IXYS
INTEGRATED CIRCUITS DIVISION

IXD_630
30-Ampere Low-Side Ultrafast MOSFET Drivers

Features

- 30A Peak Source/Sink Drive Current
- High Operating Voltage Capability: 35V
- -40°C to +125°C Extended Operating Temperature Range
- Under-Voltage Lockout Protection
- Logic Input Withstands Negative Swing of up to 5V
- Fast Rise and Fall Times: < 20ns
- 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

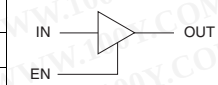
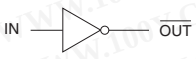
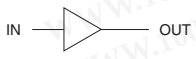
Description

The IXDD630/IXDI630/IXDN630 high-speed gate drivers are especially well suited for driving the latest IXYS power MOSFETs and IGBTs. The IXD_630 output can source and sink 30A of peak current while producing voltage rise and fall times of less than 20ns. Internal circuitry eliminates cross conduction and current "shoot-through," and the driver is virtually immune to latch up. Under-voltage lockout (UVLO) circuitry holds the output LOW until sufficient supply voltage is applied (12.5V for the IXD_630 versions, and 9V for the IXD_630M versions). Low propagation delays and fast, matched rise and fall times make the IXD_630 family ideal for very high frequency and high-power applications.

The IXDD630 is configured as a non-inverting driver with an enable. The IXDN630 is configured as a non-inverting driver, and the IXDI630 is configured as an inverting driver.

The IXD_630 family is available in a 5-pin TO-220 (CI), and a 5-pin TO-263 (YI) package.

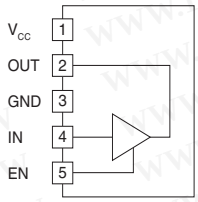
Ordering Information

Part Number	Logic Configuration	UVLO	Package Type	Packing Method	Quantity
IXDD630CI		12.5V	5-Pin TO-220	Tube	50
IXDD630MCI		9V	5-Pin TO-220	Tube	50
IXDD630YI		12.5V	5-Pin TO-263	Tube	50
IXDD630MYI		9V	5-Pin TO-263	Tube	50
IXDI630CI		12.5V	5-Pin TO-220	Tube	50
IXDI630MCI		9V	5-Pin TO-220	Tube	50
IXDI630YI		12.5V	5-Pin TO-263	Tube	50
IXDI630MYI		9V	5-Pin TO-263	Tube	50
IXDN630CI		12.5V	5-Pin TO-220	Tube	50
IXDN630MCI		9V	5-Pin TO-220	Tube	50
IXDN630YI		12.5V	5-Pin TO-263	Tube	50
IXDN630MYI		9V	5-Pin TO-263	Tube	50

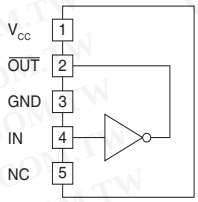
1 Specifications

1.1 Lead Configurations

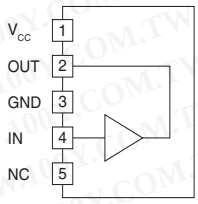
IXDD630 CI / YI



IXDI630 CI / YI



IXDN630 CI / YI



1.2 Lead Definitions

Lead Name	Description
IN	Logic Input
EN	Output Enable - Drive lead 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
$\overline{OUT}$	Inverted Output - Sources or sinks current to turn-on or turn-off a discrete MOSFET or IGBT
V_{CC}	Supply Voltage - Provides power to the device
GND	Ground - Common ground reference for the device
NC	Not connected

1.3 Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Supply Voltage	V_{CC}	-0.3	40	V
Input Voltage Range	V_{IN} , V_{EN}	-5	V_{CC}+0.3	V
Output Current	I_{OUT}	-	±30	A
Junction Temperature	T_J	-55	+150	°C
Storage Temperature	T_{STG}	-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_{CC}	UVLO to 35	V
Operating Temperature Range	T_A	-40 to +125	°C

1.5 Electrical Characteristics: T_A = 25°C

Test Conditions: UVLO ≤ V_{CC} ≤ 35V (unless otherwise noted).

Parameter	Conditions	Symbol	Minimum	Typical	Maximum	Units
Input Voltage, High	UVLO ≤ V_{CC} ≤ 18V	V_{IH}	3.5	-	-	V
Input Voltage, Low	UVLO ≤ V_{CC} ≤ 18V	V_{IL}	-	-	0.8	
Input Current	0V ≤ V_{IN} ≤ V_{CC}	I_{IN}	-	-	±10	µA
EN Input Voltage, High	IXDD630 only	V_{ENH}	2/3V_{CC}	-	-	V
EN Input Voltage, Low	IXDD630 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}=18V, I_{OUT}= -100mA	R_{OH}	-	0.17	0.4	Ω
Output Resistance, Low State	V_{CC}=18V, I_{OUT}=100mA	R_{OL}	-	0.16	0.3	
Output Current, Continuous	Limited by package power dissipation	I_{DC}	-	-	±8	A
Rise Time	C_{LOAD}=5.6nF, V_{CC}=18V	t_r	-	11	20	ns
Fall Time	C_{LOAD}=5.6nF, V_{CC}=18V	t_f	-	11	18	
On-Time Propagation Delay	C_{LOAD}=5.6nF, V_{CC}=18V	t_{ondly}	-	46	65	
Off-Time Propagation Delay	C_{LOAD}=5.6nF, V_{CC}=18V	t_{offdly}	-	46	65	
Output Enable Time	IXDD630 only	t_{PZL}, t_{PZH}	-	34	65	
Output Disable Time	IXDD630 only	t_{PLZ}, t_{PHZ}	-	65	125	
Enable Pull-Up Resistor	IXDD630 only	R_{EN}	-	400	-	kΩ
Power Supply Current	V_{CC}=18V, V_{IN}=3.5V	I_{CC}	-	2.5	4	mA
	V_{CC}=18V, V_{IN}=0V		-	-	0.75	mA
	V_{CC}=18V, V_{IN}=V_{CC}		-	-	0.75	
Under-Voltage Lockout Threshold	V_{CC} Rising, IXD_630M	UVLO	7	9	9.9	V
	V_{CC} Rising, IXD_630		10	12.5	13.5	
Under-Voltage Lockout Hysteresis	IXD_630M	-	-	1	-	V
	IXD_630		-	1.5	-	

1.6 Electrical Characteristics: T_A = - 40°C to +125°C

Test Conditions: UVLO ≤ V_{CC} ≤ 35V, T_J<150°C.

Parameter	Conditions	Symbol	Minimum	Maximum	Units
Input Voltage, High	UVLO ≤ V_{CC} ≤ 18V	V_{IH}	4	-	V
Input Voltage, Low	UVLO ≤ V_{CC} ≤ 18V	V_{IL}	-	0.8	
Output Resistance, High State	V_{CC}=18V, I_{OUT}= -100mA	R_{OH}	-	0.6	Ω
Output Resistance, Low State	V_{CC}=18V, I_{OUT}=100mA	R_{OL}	-	0.45	
Rise Time	C_{LOAD}=5.6nF, V_{CC}=18V	t_r	-	35	ns
Fall Time	C_{LOAD}=5.6nF, V_{CC}=18V	t_f	-	35	
On-Time Propagation Delay	C_{LOAD}=5.6nF, V_{CC}=18V	t_{ondly}	-	100	
Off-Time Propagation Delay	C_{LOAD}=5.6nF, V_{CC}=18V	t_{offdly}	-	100	

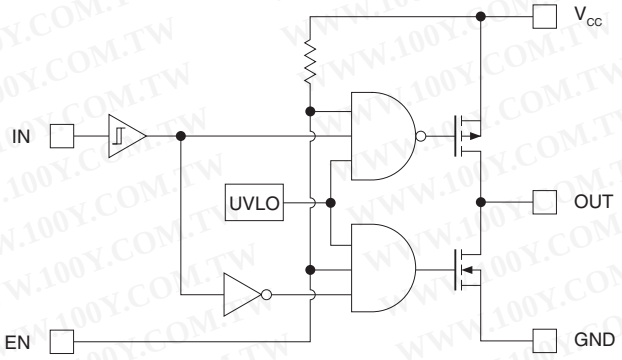
1.7 Thermal Characteristics

Package	Parameter	Symbol	Rating	Units
IXD_630CI (5-Lead TO-220)	Thermal Resistance, Junction-to-Ambient	θ_{JA}	36	°C/W
IXD_630YI (5-Lead TO-263)			46	
IXD_630CI (5-Lead TO-220)	Thermal Resistance, Junction-to-Case	θ_{JC}	3	°C/W
IXD_630YI (5-Lead TO-263)			2	

2 Functional Description

2.1 IXDD630 Block Diagram & Truth Table

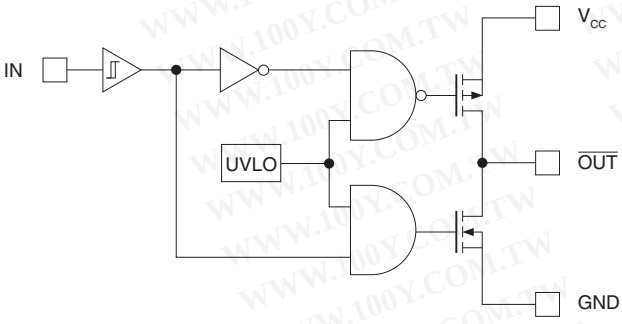
IXDD630



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

2.2 IXDI630 Block Diagram & Truth Table

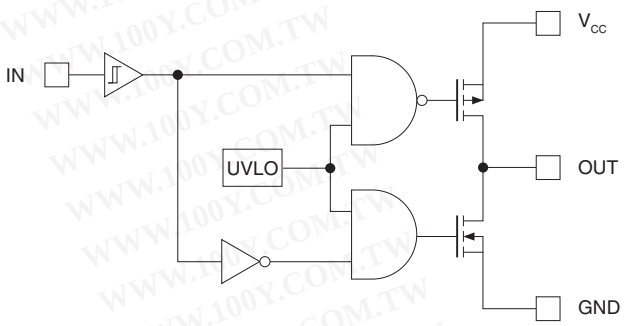
IXDI630



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

2.3 IXDN630 Block Diagram & Truth Table

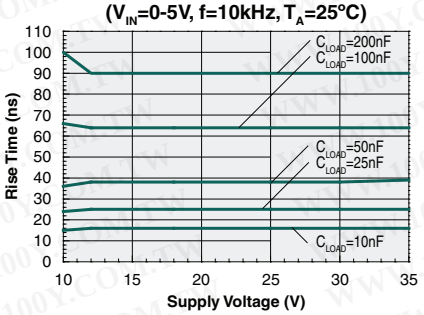
IXDN630



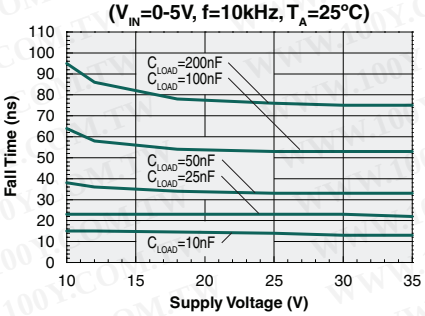
IN	OUT
0	0
1	1

3 Typical Performance Characteristics

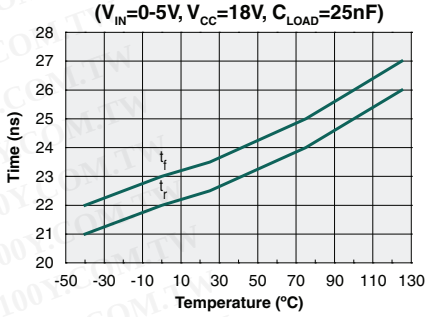
Rise Time vs. Supply Voltage
(V_{IN}=0-5V, f=10kHz, T_A=25°C)



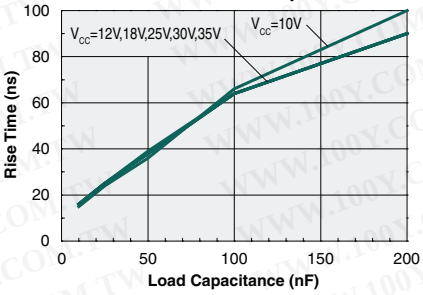
Fall Time vs. Supply Voltage
(V_{IN}=0-5V, f=10kHz, T_A=25°C)



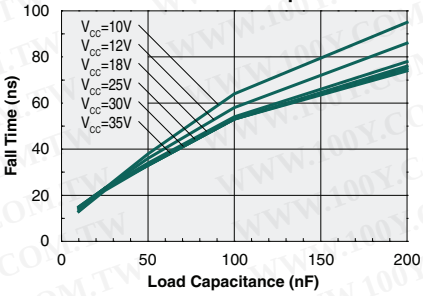
Rise & Fall Times vs. Temperature
(V_{IN}=0-5V, V_{CC}=18V, C_{LOAD}=25nF)



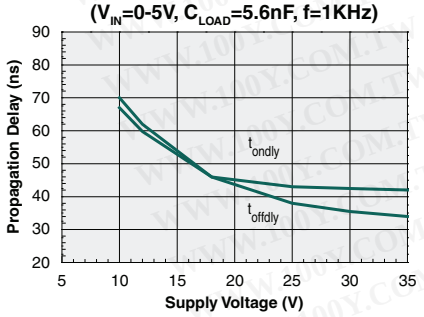
Rise Time vs. Load Capacitance



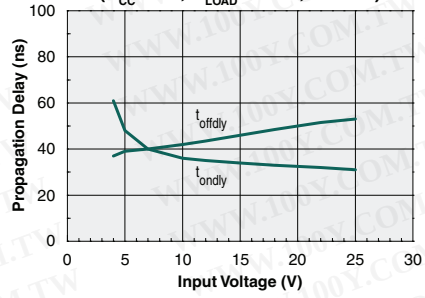
Fall Time vs. Load Capacitance



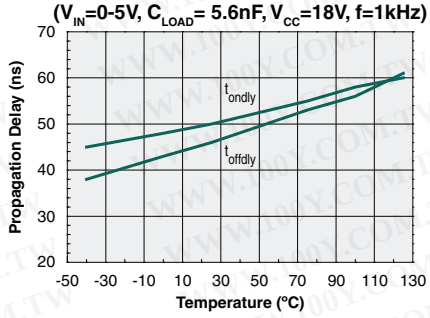
Propagation Delay vs. Supply Voltage
(V_{IN}=0-5V, C_{LOAD}=5.6nF, f=1KHz)



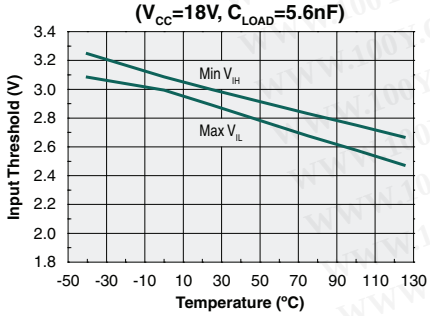
Propagation Delay vs. Input Voltage
(V_{CC}=25V, C_{LOAD}=5.6nF, f=1kHz)



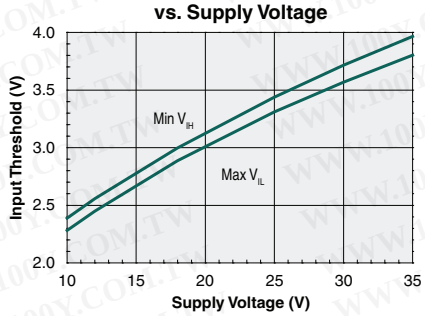
Propagation Delay
vs. Junction Temperature
(V_{IN}=0-5V, C_{LOAD}= 5.6nF, V_{CC}=18V, f=1kHz)



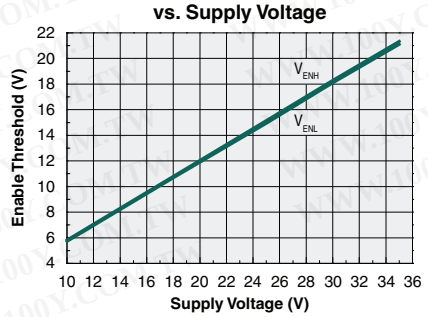
Input Threshold vs. Temperature
(V_{CC}=18V, C_{LOAD}=5.6nF)



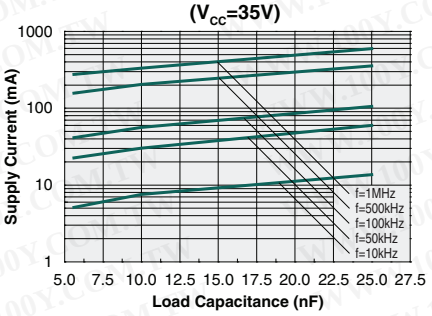
Input Threshold
vs. Supply Voltage



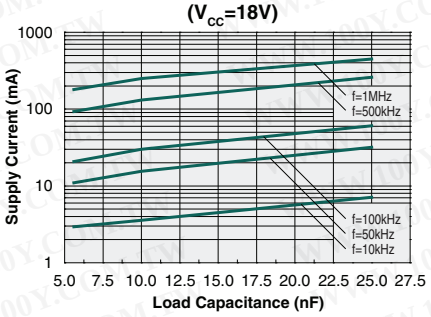
Enable Thresholds
vs. Supply Voltage



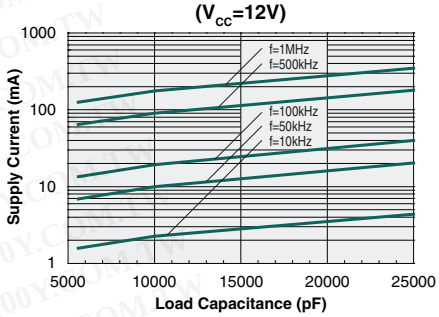
Supply Current vs. Load Capacitance (V_{CC}=35V)



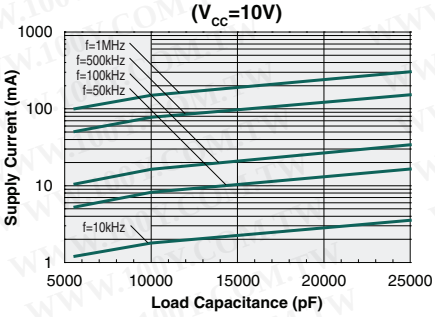
Supply Current vs. Load Capacitance (V_{CC}=18V)



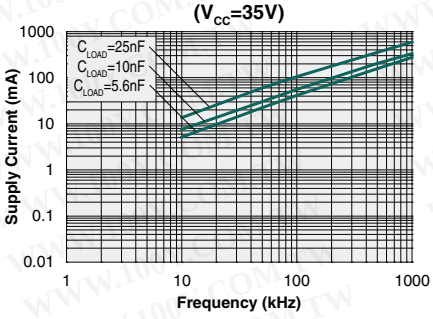
Supply Current vs. Load Capacitance (V_{CC}=12V)



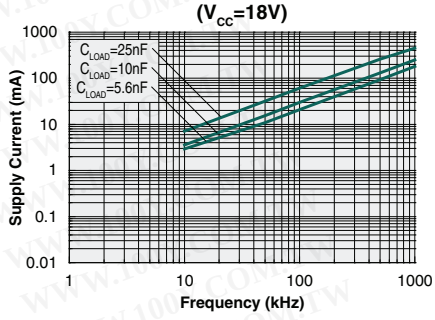
Supply Current vs. Load Capacitance (V_{CC}=10V)



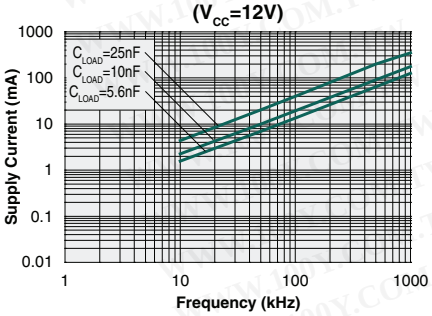
Supply Current vs. Frequency (V_{CC}=35V)



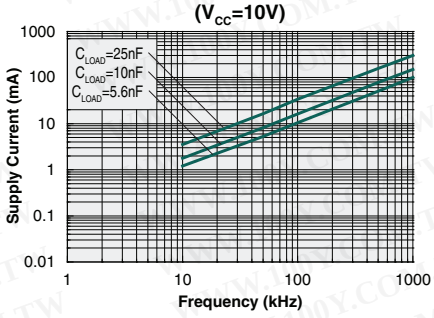
Supply Current vs. Frequency (V_{CC}=18V)



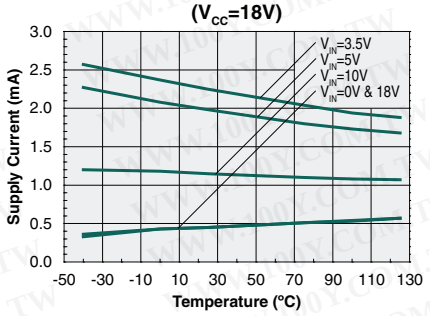
Supply Current vs. Frequency (V_{CC}=12V)



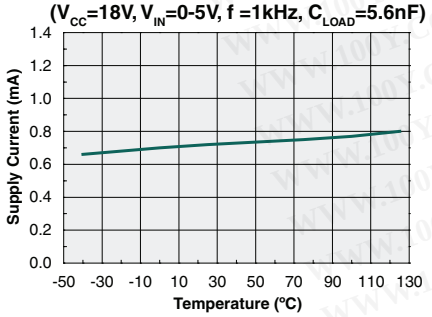
Supply Current vs. Frequency (V_{CC}=10V)



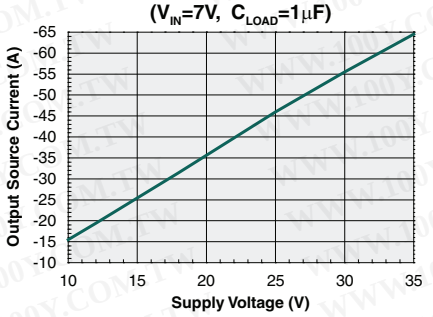
Quiesent Supply Current vs. Temperature (V_{CC}=18V)



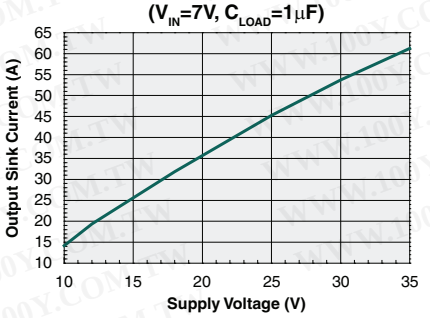
Dynamic Supply Current vs. Temperature (V_{CC}=18V, V_{IN}=0-5V, f =1kHz, C_{LOAD}=5.6nF)



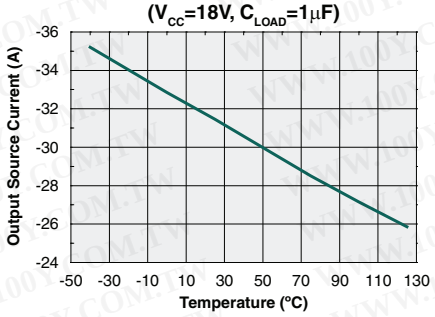
Output Source Current vs. Supply Voltage (V_{IN}=7V, C_{LOAD}=1µF)



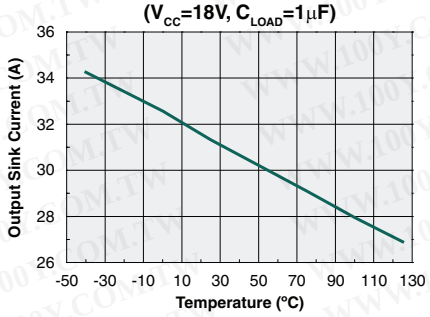
Output Sink Current vs. Supply Voltage (V_{IN}=7V, C_{LOAD}=1µF)



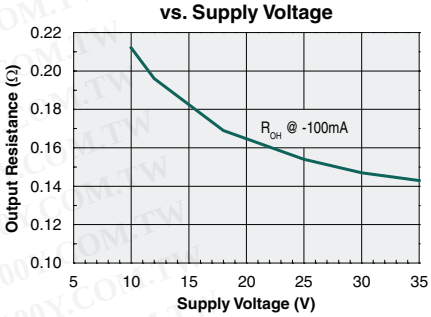
Output Source Current vs. Temperature (V_{CC}=18V, C_{LOAD}=1μF)



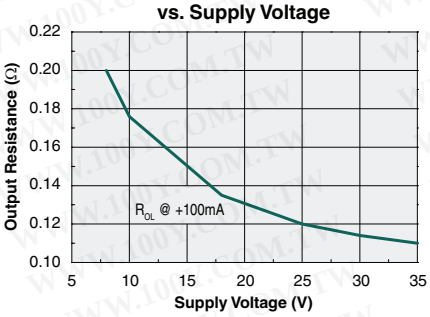
Output Sink Current vs. Temperature (V_{CC}=18V, C_{LOAD}=1μF)



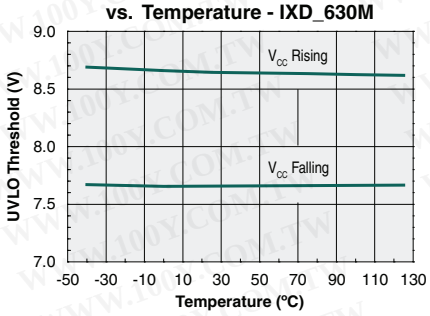
High-State Output Resistance vs. Supply Voltage



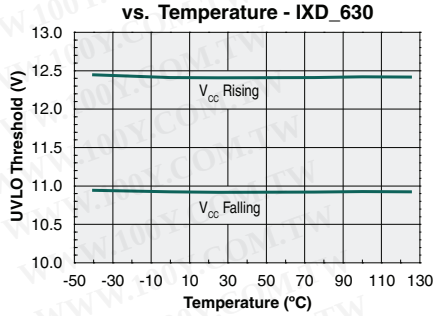
Low-State Output Resistance vs. Supply Voltage



Under Voltage Lockout Threshold vs. Temperature - IXD_630M



Under-Voltage Lockout Threshold vs. Temperature - IXD_630



4 Manufacturing Information

4.1 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
IXD_630YI / IXD_630MYI / IXD_630CI / IXD_630MCI	MSL1

4.2 ESD Sensitivity

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

4.3 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.

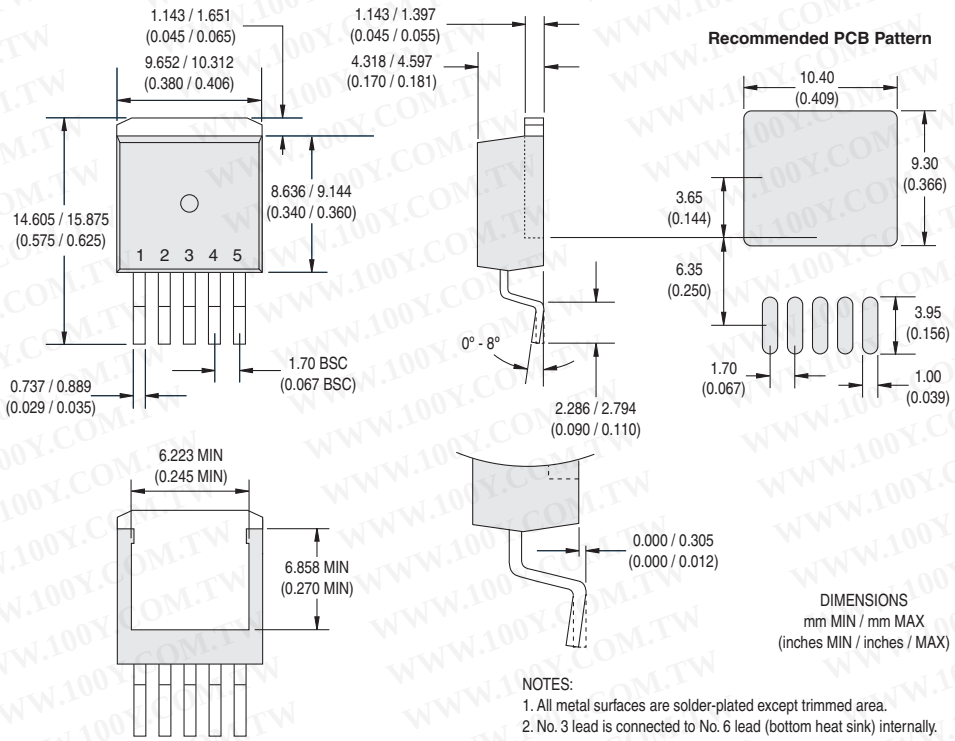
Device	Maximum Temperature x Time
IXD_630YI / IXD_630MYI / IXD_630CI / IXD_630MCI	245°C for 30 seconds

4.4 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.

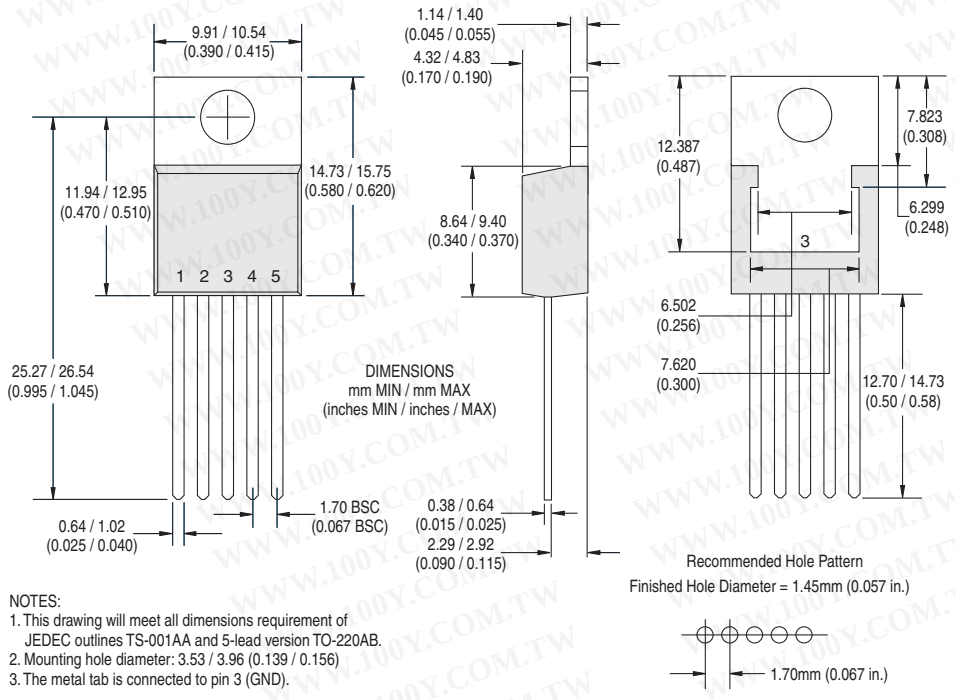
4.5 Mechanical Dimensions

4.5.1 IXD_630YI (5-Lead TO-263)



NOTES:
1. All metal surfaces are solder-plated except trimmed area.
2. No. 3 lead is connected to No. 6 lead (bottom heat sink) internally.

4.5.2 IXD_630CI (5-Lead TO-220)



NOTES:
1. This drawing will meet all dimensions requirement of JEDEC outlines TS-001AA and 5-lead version TO-220AB.
2. Mounting hole diameter: 3.53 / 3.96 (0.139 / 0.156)
3. The metal tab is connected to pin 3 (GND).

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

Specification: DS-IXD_630-R03

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