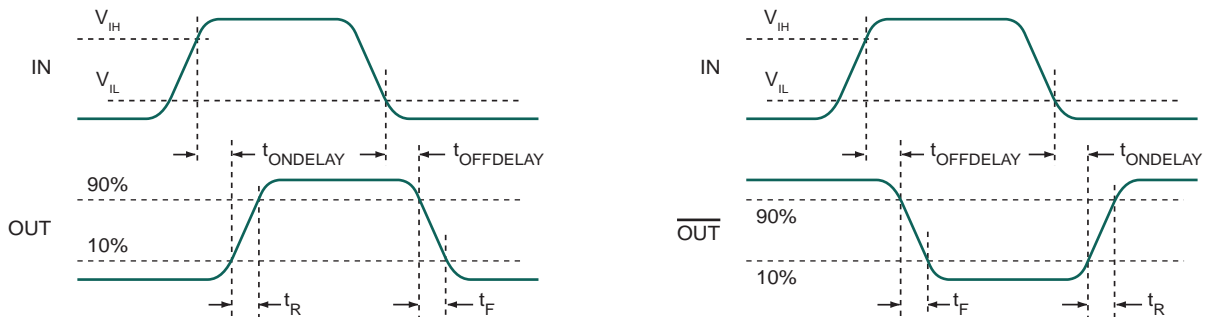
Parameter	Conditions	Symbol	Minimum	Maximum	Units
Input Voltage, High	$4.5\text{V} \leq V_{CC} \leq 18\text{V}$	$V_{IH}$	3.3	-	V
Input Voltage, Low	$4.5\text{V} \leq V_{CC} \leq 18\text{V}$	$V_{IL}$	-	0.65	
Input Current	$0\text{V} \leq V_{IN} \leq V_{CC}$	$I_{IN}$	-	$\pm 10$	$\mu\text{A}$
Output Voltage, High	-	$V_{OH}$	$V_{CC}-0.025$	-	V
Output Voltage, Low	-	$V_{OL}$	-	0.025	
Output Resistance, High State	$V_{CC}=18\text{V}, I_{OUT}=-100\text{mA}$	$R_{OH}$	-	1.5	$\Omega$
Output Resistance, Low State	$V_{CC}=18\text{V}, I_{OUT}=100\text{mA}$	$R_{OL}$	-	1.2	
Output Current, Continuous	Limited by package power dissipation	$I_{DC}$	-	$\pm 1$	A
Rise Time	$C_{LOAD}=15\text{nF}, V_{CC}=18\text{V}$	$t_R$	-	50	ns
Fall Time	$C_{LOAD}=15\text{nF}, V_{CC}=18\text{V}$	$t_F$	-	40	
On-Time Propagation Delay	$C_{LOAD}=15\text{nF}, V_{CC}=18\text{V}$	$t_{ONDELAY}$	-	90	
Off-Time Propagation Delay	$C_{LOAD}=15\text{nF}, V_{CC}=18\text{V}$	$t_{OFFDELAY}$	-	90	
Enable to Output-High Delay Time	IXDD614 only	$t_{ENOH}$	-	75	
Disable to High Impedance State Delay Time	IXDD614 only	$t_{DOLD}$	-	85	
Power Supply Current	$V_{CC}=18\text{V}, V_{IN}=3.5\text{V}$	$I_{CC}$	-	3	mA
	$V_{CC}=18\text{V}, V_{IN}=0\text{V}$		-	150	$\mu\text{A}$
	$V_{CC}=18\text{V}, V_{IN}=V_{CC}$		-	150	

### 1.7 Thermal Characteristics

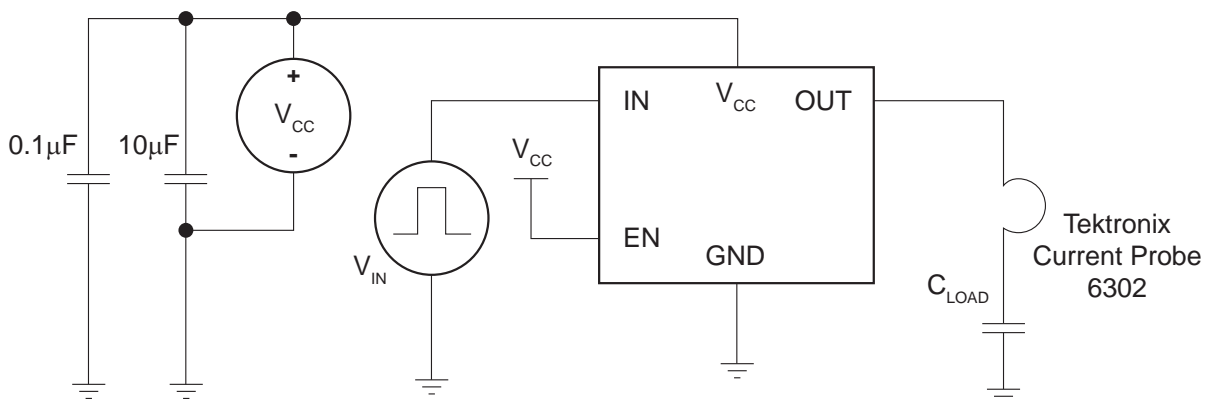
Package	Parameter	Symbol	Rating	Units
CI (5-Pin TO-220)	Thermal Impedance, Junction-to-Ambient	$\theta_{JA}$	36	°C/W
PI (8-Pin DIP)			125	
SI (8-Pin Power SOIC)			85	
YI (5-Pin TO-263)			46	
CI (5-Pin TO-220)	Thermal Impedance, Junction-to-Case	$\theta_{JC}$	3	°C/W
SI (8-Pin Power SOIC)			10	
YI (5-Pin TO-263)			2	

## 2 Performance

### 2.1 Timing Diagrams

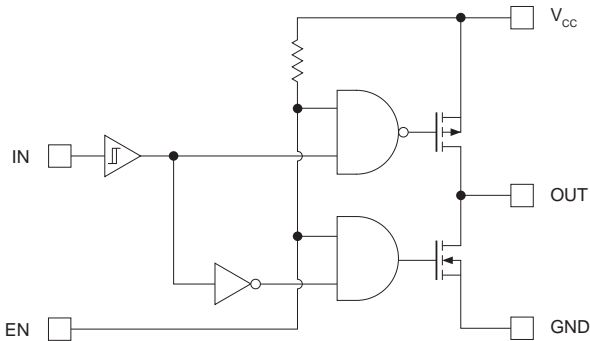


### 2.2 Characteristics Test Diagram



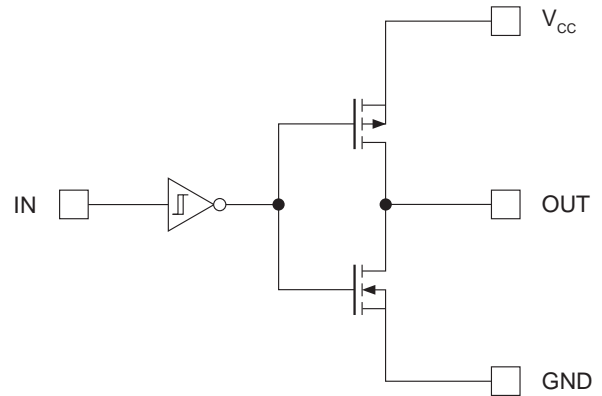
### 3 Block Diagrams & Truth Tables

#### 3.1 IXDD614



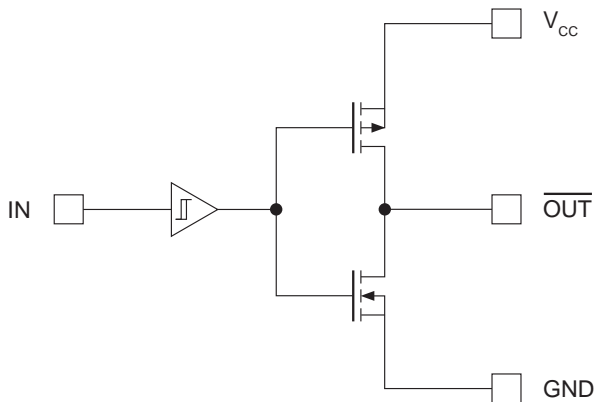
IN	EN	OUT
0	1 or open	0
1	1 or open	1
x	0	Z

#### 3.3 IXDN614



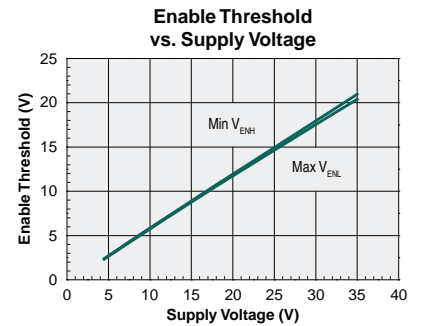
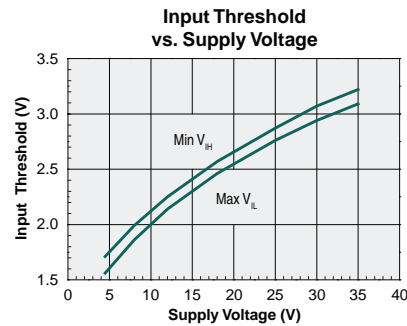
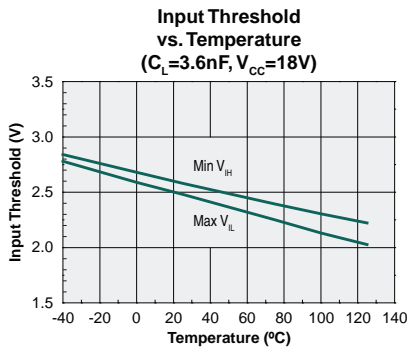
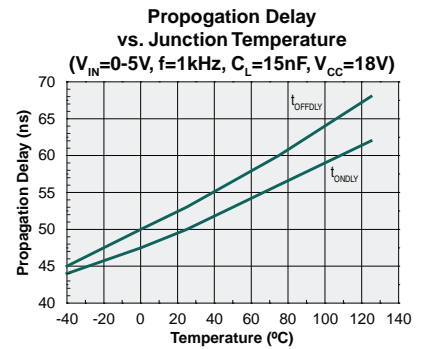
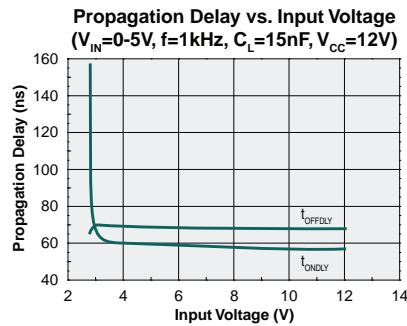
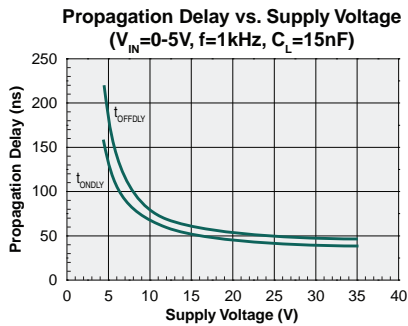
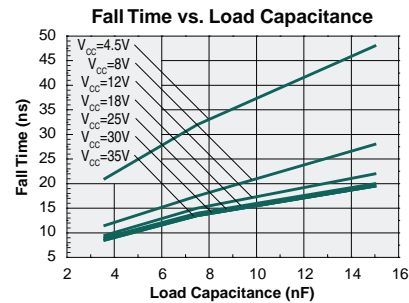
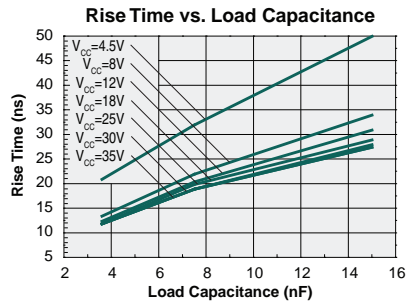
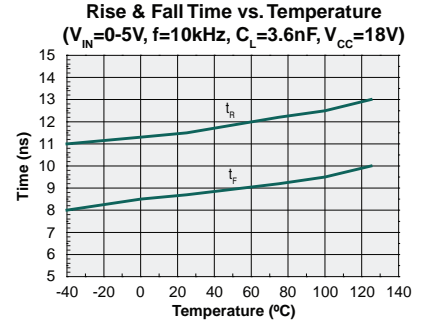
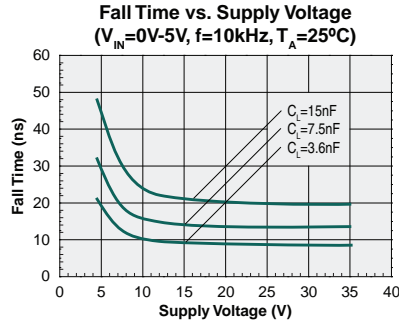
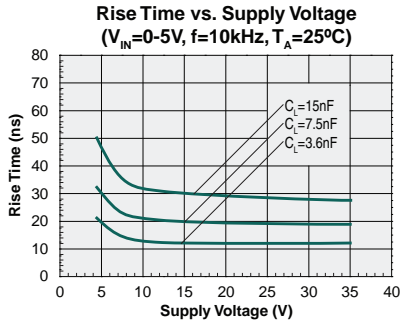
IN	OUT
0	0
1	1

#### 3.2 IXDI614

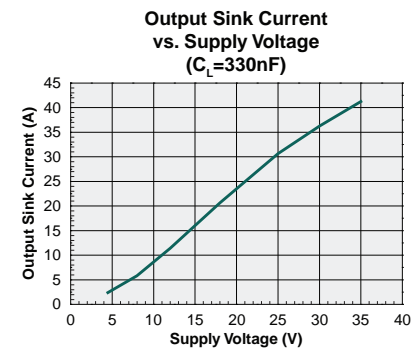
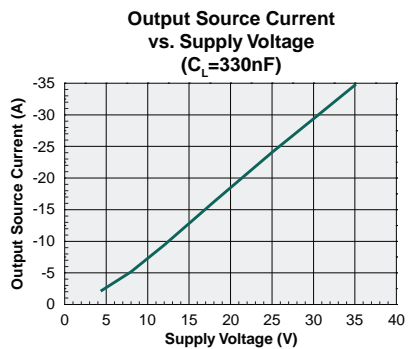
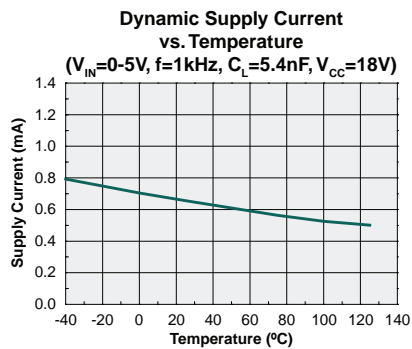
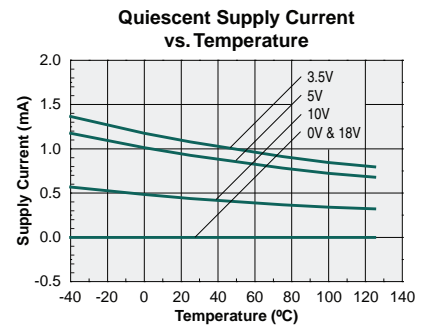
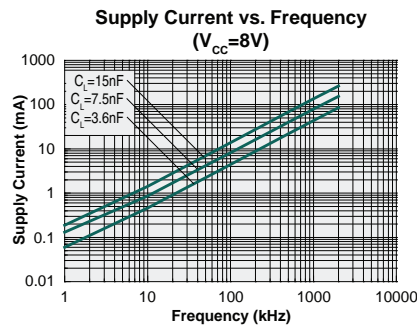
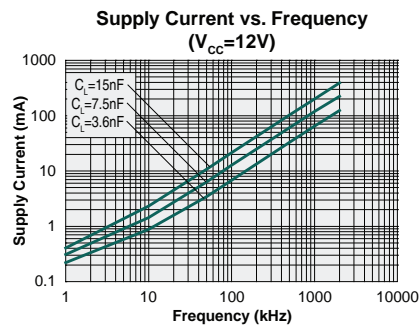
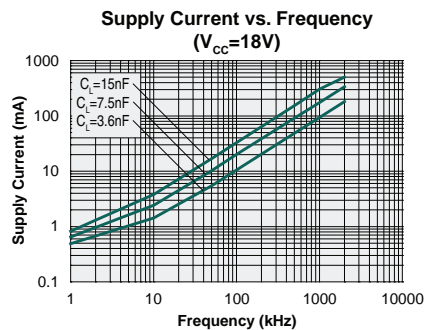
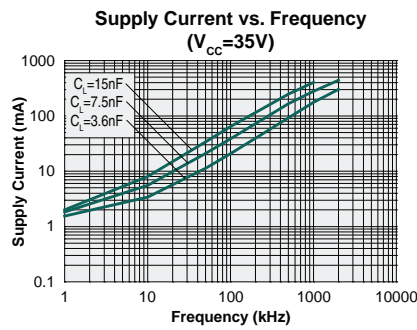
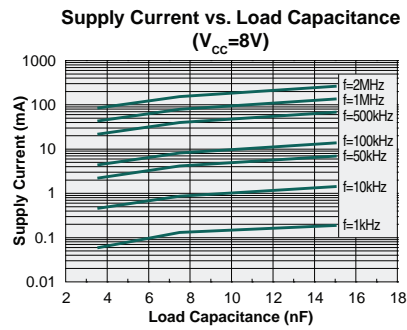
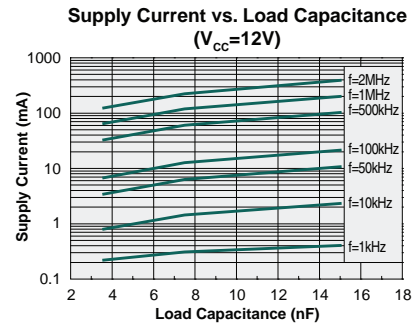
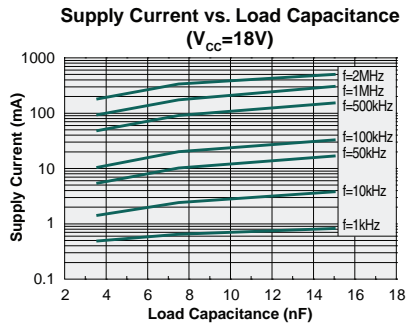
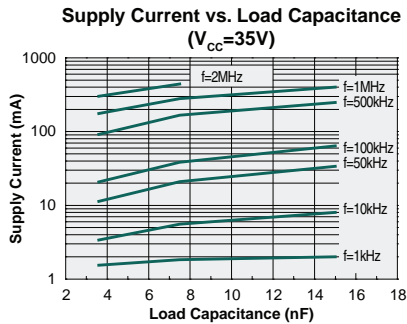


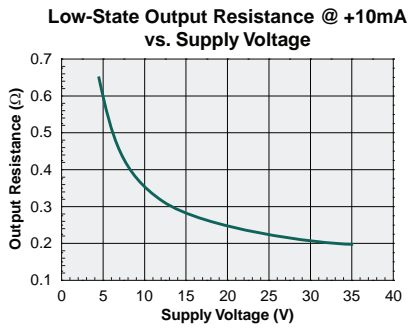
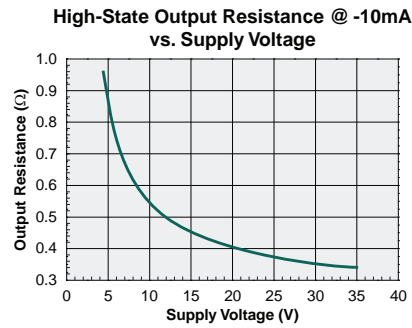
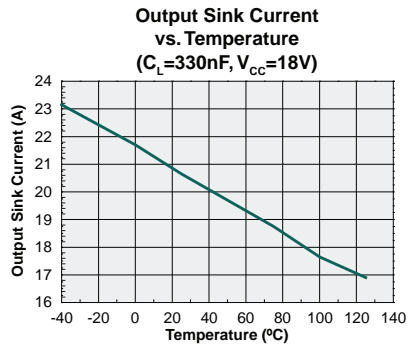
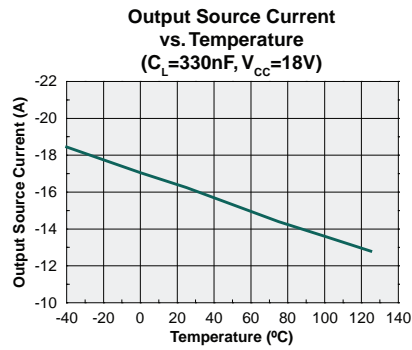
IN	$\overline{\text{OUT}}$
0	1
1	0

## 4 Typical Performance Characteristics









## 5 Manufacturing Information

### 5.1 Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. IXYS Integrated Circuits Division classifies 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)** classification 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) Classification
IXD_614SI / IXD_614PI / IXD_614CI	MSL 1
IXD_614YI	MSL 3

### 5.2 ESD Sensitivity



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

### 5.3 Soldering Profile

Provided in the table below is the Classification Temperature ( $T_C$ ) of this product and the maximum dwell time the body temperature of this device may be ( $T_C - 5$ )°C or greater. The classification temperature sets the Maximum Body Temperature allowed for this device during lead-free reflow processes. For through-hole devices, and any other processes, the guidelines of J-STD-020 must be observed.

Device	Classification Temperature ( $T_C$ )	Dwell Time ( $t_p$ )	Max Reflow Cycles
IXD_614CI	245°C	30 seconds	1
IXD_614YI	245°C	30 seconds	3
IXD_614PI	250°C	30 seconds	3
IXD_614SI	260°C	30 seconds	3

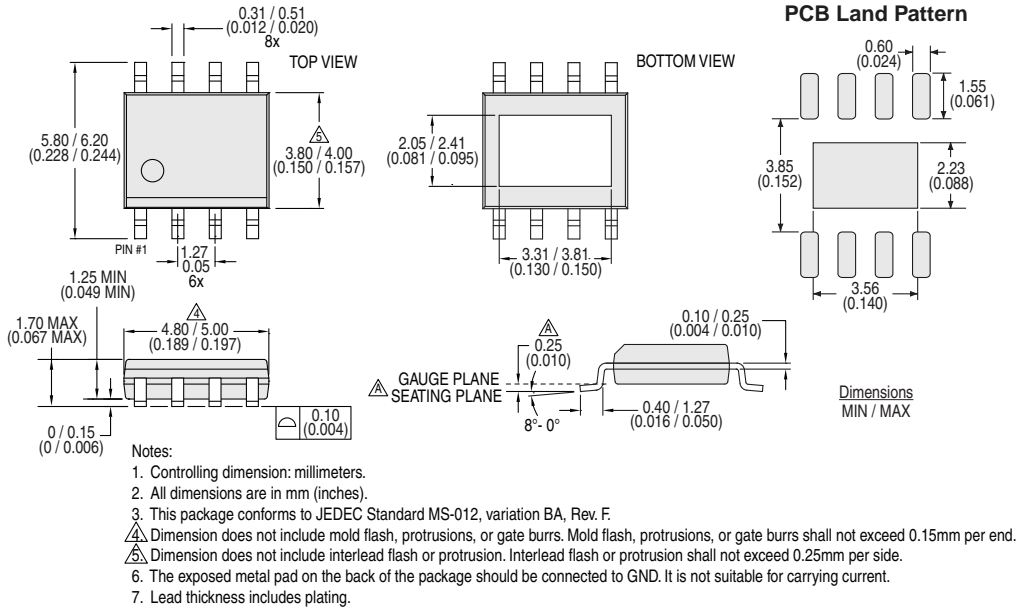
### 5.4 Board Wash

IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. Board washing to reduce or remove flux residue following the solder reflow process is acceptable provided proper precautions are taken to prevent damage to the device. These precautions include but are not limited to: using a low pressure wash and providing a follow up bake cycle sufficient to remove any moisture trapped within the device due to the washing process. Due to the variability of the wash parameters used to clean the board, determination of the bake temperature and duration necessary to remove the moisture trapped within the package is the responsibility of the user (assembler). Cleaning or drying methods that employ ultrasonic energy may damage the device and should not be used. Additionally, the device must not be exposed to flux or solvents that are Chlorine- or Fluorine-based.

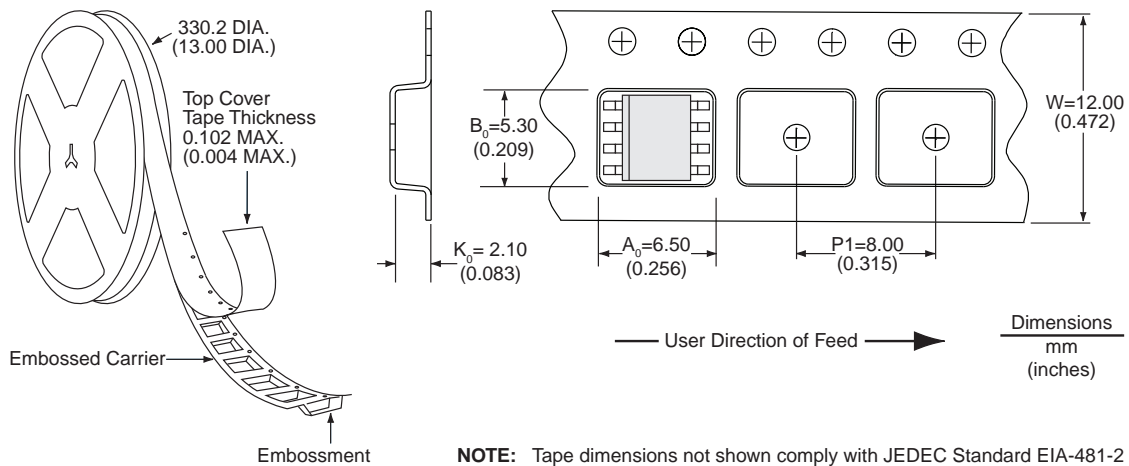


### 5.5 Mechanical Dimensions

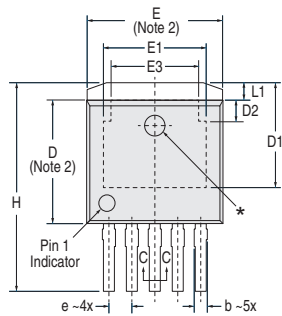
#### 5.5.1 SI (8-Pin Power SOIC with Exposed Metal Back)



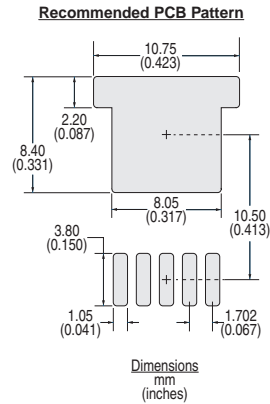
#### 5.5.2 SI Package Tape & Reel Information



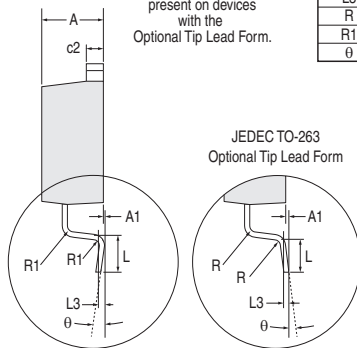
### 5.5.3 YI (5-Pin TO-263)



SYMBOL	MM		INCH	
	MIN	MAX	MIN	MAX
A	4.064	4.826	0.160	0.190
A1	0.000	0.254	0.000	0.010
b	0.508	0.991	0.020	0.039
b1	0.508	0.889	0.020	0.035
c	0.381	0.737	0.015	0.029
c1	0.381	0.584	0.015	0.023
c2	1.143	1.651	0.045	0.065
D	8.382	9.652	0.330	0.380
D1	6.858	7.700	0.270	0.303
D2	1.358	1.562	0.053	0.062
E	9.652	10.668	0.380	0.420
E1	6.223	8.000	0.245	0.315
E3	5.092	6.869	0.200	0.270
e	1.702 BSC		0.067 BSC	
H	14.605	15.875	0.575	0.625
L	1.778	2.794	0.070	0.110
L1	1.000	1.676	0.039	0.066
L3	0.254 BSC		0.010 BSC	
R	0.460 TYP		0.018 TYP	
R1	0.506 TYP		0.02 TYP	
θ	-	8°	-	8°

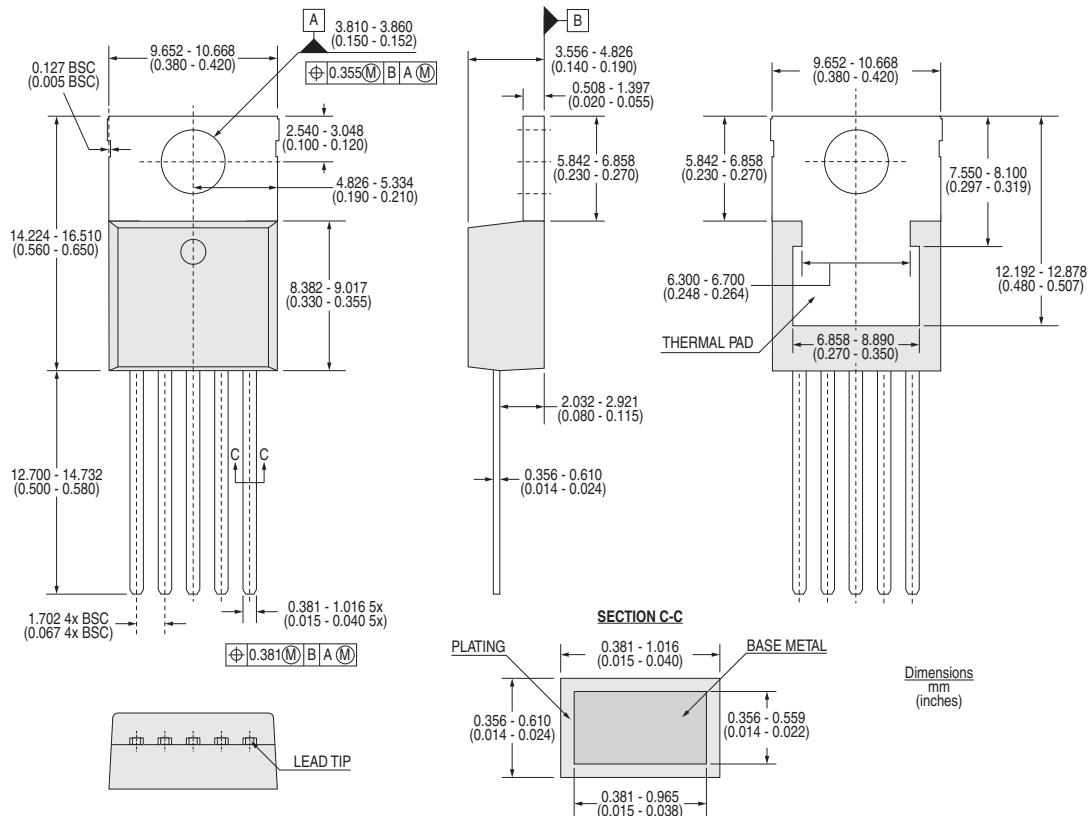


\* Circular feature will be present on devices with the Optional Tip Lead Form.

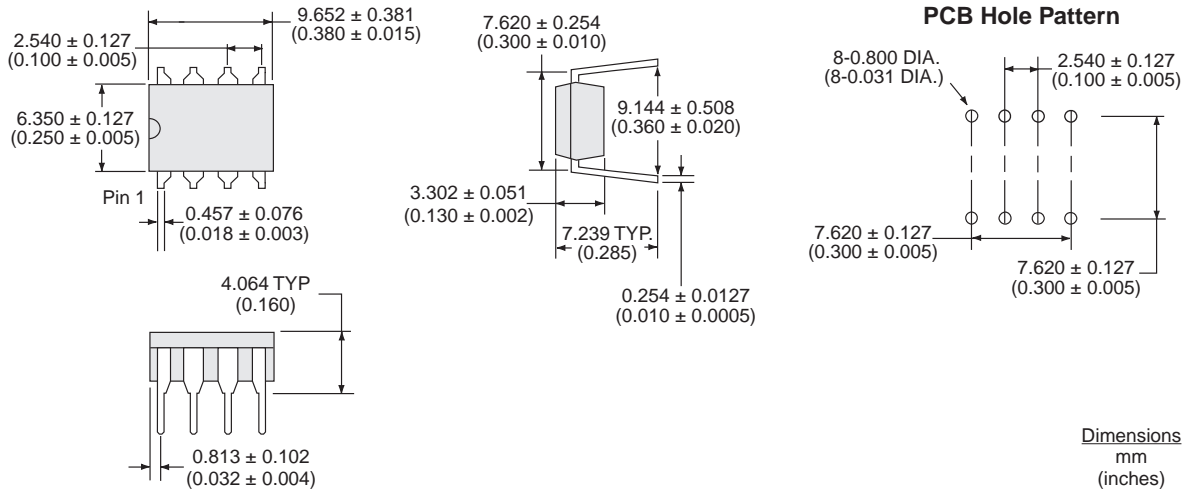


- NOTES:
- Reference JEDEC TO-263 Type "BA".
  - Dimension does not include mold flash; mold flash shall not exceed 0.127mm (0.005 inch) per side.
  - Minimum plating: 1000 microinches.
  - Controlling dimension: millimeters.

### 5.5.4 CI (5-Pin TO-220)



5.5.5 PI (8-Pin DIP)



For additional information please visit our website at: [www.ixysic.com](http://www.ixysic.com)

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