30V Input Voltage Step-Down DC/DC Converter

FEATURES

- **Operating Input Voltage Range**: 7.0 V ~ 30 V
- **Reference Voltage**: 0.8 V ± 2%
- **Maximum Output Current** : 2.0 A
- **Oscillation Frequency**: 300 kHz – 500 kHz
- **Operating Mode:** PWM only or PFM/PWM automatically selected
- **Soft Start:** set by external capacitor
- **Protection:** Over-current at 3.2 A with Integral Latch (version A) or Automatic Recovery (version B), and Thermal Shutdown
- **Low ESR Ceramic Capacitors Compatible**
- **Operating Ambient Temperature** : -40℃～+105℃
- **Package:** SOP-8FD
- **Environmentally Friendly** : EU RoHS Compliant, Pb Free

APPLICATION

- Digital home appliances
- Office automation equipment
- Car accessories power supplies
- Various portable equipment

DESCRIPTION

The IXD3270/IXD3271 is a 30V input voltage step-down DC/DC converter IC operating with a built-in internal N-channel transistor.

The bootstrap architecture to drive gate of the internal N-channel transistor allows creation of a stable, high-efficiency power supply with the output current up to 2.0 A. IC allows use of low ESR ceramic capacitors as load capacitors (C_L).

An internal 0.8 V reference voltage enables setting of output voltage using external resistive divider (R_{FB1}, R_{FB2}) from 1.2 V to 12 V.

The IXD3270/IXD3271 allows users to select switching frequency at 300 or 500 kHz. External clock within ± 25% of the internal one, applied to the SYNC pin, can be used to synchronize controllers and reduce system noise.

The IXD3270/IXD3271 automatically changes mode from PFM at light load to PWM at heavy load to achieve high efficiency over the full load range.

The soft start time is programmable by an external capacitor connected to the SS pin.

The built-in under-voltage lockout (UVLO) function forces switching transistor OFF, when input voltage is 2.5 V or lower.

Internal protection circuits include over-current protection, short-circuit protection, and thermal shutdown. The built-in under-voltage lockout (UVLO) protection turns the switching transistor OFF, when input voltage becomes less than 4.5 V.

The IXD3270/IXD3271 controller is available in an SOP-8FD package.

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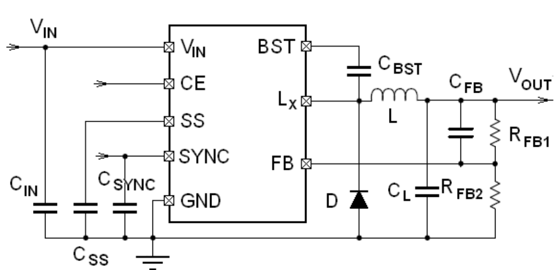
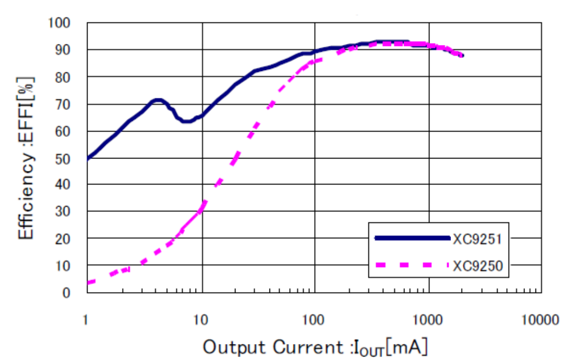
TYPICAL APPLICATION CIRCUIT



TYPICAL PERFORMANCE CHARACTERISTIC

Efficiency vs. Output Current
IXD3270x085/71x085
V_{IN} = 12 V, V_{OUT} = 5 V, L = 15 μH (CLF12555-150M), D: CMS15, C_{IN} = 10 μF (GRM32ER71H106KA12L), C_L = 22 μF × 2 (GRM32ER71E226KE15L)



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNITS
V_{IN} Pin Voltage	V_{IN}	– 0.3 ~ 36	V
BST Pin Voltage	V_{BST}	– 0.3 or V_{LX}[1)] – 0.3 – V_{LX} + 6.5 or 36[2)]	V
FB Pin Voltage	V_{FB}	– 0.3 ~ +6.5	V
SYNC Pin Voltage	V_{SYNC}	– 0.3 ~ +6.5	V
CE Pin Voltage	V_{RB}	– 0.3 ~ 36	V
SS Pin Voltage	V_{SS}	– 0.3 ~ +6.5	V
LX Pin Voltage	V_{LX}	– 0.3 ~ V_{IN} +0.3 or +36[3))]	V
LX Pin Current	I_{LX}	4.2	A
Surge Voltage	V_{SRG}	46[4)]	V
Power Dissipation	P_D	300	mW
		1500 (PCB mounted)	
Operating Temperature Range	T_{OPR}	– 40 ~ + 105	^{0}C
Storage Temperature Range	T_{STG}	– 55 ~ +125	^{0}C

Note:
* All voltages are in respect to the GND pin.
1) The maximum value should be -0.3 or V_{LX} - 0.3 V, which is the lowest.
2) The maximum value should be V_{LX} + 6.5 or + 36 V, which is the lowest.
3) The maximum value should be V_{IN} + 0.3 or + 36 V, which is the lowest.
4) Applied Time ≦ 400 ms

ELECTRICAL OPERATING CHARACTERISTICS

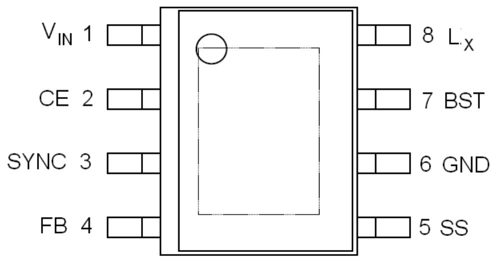
IXD327xx08x — Unless otherwise specified, Ta = 25 ^{0}C

PARAMETER		SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	CIRCUIT
Reference Voltage		V_{REF}	V_{SS} = 6 V	0.784	0.800	0.816	V	②
FB Voltage Temperature Characteristics		$\frac{\Delta V_{FB}}{V_{FB} * \Delta t_{OPR}}$	-40^{0}C ≤ T_{OPR} ≤ 105^{0}C, I_{OUT} = 100 mA		±50		ppm/^{0}C	②
Output Voltage Range[1)]		V_{OUT}		1.2		V_{IN} – 3 or 12[4)]	V	③
Operating Input Voltage Range		V_{IN}		7	-	30	V	
UVLO Detection Voltage[5)]		V_{UVLOD}	V_{SS} = 6 V, V_{FB} = 0.65 V[2]	4.3	4.6	4.9	V	②
UVLO Release Voltage[6)]		V_{UVLOR}	V_{SS} = 6V, V_{FB} = 0.65 V[3]	4.7	5.0	5.3	V	②
Quiescent Current	IXD327xx083	I_{Q1}	V_{IN} = V_{CE} = 30 V, V_{FB} = 0.95 V,		200	310	µA	①
	IXD327xx085				250	360		
Standby Current		I_{STB}	V_{IN} = 30 V, V_{CE} = V_{SS} = V_{SYNC} = 0 V		0.01	0.1	µA	①
Oscillation Frequency	IXD327xx083	f_{OSC1}	I_{OUT} = 300 mA	276	300	324	kHz	③
	IXD327xx085	f_{OSC2}	I_{OUT} = 100 mA	460	500	540	kHz	③
External Clock Synchronization Range		f_{SYNC}	I_{OUT} = 0 mA	f_{OSC} x 0.75	f_{OSC}	f_{OSC} x 1.25	kHz	③
External Clock Duty Cycle		D_{SYNC}	I_{OUT} = 0 mA	25		75	%	③
Maximum Duty Cycle Ratio		D_{MAX}	V_{FB} = 0.65 V,	83	85	88	%	②
Minimum Duty Cycle Ratio		D_{MIN}	V_{FB} = 0.95 V			0	%	②
L_X ON Resistance		R_{LX}	V_{FB} = 0.65 V, V_{SS} = 6 V		0.3		Ω	②
PFM Switch Current		I_{PFM}	I_{OUT} = 0 mA – IXD3271x08x version only	80	160	240	mA	
Current Limit[2)]		I_{LIM}	V_{FB} = 0.65 V,[)] V_{SS} = 6 V	2.4	3.2		A	②
Latch Time[)]	IXD327xA083	t_{LAT}	V_{FB} = 0.65 V,[)] V_{SS} = 6 V - A series only	0.8	1.3	1.8	ms	③
	IXD327xA085			0.4	0.7	1.0		
Short Protection Threshold[7)]		V_{FB_SHORT}	V_{SS} = 6 V	0.35	0.4	0.45	V	③
Internal Soft-Start Time[7)]	IXD327xx083	t_{SS1}	V_{IN} = V_{CE} = 12 V, V_{FB} = V_{REF} x 0.9 V, V_{SS} = 6 V [8)]	0.8	1.3	2.0	ms	②
	IXD327xx085			0.4	0.7	1.2		
External Soft-Start Time[7)]	IXD327xx083	t_{SS2}	V_{IN} = V_{CE} = 12 V, V_{FB} = V_{REF} x 0.9 V, C_{SS} = 0.01 µF[8)] V_{SS} = 6 V	9	15	24	ms	②
	IXD327xx085			5	9	15		
Efficiency [3)]		EFFI	I_{OUT} = 1 A		91		%	③
SYNC "H" Voltage[9]		V_{SYNCH}	I_{OUT}	1.5		6.0	V	③
SYNC "L" Voltage[10]		V_{SYNCL}	I_{OUT}	0		0.4	V	③
SYNC "H" Current		I_{SYNCH}	V_{IN} = V_{CE} = 30 V, V_{FB} = 0.95 V, V_{SYNC} = 6 V	-0.1		0.1	µA	①
SYNC "L" Current		I_{SYNCL}	V_{IN} = V_{CE} = 30 V, V_{FB} = 0.95 V, V_{SYNC} = 0 V	-0.1		0.1	µA	①
FB "H" Current		I_{FBH}	V_{IN} = V_{CE} = 30 V, V_{FB} = 6 V, V_{SS} = 6 V	-0.1		0.1	µA	①
FB "L" Current		I_{FBH}	V_{IN} = V_{CE} = 30 V, V_{FB} = 0 V, V_{SS} = 6 V	-0.1		0.1	µA	①
CE "H" Voltage[8]		V_{MH}	V_{FB} = 0.65 V, V_{SS} = 6 V	2.8		30	V	②
CE "L" Voltage[9]		V_{ML}	V_{FB} = 0.65 V, V_{SS} = 6 V	0		1	V	②
CE "H" Current		I_{MH}	V_{IN} = V_{CE} = 30 V, V_{FB} = 0.95 V	-0.1		0.1	µA	①
CE "L" Current		I_{ML}	V_{IN} = 30 V, V_{CE} 0 V, V_{FB} = 0.95 V	-0.1		0.1	µA	①
Thermal Shutdown Temperature		T_{TSD}			150		^{0}C	②
Thermal Shutdown Hysteresis		T_H			25		^{0}C	②

NOTE: Unless otherwise stated, V_{IN} = V_{CE} = 12 V, V_{SYNC} = V_{SS} = 2 V, L = 22 µH, C_{IN} = 10 µF, C_L = 47µF, C_{SS} = 1 µF, R_{FB1} = 2 kΩ, R_{FB2} = 390 Ω, C_{FB} = 10 nF,

1) Limited by minimum ON time of 0.22 µs
2) Determines inductor peak current value
3) EFFI = {(output voltage × output current) / (input voltage × input current)}×100
4) V_{IN} – 3 V or 12 V whichever is lower
5) V_{IN} voltage, at which L_X pin changes state from HIGH to LOW
6) V_{IN} voltage, at which L_X pin changes state from LOW to HIGH
7) Time from CE = High until L_X pin oscillations start
8) CE pin voltage, at which L_X pin oscillations start
9) CE pin voltage, at which L_X pin oscillations stop

PIN CONFIGURATION



SOP-8FD (Top View)

The dissipation pad for this IC should be solder-plated for mounting strength and heat dissipation. Please refer to the reference mount pattern and metal masking. The dissipation pad should be connected to the GND (No. 6) pin.

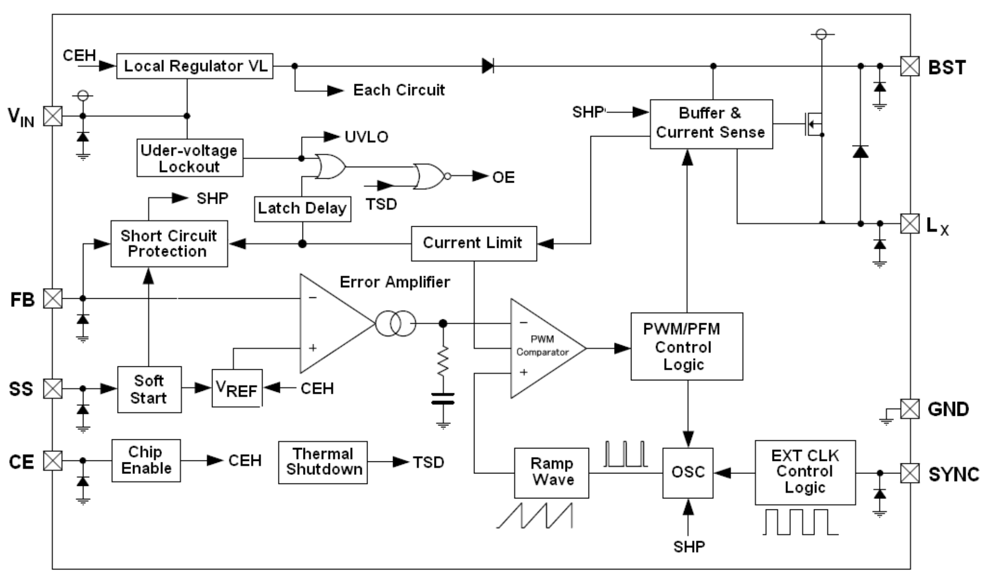
PIN ASSIGNMENT

PIN NUMBER	PIN NAME	FUNCTIONS
1	V_{IN}	Power Input
2	CE	Chip Enable Input (Logic LOW – Standby, HIGH – Active)[1)]
3	SYNC	External CLK Synchronization Input (Logic LOW or HIGH – operates with internal clock frequency, CLK – Synchronized with External Clock)[1)]
4	FB	Feedback Signal Input
5	SS	Soft Start External Capacitor Connection
6	GND	Ground
7	BST	Bootstrap
8	L_X	Switching Output

NOTE:
1) Do not leave the CE and MODE/SYNC pin open.

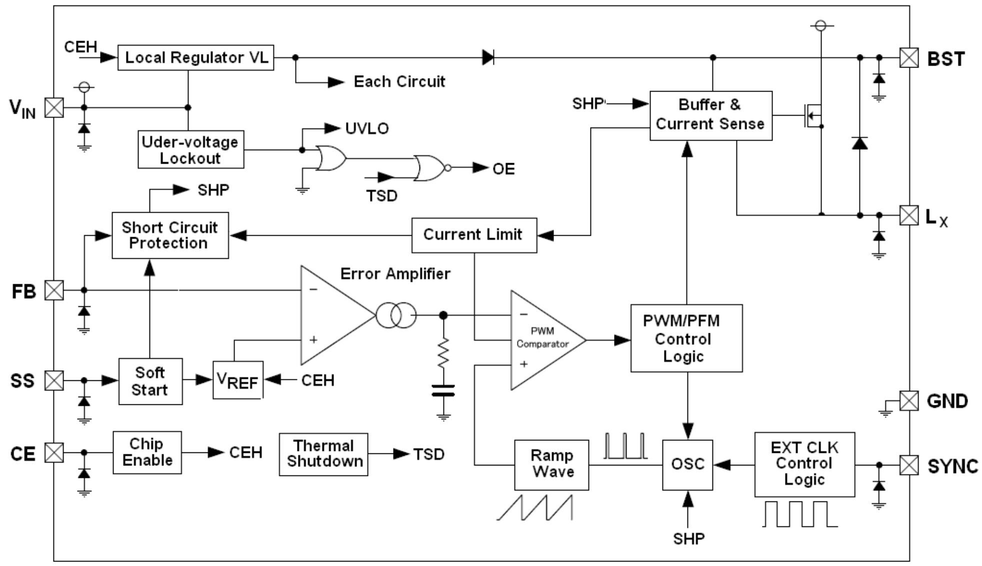
BLOCK DIAGRAMS

IXD3270A



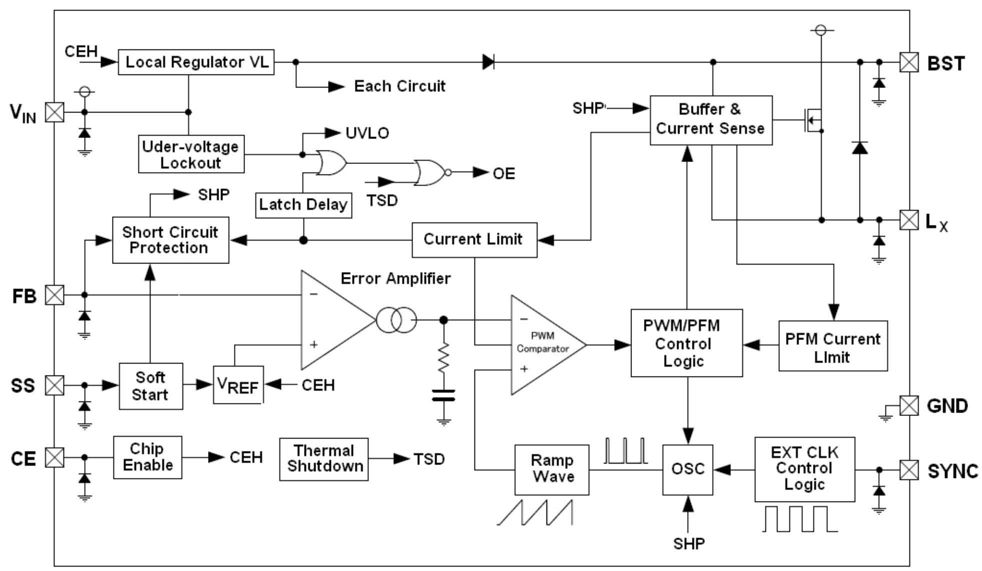
Internal diodes include an ESD protection and a parasitic diode

IXD3270B



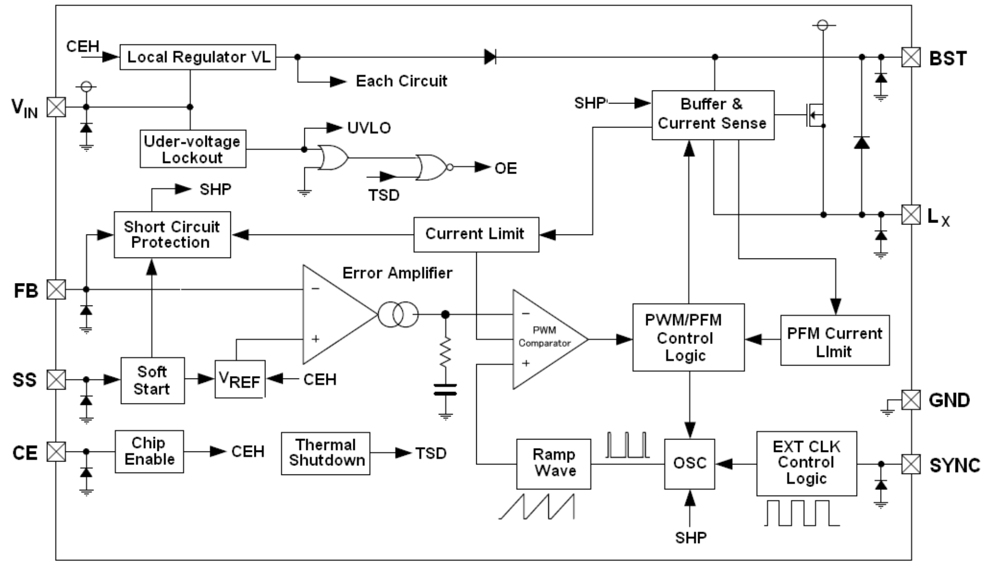
Internal diodes include an ESD protection and a parasitic diode

IXD3271A



Internal diodes include an ESD protection and a parasitic diode

IXD3271B



Internal diodes include an ESD protection and a parasitic diode

BASIC OPERATION

The IXD3270/IXD3271 converter consists of a Reference Voltage supply, Ramp Wave circuit, Error Amplifier, PWM Comparator, Phase Compensation circuit, N-channel switching transistor, Current Limiting circuit, Under-voltage Lockout (UVLO), internal power supply (V_L), gate clamp (CLAMP), Thermal shutdown (TSD), Oscillator (OSC), Soft Start circuit, Control block, and other elements.

The error amplifier compares feedback voltage from the FB pin with the internal reference. The output signal, which is a multiplied and phase compensated difference between feedback and reference voltage, applies to the one input of PWM Comparator to turn switching transistor ON. The PWM Comparator compares this signal with the ramp wave to turn the switching transistor OFF.

These operations perform continuously to keep the output voltage stable.

The Current Limiting circuitry monitors switching transistor current during each pulse and modulates the output signal from the error amplifier creating a multi-feedback signal. This allows stabilize system and output voltage even when low ESR ceramic capacitors are used at the output.

The IC utilizes bootstrap architecture to generate voltage higher than the V_{IN} to drive an N-channel MOS transistor as a Hi side driver.

Reference voltage source

The reference voltage source provides the reference voltage to ensure stable output voltage of the DC/DC converter.

Oscillator circuit

The Oscillator’s frequency is fixed internally and can be selected as either 300 kHz or 500 kHz. Clock pulses generated by this circuit are used to produce ramp waveforms needed at PWM operation.

Error amplifier

The Error Amplifier compares reference voltage with the feedback signal, which is an output voltage divided by the external resistive divider R_{FB1} and R_{FB2}. If a feedback signal is less than the reference voltage, the Error Amplifier’s output voltage increases, increasing ON time of the switching transistor, which results in higher output voltage. The Error Amplifier output signal is internally phase compensated to optimize IC performance.

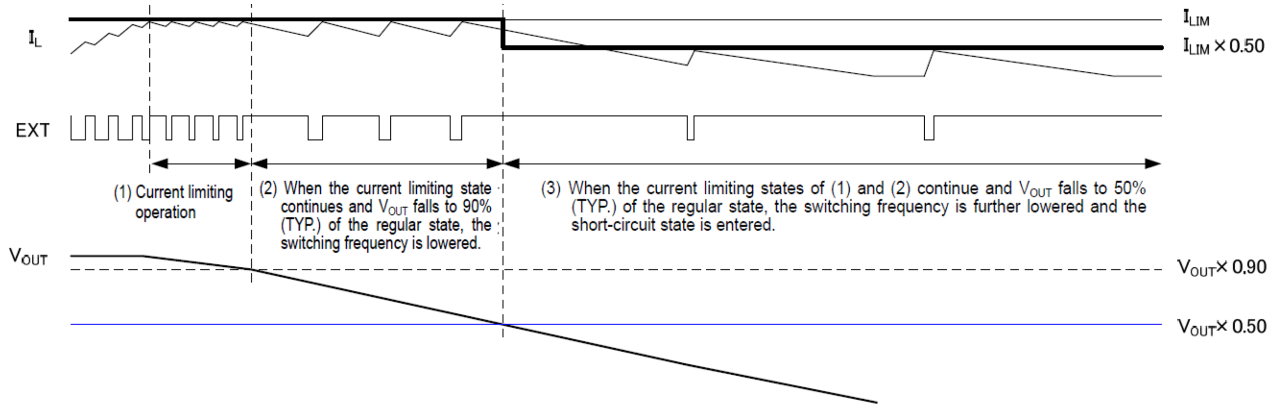
Chip Enable

The IXD3270/IXD3271 can be forced into Standby Mode by applying LOW signal to the CE pin. The IC input current in the Standby Mode is less than 1 µA. HIGH-level signal applied to the CE pin resumes operation.

Current Limiting, Short Circuit protection

The Current Limiting circuits of IXD3270/1B version combine both current limiting and short-circuit protection.

The Current Limiting circuit monitors current through N-channel switching transistor. When current goes above the circuit's threshold, the current limiting circuit activates and turns the switching transistor off (see partition 1 in the figure below). However, if this condition exists for a prolonged period of time, itresults in switching frequency drop and output voltage drop to about 90% of the regular value (partition 2).

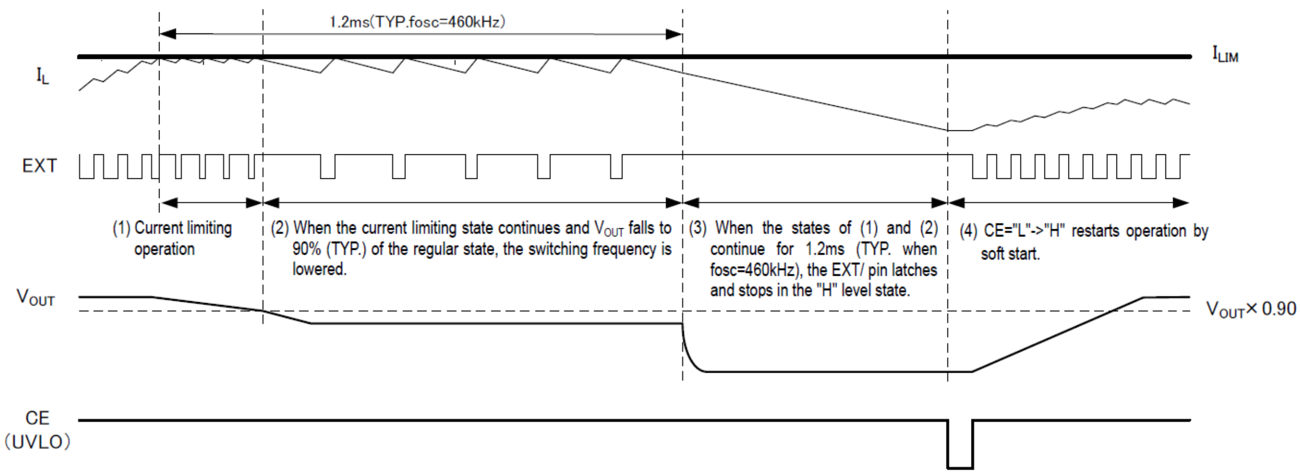


When the Current Limiter active state releases, the output voltage and the switching frequency returns to the nominal value. However, if the output voltage continues falling further, the output current remains limited, the switching frequency lowers further, and controller enters the short-circuit state (partition 3). When the load becomes lighter than the short circuit state, the IC restarts automatically through soft-start to prevent over shoot.

Integral Latch protection

When the current limiting state continues for a certain time, the Current Limiting circuit of the IXD3270/1C latches and stops the L_X pin in the HIGH-level state turning the switching transistor off.

To restart operation from the latch stop state, the CE pin should be triggered LOW/HIGH, or the V_{IN} pin voltage should be set for a short time below the UVLO detection voltage. The IXD3270/1C will restart through soft start mode to prevent output voltage overshoot.



Thermal Shutdown

Thermal Shutdown circuitry monitors chip temperature to prevent the IC from damage. The Thermal Shutdown circuit starts operating when the chip's temperature reaches 150^0C and turns off the N-channel MOSFET driver transistor. When the temperature drops to 125^0C or less, the IC performs soft-start to resume normal operation.

UVLO

When the V_{IN} pin voltage falls below 4.6 V, the switching transistor stops to prevent false pulse output due to instable operation of the internal circuits, and the L_X pin goes HIGH. When the V_{IN} pin voltage rises above 5.0 V, the UVLO function releases, the soft-start function activates, and switching resumes. Stopping by UVLO is not a shutdown, because only the pulse output is stopped, but the internal circuitries are active.

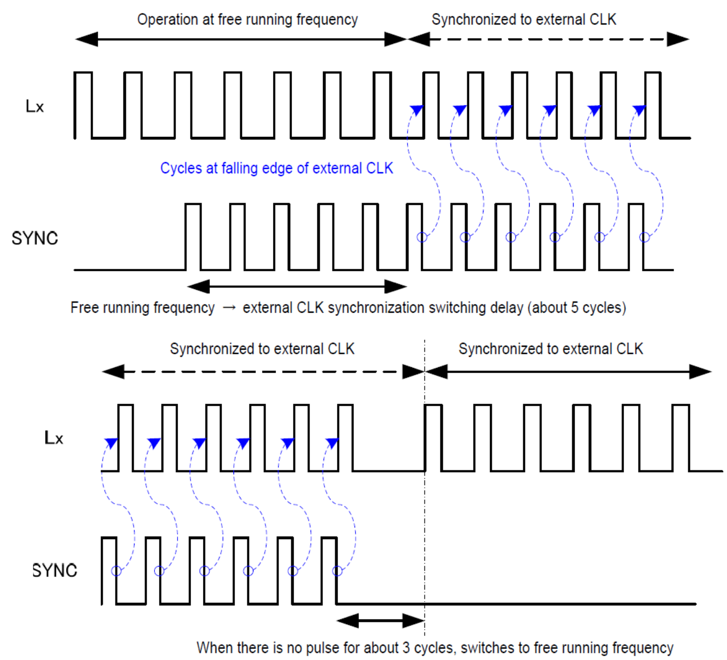
SYNC function

When an external clock (± 25% of the IXD3270/1 free running frequency and 25% - 75% duty cycle) is applied to the SYNC pin, the internal frequency synchronizes with the falling edge of the external clock and the IXD3270/IXD3271 enters PWM mode.

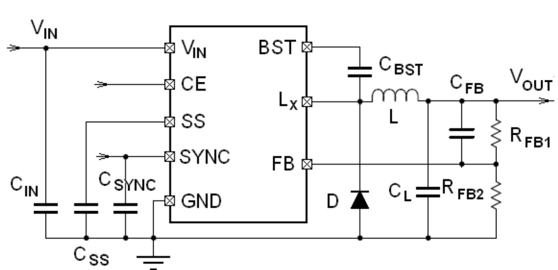
If the external clock stops either in high or low state for more than three periods, synchronization stops and the IXD3270/IXD3271 resumes operations with a free running frequency.

Switching from free running frequency to external synchronization

Switching from external synchronization to free running frequency



TYPICAL APPLICATION CIRCUIT



EXTERNAL COMPONENTS

Recommended Components

COMPONENT	VALUE	PART NUMBER	MANUFACTURER
Inductor	15 µH	CLF12555-150M	TDK
	22 µH	CLF12555-220M	
	33 µH	CLF12555-3350M	
	20 µH	TCM 0840-200	Toho Zinc
Diode		CMS15	TOSHIBA
Capacitor C_{IN1}	10 µF 50 V	GRM32ER71H106K	Murata
Capacitor C_{IN2}	1 µF 50 V	GRM32ER71H101K	
Capacitor C_L 1)	47 µF 10 V	GRM32ER71A476K	Murata
	22 µF 25 V x 2	GRM32ER71E226K	
	47 µF 25 V	25SVP47M	Panasonic
Capacitor C_{SS} 2)	0.01 µF 10 V		
Capacitor C_{SYNC} 3)	1000 pF 10 V		
Capacitor C_{BST}	1 µF 10 V		

1) C_{IN} capacitor consists of two of them connected in parallel, i.e. 10 µF + 1 µF capacitor.
2) C_{SS} not required (SS pin OPEN), if the internal soft start used.
3) C_{SYNC} not required (SYNC pin shorted to GND), if the external CLK synchronization function is not used.

V_{OUT} Setting

The 0.8 V reference voltage allows users to set the output voltage in a range of 1.2 V to 12 V by external resistive divider. Values of resistors R_{FB1} and R_{FB2} determine the output voltage, as given in the equation below.

$$V_{OUT} = \frac{0.8\ x\ (R_{FB1} + R_{FB2})}{R_{FB2}}$$

$$R_{FB2} \le 15\ k\Omega$$

Adjust the value of the phase compensation capacitor C_{FB} using the following equation:

$$C_{FB} = \frac{1}{2\pi f_{zfh} R_{FB1}}$$

A target value $f_{zfp} = \frac{1}{\pi\sqrt{C_L L}}$ = 10 kHz is optimal to provide stable operations.

Example:

When R_{FB1} = 68 kΩ, R_{FB2} = 13 kΩ, V_{OUT} = 0.8 × (68 kΩ + 13 kΩ) / 13 kΩ = 4.98 V
When f_{zfb} is set to 10.64 kHz using the above equation, C_{FB} = 1/ (2×π×10.64 kHz × 68 kΩ) = 220pF.

Lx ON time longer than 0.22 µs (TYP.) required at a frequency of 300 kHz and 0.15 µs (TYP.) at 500 kHz. If the dropout voltage is too large and the minimum Lx ON time is not satisfied, pulse skipping will occur and the output voltage will be not stable.

Selecting Inductance value

Recommended inductance value depends on the switching frequency and output voltage, as shown below.

Switching Frequency	1.2 V ≤ V_{OUT} < 6 V	6 V ≤ V_{OUT} < 12 V
300 kHz	20 µH – 22 µH	33 µH
500 kHz	15 µH	20 µH – 22 µH

Selecting C_L Capacitor

A low ESR capacitor can be used as a load capacitor C_L; however, if a ceramic capacitor is used, the IXD3270/IXD3271 output voltage is restricted to V_{OUT} = 2.5 V or higher. If V_{OUT} < 2.5 V is required, an OS-CON (conductive polymer aluminum solid electrolytic capacitor) is recommended. Select a capacitor with good temperature characteristics with respect to V_{OUT} and switching frequency, as shown in the table below.

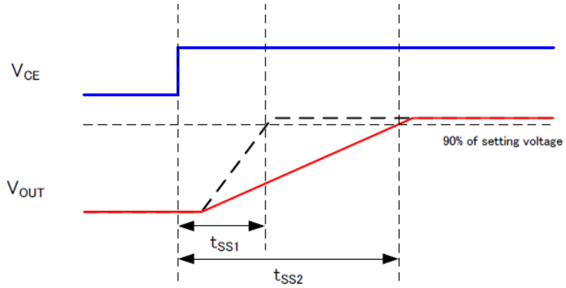
Switching Frequency	VOUT < 2.5 V	VOUT ≥ 2.5 V
	OS-CON	Ceramic
200 kHz < 400 kHz	47 µF	22 µF x 2
400 kHz ≤ 550 kHz	22 µF	22 µF

Soft-start function

The soft-start time determines time from the moment V_{CE} goes HIGH until the output voltage reaches 90% of the set value. The IXD3270/IXD3271 soft-start minimum value t_{SS1} is set internally to about t_{SS1} = 1.3 ms at f_{OSC} = 300 kHz and t_{SS1} = 0.7 ms at f_{OSC} = 500 kHz and it can be adjusted by an external capacitor connected between SS pin and ground. The soft-start time depends on the C_{SS} capacitance as

$$t_{SS2} = 1.08 \times C_{SS} / I_{SS}\text{, ms, where}$$

C_{SS} is an external capacitance, nF,
I_{SS} = 0.72 µA (TYP) at f_{OSC} = 300 kHz, and I_{SS} = 1.2 µA (TYP) at f_{OSC} = 500 kHz
f_{OSC} is an IXD3270/1 oscillation frequency.



Example:
If f_{OSC}= 300 kHz and C_{SS} = 10 nF, tss2 = 1.08 × 10/0.72 = 15 ms
If f_{OSC}= 500 kHz and C_{SS} = 10 nF, tss2 = 1.08 ×10/1.2 = 9 ms

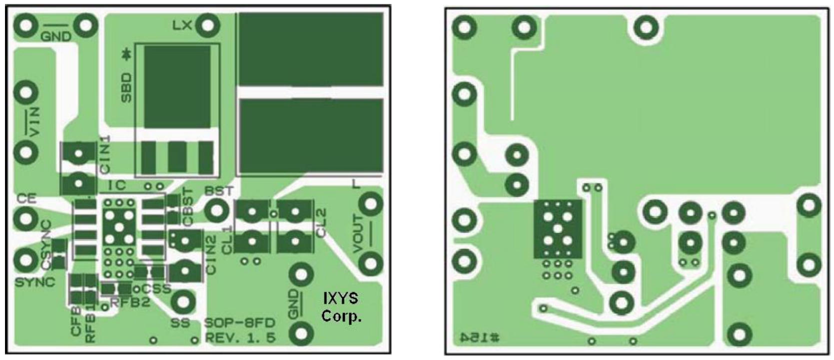
LAYOUT AND USE CONSIDERATIONS

1. Place external components as close to the IC as possible and use thick, short connecting traces to reduce the circuit impedance. Pay special attention to the V_{IN} and GND wiring. Switching noise, which occurs from the GND, may cause the instability of the IC, so, position V_{IN} capacitors as close to IC as possible.
2. The absolute maximum ratings of the IC and external components should not be exceeded
3. The IXD3270/IXD3271 is designed to work with ceramic output capacitors. We recommend capacitors with X7R or X5R ceramic.
4. A large difference between V_{IN} and V_{OUT} voltage, as well as high load current, increase inductor peak current, which may result in activation of the current limiting circuit and unstable IC operations. To avoid this condition, increase the inductor's value to set current below the current limiting circuit threshold. The following formula can be used to determine inductor peak current.

$$I_{LP} = \frac{(V_{IN}-V_{OUT})V_{OUT}}{2V_{IN}Lf_{OSC}} + I_{OUT}\text{ , (A), where:}$$

V_{IN} – input voltage, V
V_{OUT} – output voltage, V
L – Inductance, µH
I_{OUT} – output current, A
f. – oscillation frequency

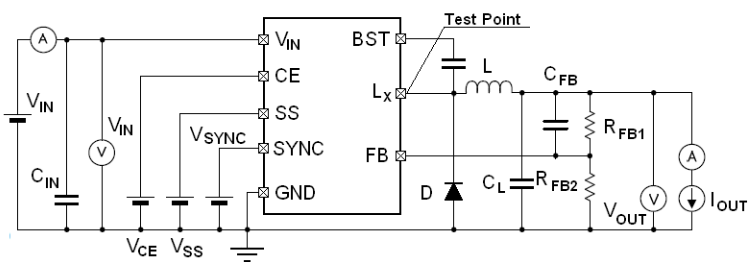
5. At large difference between V_{IN} and V_{OUT} voltage, the propagation delay time of internal signals could ramp-up the inductor current with staircase waveform exceeding the current limit.
6. Switching between continuous and discontinuous conduction modes may increase ripple voltage.
7. A ripple voltage may increase at light load due charging the C_{BST} capacitor, and this is a normal condition.
8. The IC enters test mode when a 6 V external power supply is applied to the SS pin. Do not apply an external power supply to the SS pin at normal operations.
9. The IC operation becomes unstable below the minimum operating voltage.
10. The ambient electrical noise and quality of the circuit board may cause release from the current limiting mode. The latch time may lengthen as well, or latch operation may fail. Test sufficiently using the actual equipment.
11. When operation changes from free running frequency to external CLK synchronization, the output voltage may fluctuate. Examine this condition at system level.



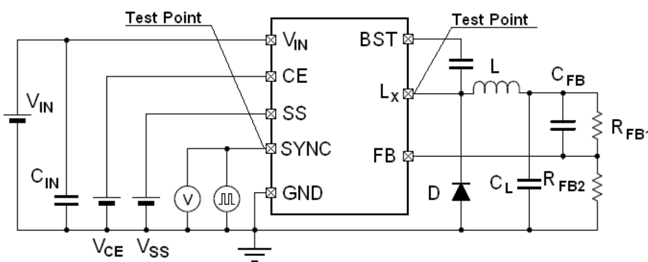
Recommended PCB layout

TEST CIRCUITS

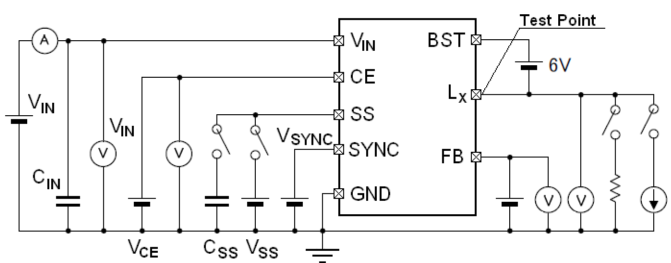
Circuit ①



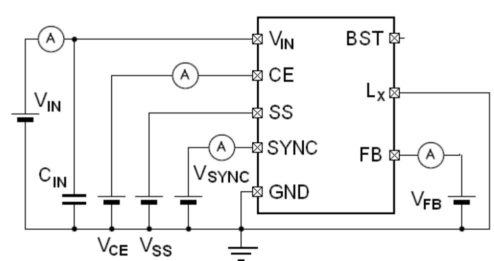
Circuit ②



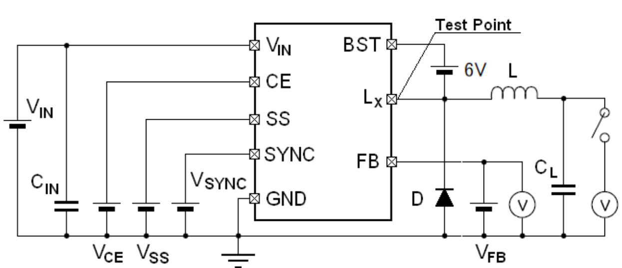
Circuit ③



Circuit ④



Circuit ⑤



External Components

C_{IN} = 10 µF, C_{SS} = 0.01 µF, C_L = 47 µF, C_{BST} = 1 µF, L = 22 µH,

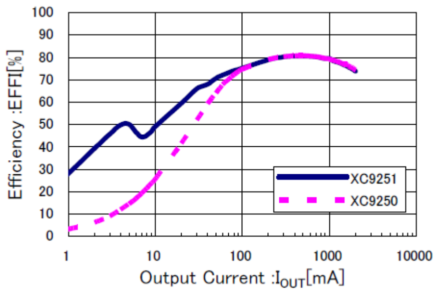
TYPICAL PERFORMANCE CHARACTERISTICS (IXD3270/1A)

(1) Efficiency vs. Output Current

Topr = 25 ^{0}C

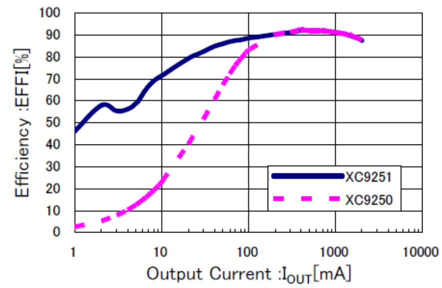
IXD327xx083

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 1.8 V



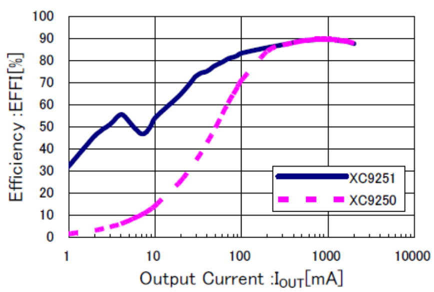
IXD327xx083

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V



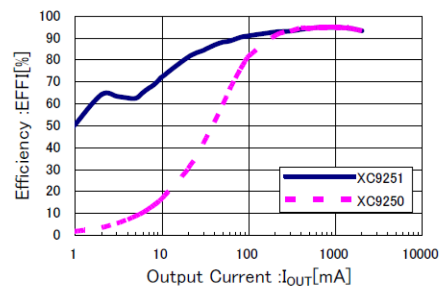
IXD327xx083

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 24 V, V_{OUT} = 5.0 V



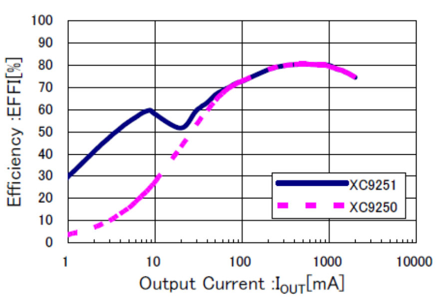
IXD327xx083

L= 30 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 24 V, V_{OUT} = 12 V



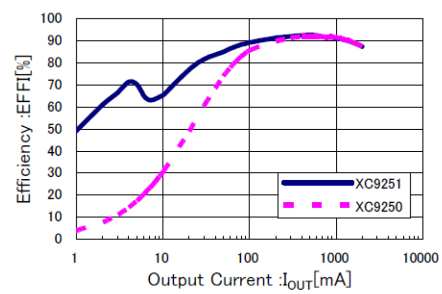
IXD327xx085

L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 1.8 V



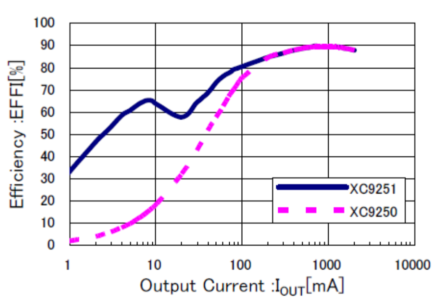
IXD327xx085

L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V



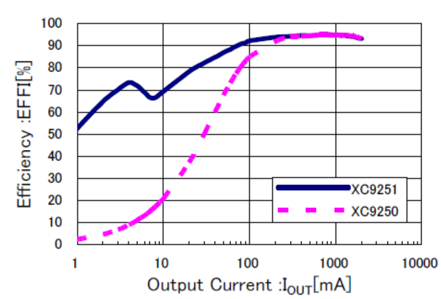
IXD327xx085

L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 24 V, V_{OUT} = 5.0 V



IXD327xx085

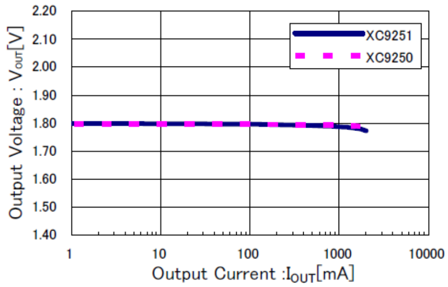
L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 24 V, V_{OUT} = 12 V



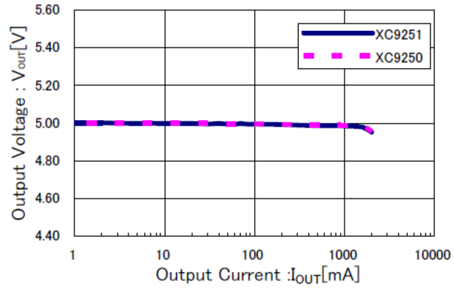
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(2) Output Voltage vs. Output Current

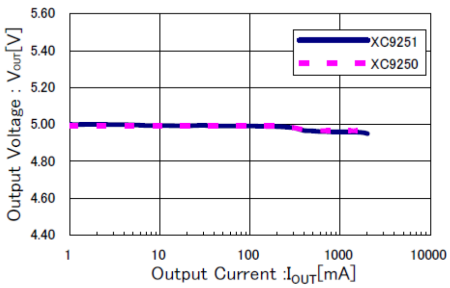
IXD327xx083
L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 1.8 V



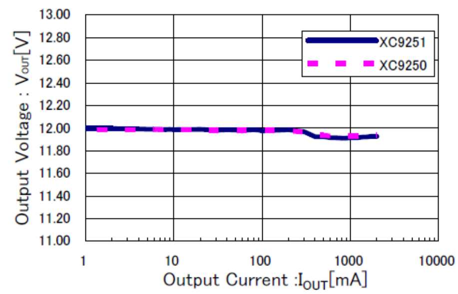
IXD327xx083
L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V



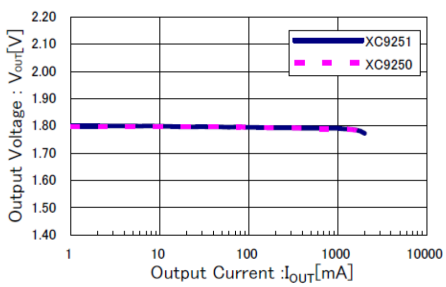
IXD327xx083
L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 24 V, V_{OUT} = 5.0 V



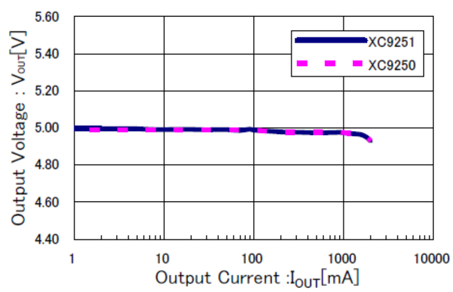
IXD327xx083
L= 30 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 24 V, V_{OUT} = 12 V



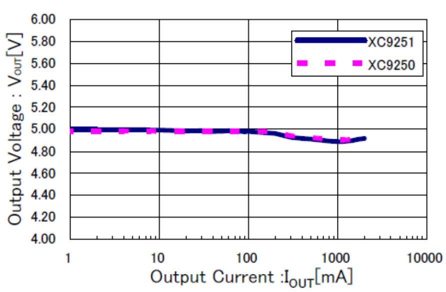
IXD327xx085
L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 1.8 V



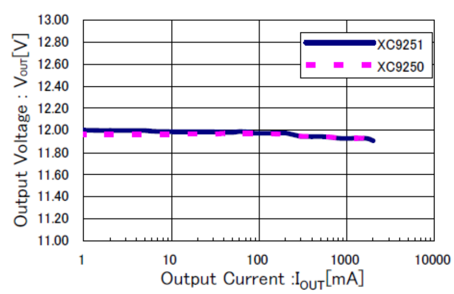
IXD327xx085
L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V



IXD327xx085
L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 24 V, V_{OUT} = 5.0 V



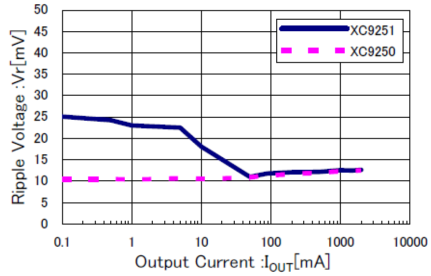
IXD327xx085
L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 24 V, V_{OUT} = 12 V



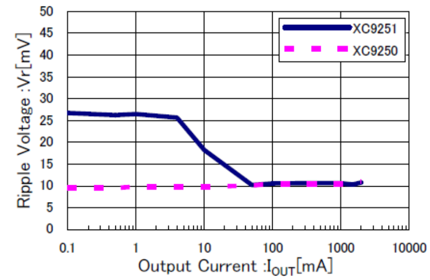
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(3) Ripple Voltage vs. Output Current

IXD327xx083
L= 22 μH, C_{IN} =10 μF, C_L= 44 μF, V_{IN} = 12 V, V_{OUT} = 5.0 V

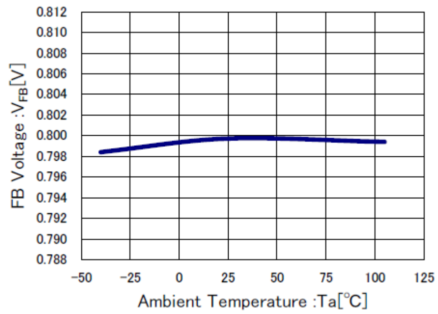


IXD327xx085
L= 15 μH, C_{IN} =10 μF, C_L= 44 μF, V_{IN} = 12 V, V_{OUT} = 5.0 V



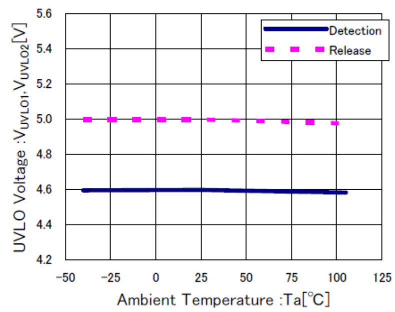
(4) FB Voltage vs. Ambient Temperature

IXD327xx08x
V_{IN} = 12 V



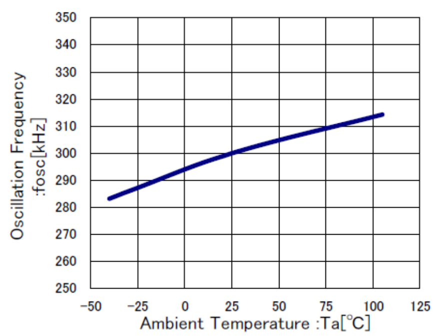
(5) UVLO Voltage vs. Ambient Temperature

IXD327xx08x

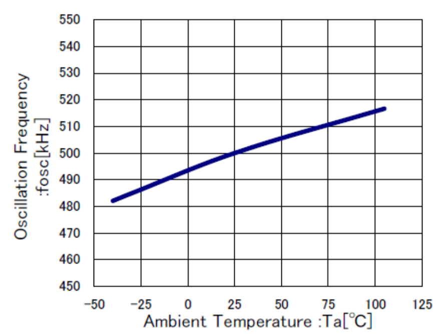


(6) Oscillation Frequency vs. Ambient Temperature

IXD327xx083
V_{IN} = 12 V

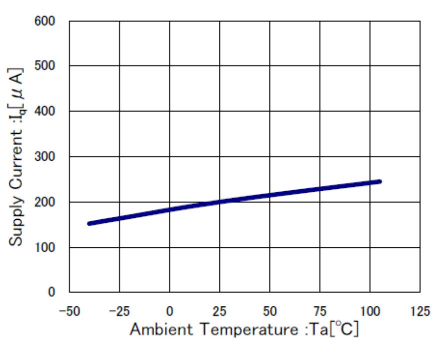


IXD327xx085
V_{IN} = 12 V

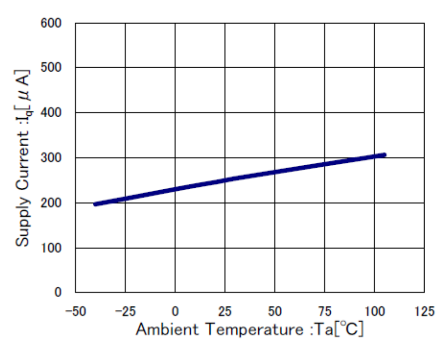


(7) Supply Current vs. Ambient Temperature

IXD327xx083
V_{IN} = 30 V



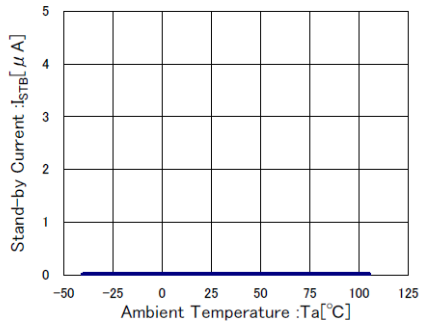
IXD327xx085
V_{IN} = 30 V



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

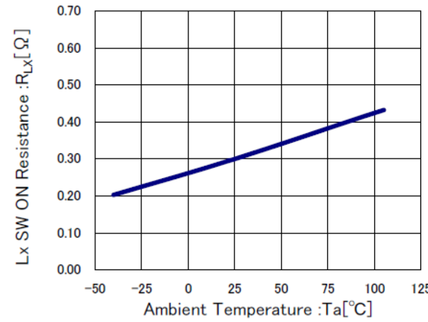
(8) Standby Current vs. Ambient Temperature

IXD327xx08x
V_{IN} = 30 V



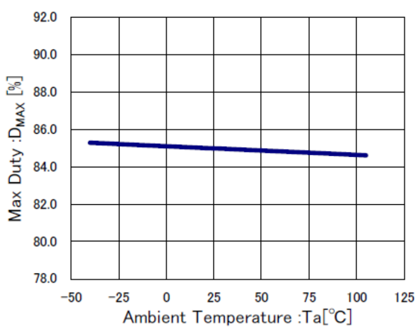
(9) L_X Switch ON Resistance vs. Ambient Temperature

IXD327xx08x



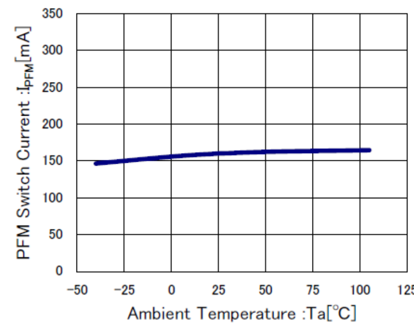
(10) Maximum Duty Cycle vs. Ambient Temperature

IXD327xx08x



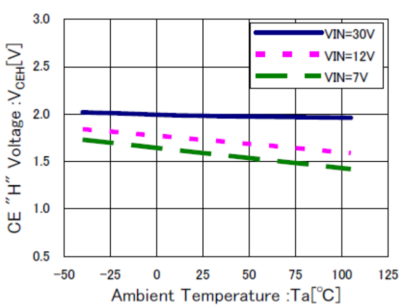
(11) PFM Switch Current vs. Ambient Temperature

IXD327xx08x
V_{IN} = 12 V



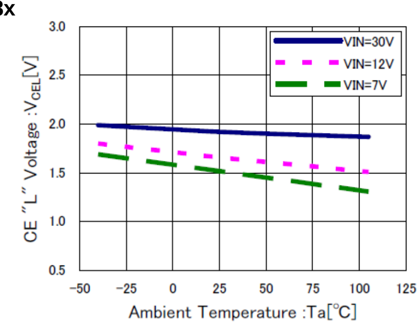
(12) CE "H" Voltage vs. Ambient Temperature

IXD327xx08x



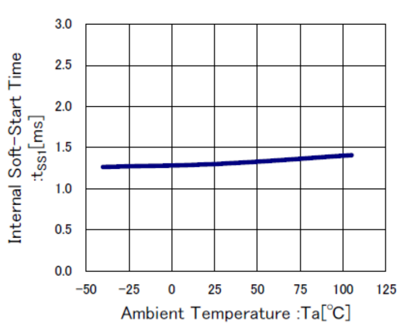
(13) CE "L" Voltage vs. C_{SS} Value

IXD327xx08x

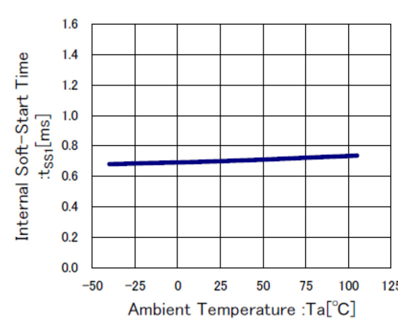


(14) Internal Soft start Time vs. Ambient Temperature

IXD327xx083
V_{IN} = 12 V



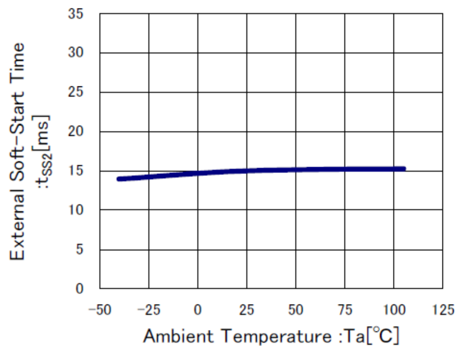
IXD327xx085
V_{IN} = 12 V



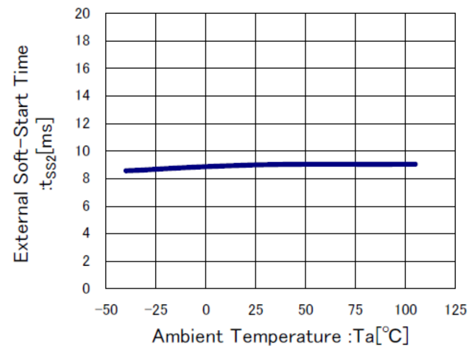
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(15) External Soft Start Time vs. Ambient Temperature

IXD327xx083
V_{IN} = 12 V

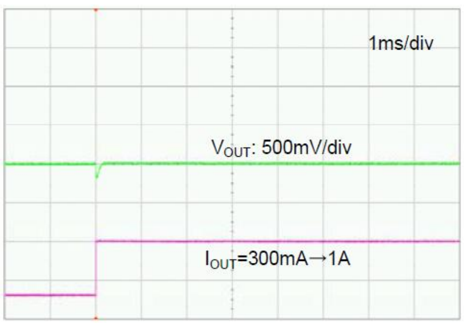


IXD327xx085
V_{IN} = 12 V

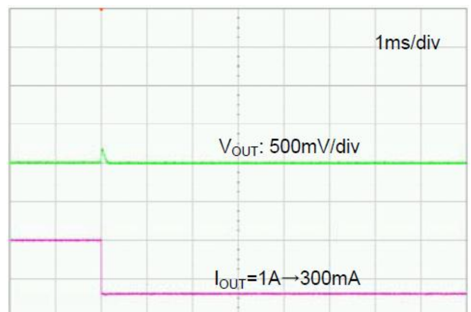


(16) Load Transient Response

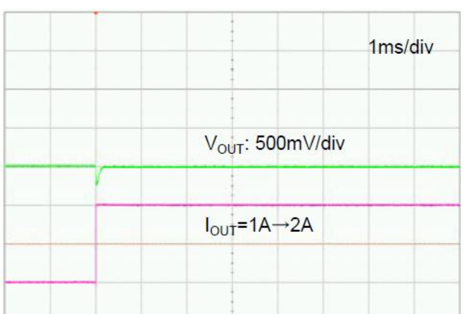
IXD327xx083
L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V , I_{OUT} = 300 mA → 1 A



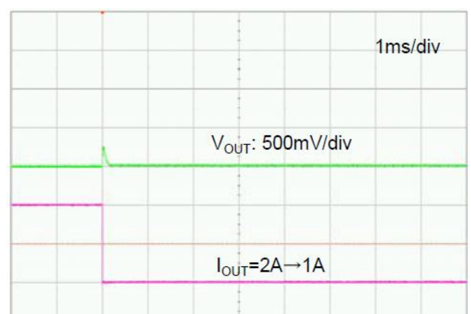
IXD327xx083
L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V , I_{OUT} = 1 A → 300 mA



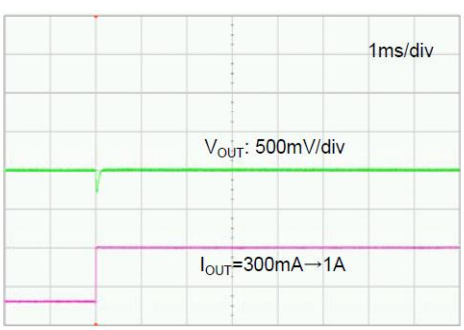
IXD327xx083
L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V , I_{OUT} = 1 A → 2 A



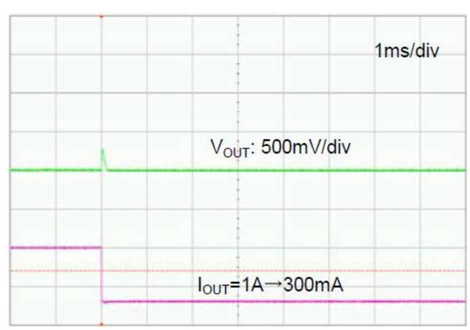
IXD327xx083
L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V , I_{OUT} = 2 A → 1 A



IXD327xx085
L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V , I_{OUT} = 300 mA → 1 A



IXD327xx085
L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V , I_{OUT} = 1 A → 300 mA

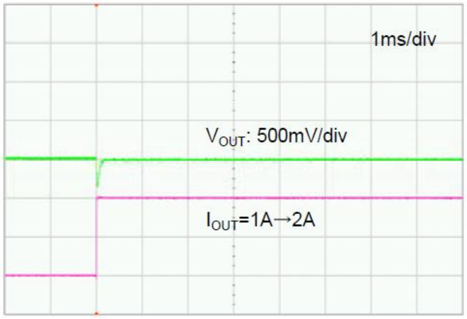


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(16) Load Transient Response (Continued)

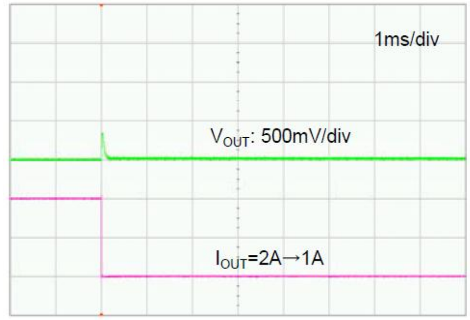
IXD327xx085

L= 15 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V , I_{OUT} = 300 mA → 1 A



IXD327xx083

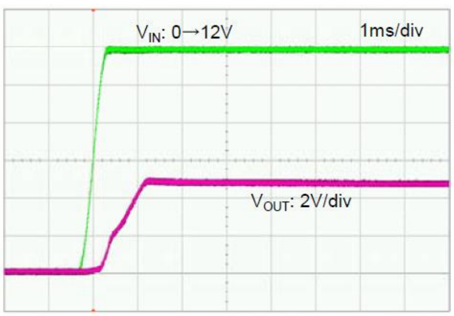
L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{IN} = 12 V, V_{OUT} = 5.0 V , I_{OUT} = 2 A → 1 A



(17) Rising Input Voltage Response Time

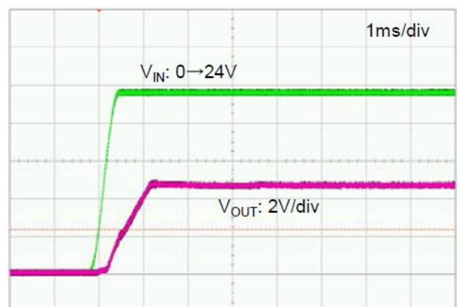
IXD327xx083

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{OUT} = 5.0 V , I_{OUT} = 1 mA, V_{IN} = 0 V → 12 V



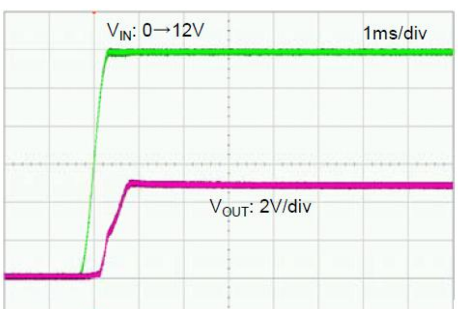
IXD327xx083

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{OUT} = 5.0 V , I_{OUT} = 1 mA, V_{IN} = 0 V → 24 V



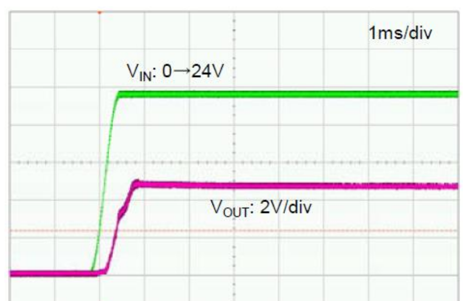
IXD327xx085

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{OUT} = 5.0 V , I_{OUT} = 1 mA, V_{IN} = 0 V → 12 V



IXD327xx085

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{OUT} = 5.0 V , I_{OUT} = 1 mA, V_{IN} = 0 V → 24 V

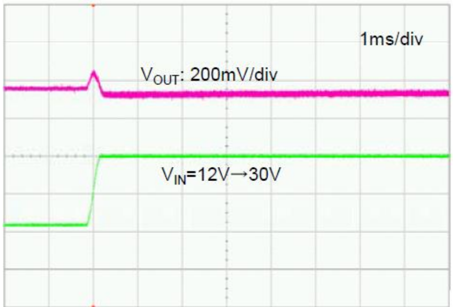


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(18) Input Voltage Transient Response

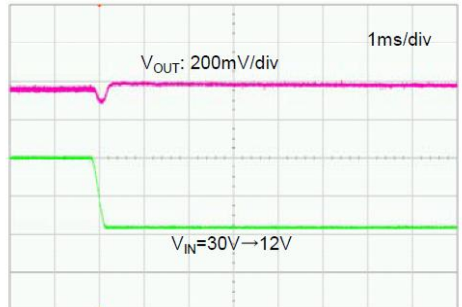
IXD327xx083

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{OUT} = 5.0 V , I_{OUT} = 1 A, V_{IN} = 12 V → 30 V



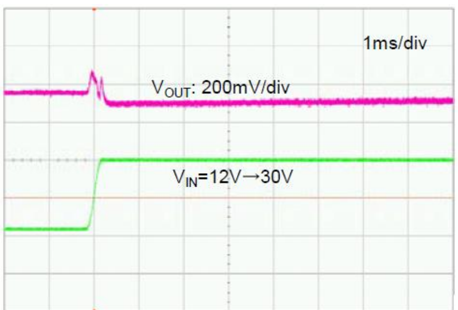
IXD327xx083

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{OUT} = 5.0 V , I_{OUT} = 1 A, V_{IN} = 30 V → 12 V



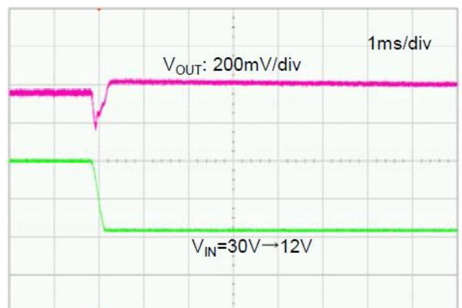
IXD327xx085

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{OUT} = 5.0 V , I_{OUT} = 1 A, V_{IN} = 12 V → 30 V



IXD327xx085

L= 22 µH, C_{IN} =10 µF, C_L= 44 µF, V_{OUT} = 5.0 V , I_{OUT} = 1 A, V_{IN} = 30 V → 12 V



ORDERING INFORMATION

IXD3270①②③④⑤⑥-⑦ PWM
IXD3271①②③④⑤⑥-⑦ PWM/PFM Auto Switch mode

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller	A	Refer to Selection Guide
		B	
②③	Reference Voltage	08	Fixed 0.8 V
④	Oscillation Frequency	3	300 kHz
		5	500 kHz
⑤⑥–⑦ (*1)	Packages (Order Limit)	QR-G	SOP-8FD (1,000/Reel)

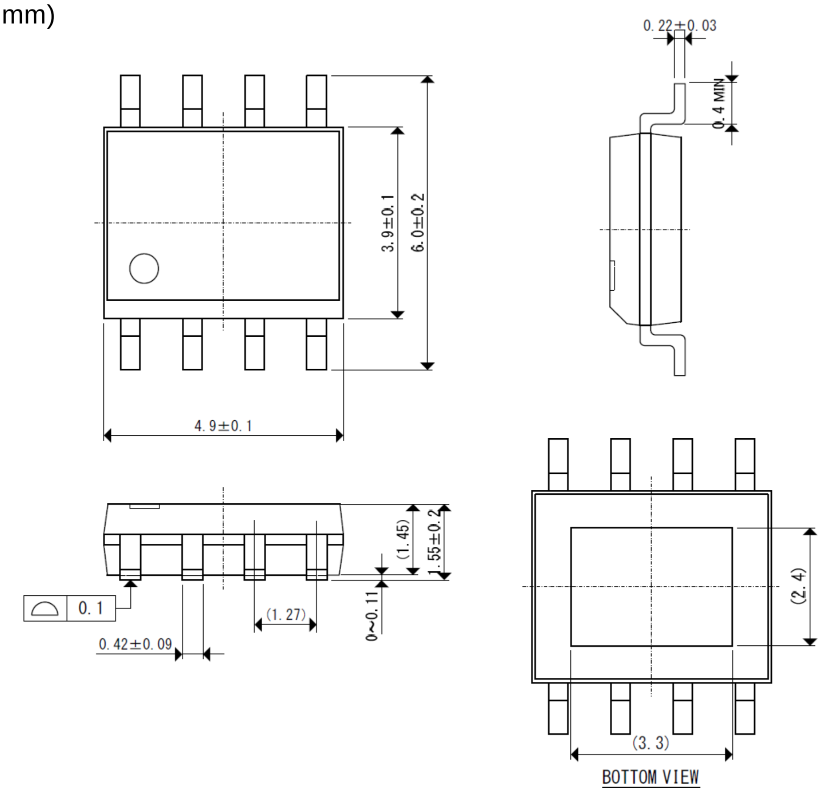
(*1) The "-G" suffix denotes halogen and antimony free, as well as being fully ROHS compliant.

PRODUCT CLASSIFICATION

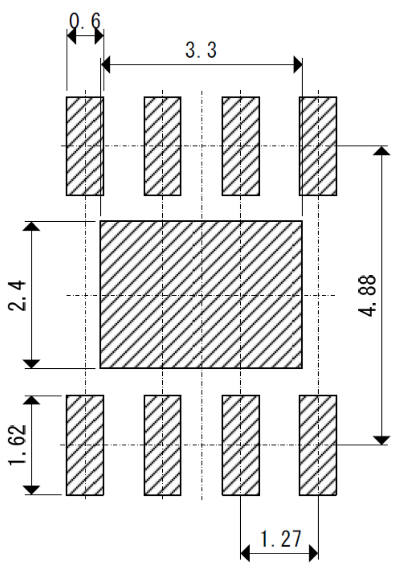
TYPE	CURRENT LIMITER	LATCH PROTECTION	CHIP ENABLE	THERMAL SHUTDOWN	UVLO	SYNCHRONIZED WITH EXTERNAL CLOCK	SOFT START
A	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B	Yes	No	No	Yes	Yes	Yes	No

PACKAGE DRAWING AND DIMENSIONS

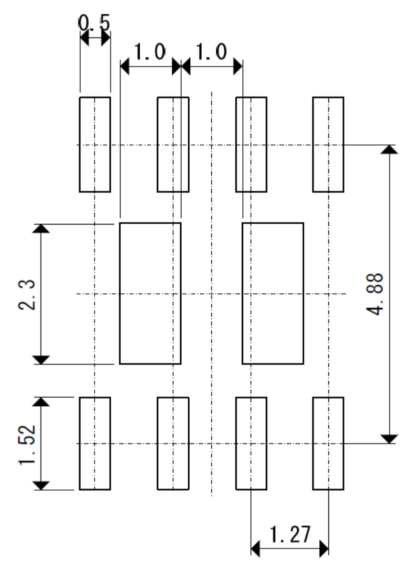
SOP-8FD (Units: mm)



SOP-8FD Reference Pattern Layout (Units: mm)

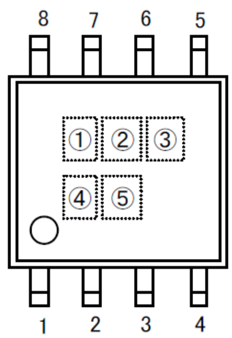


SOP-8FD Referencre Metal Mask Design (Units: mm)



MARKING

SOP-8FD



① Represents product series

MARK	PRODUCT SERIES
C	IXD3270xxxxxx-G
D	IXD3271xxxxxx-G

②Represents product types

MARK	PRODUCT SERIES
A	IXD3270Axxxxx-G
	IXD3271Axxxxx-G
B	IXD3270Bxxxxx-G
	IXD3271Bxxxxx-G

③ Represents FB voltage and oscillation frequency

MARK	REFERENCE VOLTAGE, V	OSCILLATION FREQUENCY, kHz	PRODUCT SERIES
3	0.8	300	IXD3270x083xx-G
5		500	IXD3270x085xx-G
A		300	IXD3271x083xx-G
B		500	IXD3271x085xx-G

④⑤ Represents production lot number

01～09、0A～0Z、11～9Z、A1～A9、AA～AZ、B1～ZZ in order.
(G, I, J, O, Q, and W excluded)

Customer Support

To share comments, get your technical questions answered, or report issues you may be experiencing with our products, please visit Zilog's Technical Support page at http://support.zilog.com. To learn more about this product, find additional documentation, or to discover other fac-ets about Zilog product offerings, please visit the Zilog Knowledge Base at http:// zilog.com/kb or consider participating in the Zilog Forum at http://zilog.com/forum. This publication is subject to replacement by a later edition. To determine whether a later edition exists, please visit the Zilog website at http://www.zilog.com.

Warning: DO NOT USE THIS PRODUCT IN LIFE SUPPORT SYSTEMS.