- **Duty 58%**
- **CMOS Low Power Consumption**
- **Operating Voltage: 0.9V~10.0V**
- **Output Voltage Range: 2.0V~7.0V**
- **Output Voltage Accuracy: ±2.5%**

Applications

- Cellular phones, pagers
- Palmtops
- Cameras, video recorders
- Portable equipment

General Description

The XC6381 series is a group of PFM controlled step-up DC/DC converters. The XC6381 series employs CMOS process and laser trimming technologies so as to attain low power and high accuracy. Max. oscillator frequency is trimmed to 155kHz (accuracy: ±15%).
Every built-in switching transistor type enables a step-up circuit to be configured using only three external components ; a coil, a diode, and a capacitor. External transistor versions are available to accommodate high output current applications.
Both built-in and external transistor types include 5-pin and 3-pin packages, which are provided with either a CE (chip enable) function that reduces power consumption during shut-down mode, or a V_{DD} pin function (separated power and voltage detect pins).
SOT-23, SOT-25, and SOT-89-5 super mini-mold packages.

Features

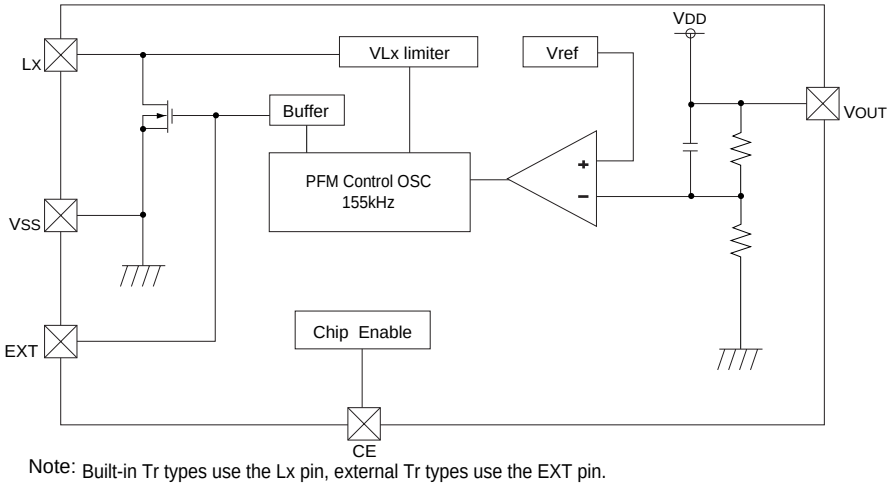
Operating (start-up) voltage range: 0.9V~10V
Output voltage range: 2.0V~7.0V in 0.1V increments
Highly accurate: Set-up voltage ±2.5%
Maximum oscillator frequency: 155kHz (±15%)
Duty Ratio: 58% (±5%)
Both built-in switching transistor and external types are available
Five-lead packaged units offer either Chip Enable or independent V_{OUT} pin option.
Small package: SOT-23, 25 mini-mold (3-pin, 5-pin)
SOT-89, 89-5 mini-power mold (3-pin, 5-pin)

Selection Guide

PART TYPE	DUTY RATIO	PACKAGE	SWITCHING RELATED	ADDITIONAL FUNCTION	FEATURES
XC6381A	58%	SOT-23, SOT-89-3	Built-in Transistor "Lx" lead		• Accommodates a duty ratio of 58%.
XC6381B	58%	SOT-23, SOT-89-3	External Transistor "EXT" lead		• Accommodates a duty ratio of 58%. • Adding an external transistor can improve the output capability by up to several hundred mA.
XC6381C	58%	SOT-25, SOT-89-5	Built-in Transistor "Lx" lead	Chip Enable(CE)	• Stand-by (CE) function added version to the XC6381A. • Stand-by current: 0.5µA max.
XC6381D	58%	SOT-25, SOT-89-5	External Transistor "EXT" lead	Chip Enable(CE)	• Stand-by (CE) function added version to the XC6381B. • Stand-by current: 0.5µA max.
XC6381E	58%	SOT-25, SOT-89-5	Built-in Transistor "Lx" lead	Separated "V_{DD}" and "V_{OUT}" leads	• Independent power supply and set-up voltage sensing leads allow designing of PFM controllers.
XC6381F	58%	SOT-25, SOT-89-5	External Transistor "EXT" lead	Separated "V_{DD}" and "V_{OUT}" leads	• Independent power supply and set-up voltage sensing leads allow designing of PFM controllers.

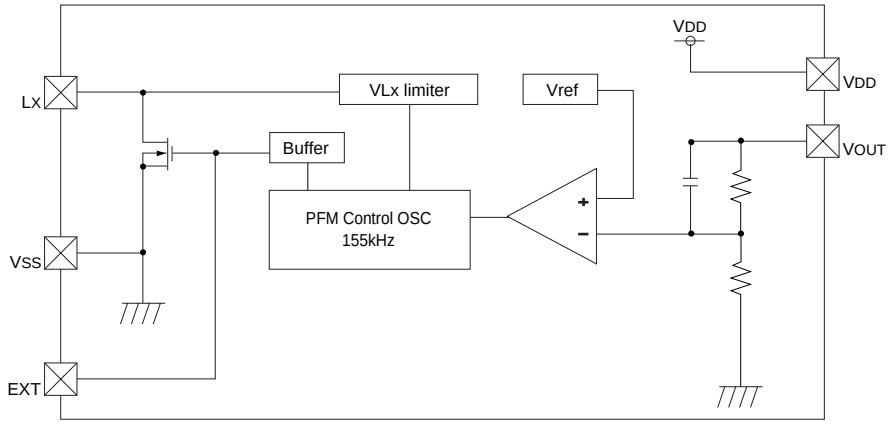
■ Block Diagram

XC6381A~XC6381D (VOUT pin can also be used for VDD pin.)



Note: Built-in Tr types use the Lx pin, external Tr types use the EXT pin.
The CE pin is only used with the XC6381C and XC6381D.

XC6381E and XC6381F



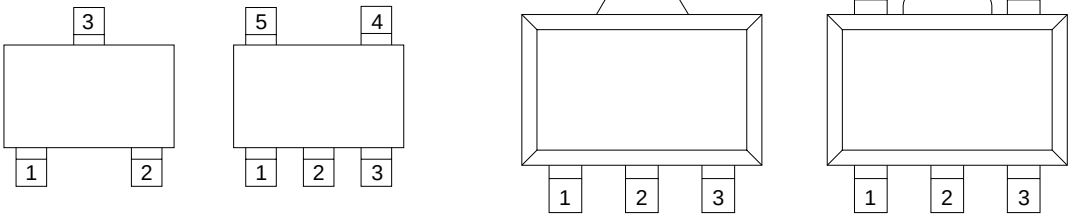
Note: The VDD pin is only used with the XC6381E and XC6381F.
Built-in Tr types use the Lx pin, external Tr types use the EXT pin.

■ Absolute Maximum Ratings

Ta=25℃

PARAMETER		SYMBOL	RATINGS	UNITS
VOUT Input Voltage		VOUT	12	V
Lx pin Voltage		VLX	12	V
Lx pin Current		ILX	400	mA
EXT pin Voltage		VEXT	VSS−0.3~VOUT+0.3	V
EXT pin Current		IEXT	±50	mA
CE Input Voltage		VCE	12	V
VDD Input Voltage		VDD	12	V
Continuous Total Power Dissipation	SOT-23	PD	150	mW
	SOT-89		500	
Operating Ambient Temperature		Topr	−30~+80	℃
Storage Temperature		Tstg	−40~+125	℃

■ Pin Configuration



SOT-23 (TOP VIEW)

SOT-25 (TOP VIEW)

SOT-89 (TOP VIEW)

SOT-89-5 (TOP VIEW)

■ Pin Assignment

(XC6381A, XC6381B)

PIN NUMBER				PIN NAME	FUNCTION
XC6381A		XC6381B			
SOT-23	SOT-89-3	SOT-23	SOT-89-3		
1	1	1	1	V_{SS}	Ground
3	2	3	2	V_{OUT}	Output voltage monitor, IC internal power supply
2	3	—	—	Lx	Switch
—	—	2	3	EXT	External switch transistor drive

(XC6381C, XC6381D)

PIN NUMBER				PIN NAME	FUNCTION
XC6381C		XC6381D			
SOT-25	SOT-89-5	SOT-25	SOT-89-5		
4	5	4	5	V_{SS}	Ground
2	2	2	2	V_{OUT}	Output voltage monitor, IC internal power supply
5	4	—	—	Lx	Switch
—	—	5	4	EXT	External switch transistor drive
1	3	1	3	CE	Chip enable
3	1	3	1	NC	No Connection

(XC6381E, XC6381F)

PIN NUMBER				PIN NAME	FUNCTION
XC6381E		XC6381F			
SOT-25	SOT-89-5	SOT-25	SOT-89-5		
4	5	4	5	V_{SS}	Ground
2	2	2	2	V_{DD}	IC internal power supply
5	4	—	—	Lx	Switch
—	—	5	4	EXT	External switch transistor drive
1	3	1	3	V_{OUT}	Output voltage monitor
3	1	3	1	NC	No Connection

■ Electrical Characteristics

XC6381A201 V_{OUT}=2.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L, etc. connected	1.950	2.000	2.050	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
No-Load Input Current	I_{IN}	I_{OUT}=0mA,(Note1)		4.3	8.6	μA
Supply Current 1 (Note 2)	I_{DD1}	V_{IN}=V_{OUT} × 0.95		20.1	40.2	μA
Supply Current 2	I_{DD2}	V_{IN}=V_{OUT}+0.5V		1.9	3.9	μA
Lx Switch On-Resistance	R_{SWON}	Same as I_{DD1}, V_{LX}=0.4V		9.1	13.7	Ω
Lx Leakage Current	I_{LXL}	No external components, V_{OUT}=V_{LX}=10V			1.0	μA
Duty Ratio	DTY	Same as I_{DD1} Measuring of Lx waveform	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as I_{DD1}, 58% duty.	131.75	155	178.25	kHz
Lx Limit Voltage	VLxLMT	Same as I_{DD1}, Fosc ≥ MAXFOSC × 2	0.7		1.1	V
Efficiency	EFFI	L,SD,C_L, etc. connected		70		%

Measuring conditions: Unless otherwise specified, V_{IN}=V_{OUT} × 0.6, I_{OUT}=10mA. See Typical application circuits, Fig.1.

Note: 1. The Schottky diode (SD) must be type MA735, with reverse current (I_R) <1.0μA at reverse voltage (V_R)=10.0V.
2. "Supply current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates, which results in less average power consumption. The current actually provided by an external V_{IN} source is represented by "No-Load Input Current (I_{IN})".

XC6381A301 V_{OUT}=3.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L, etc. connected	2.925	3.000	3.075	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
No-Load Input Current	I_{IN}	I_{OUT}=0mA,(Note1)		4.6	9.3	μA
Supply Current 1 (Note 2)	I_{DD1}	V_{IN}=V_{OUT} × 0.95		29.3	58.7	μA
Supply Current 2	I_{DD2}	V_{IN}=V_{OUT}+0.5V		2.1	4.2	μA
Lx Switch On-Resistance	R_{SWON}	Same as I_{DD1}, V_{LX}=0.4V		5.2	7.9	Ω
Lx Leakage Current	I_{LXL}	No external components, V_{OUT}=V_{LX}=10V			1.0	μA
Duty Ratio	DTY	Same as I_{DD1} Measuring of Lx waveform	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as I_{DD1}, 58% duty.	131.75	155	178.25	kHz
Lx Limit Voltage	VLxLMT	Same as I_{DD1}, Fosc ≥MAXFOSC × 2	0.7		1.1	V
Efficiency	EFFI	L,SD,C_L, etc. connected		80		%

Measuring conditions: Unless otherwise specified, V_{IN}=V_{OUT} × 0.6, I_{OUT}= 30mA. See Typical application circuits, Fig.1.

Note: 1. The Schottky diode (SD) must be type MA735, with reverse current (I_R) <1.0μA at reverse voltage (V_R)=10.0V.
2. "Supply current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates, which results in less average power consumption. The current actually provided by an external V_{IN} source is represented by "No-Load Input Current (I_{IN})".

■ Electrical Characteristics

XC6381A501 V_{OUT}=5.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L, etc. connected	4.875	5.000	5.125	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
No-Load Input Current	I_{IN}	I_{OUT}=0mA,(Note1)		5.3	10.6	μA
Supply Current 1 (Note 2)	I_{DD1}	V_{IN}=V_{OUT} × 0.95		47.8	95.7	μA
Supply Current 2	I_{DD2}	V_{IN}=V_{OUT}+0.5V		2.4	4.8	μA
Lx Switch On-Resistance	R_{SWON}	Same as I_{DD1}, V_{LX}=0.4V		2.8	4.3	Ω
Lx Leakage Current	I_{LXL}	No external components, V_{OUT}=V_{LX}=10V			1.0	μA
Duty Ratio	DTY	Same as I_{DD1} Measuring of Lx waveform	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as I_{DD1}, 58% duty.	131.75	155	178.25	kHz
Lx Limit Voltage	VLxLMT	Same as I_{DD1}, fosc≥MAXFOSC × 2	0.7		1.1	V
Efficiency	EFFI	L,SD,C_L, etc. connected		85		%

Measuring conditions: Unless otherwise specified, V_{IN}=V_{OUT} × 0.6, I_{OUT}=50mA. See Typical application circuits, Fig.1.

Note: 1. The Schottky diode (SD) must be type MA735, with reverse current (I_R) <1.0μA at reverse voltage (V_R)=10.0V.
2. "Supply current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates, which results in less average power consumption. The current actually provided by an external V_{IN} source is represented by "No-Load Input Current (I_{IN})".

XC6381B201MR V_{OUT}=2.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L,Tr etc. connected	1.950	2.000	2.050	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Startup Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
Supply Current 1 (Note)	I_{DD1}	V_{IN}=V_{OUT} × 0.95		20.1	40.2	μA
Supply Current 2	I_{DD2}	V_{IN}=V_{OUT}+0.5V		1.9	3.9	μA
EXT "High" On Resistance	R_{SWON}	Same as I_{DD1}, V_{EXT}=V_{OUT}−0.4V		140	210	Ω
EXT "Low" On Resistance	I_{LXL}	Same as I_{DD1}, V_{EXT}=0.4V		140	210	Ω
Duty Ratio	DTY	Same as I_{DD1} Measuring of EXT waveform	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as I_{DD1}, 58% duty.	131.75	155	178.25	kHz
Efficiency	EFFI	L,SD,C_L,Tr etc. connected		70		%

Measuring conditions: Unless otherwise specified, V_{IN}=V_{OUT} × 0.6, I_{OUT}= 10mA. See Typical application circuits, Fig.2.

Note: "Supply current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates, which results in less average power consumption.

■ Electrical Characteristics

XC6381B301MR V_{OUT}=3.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,CL,Tr etc. connected	2.925	3.000	3.075	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
Supply Current 1 (Note)	$I_{DD}1$	V_{IN}=V_{OUT} × 0.95		29.3	58.7	μA
Supply Current 2	$I_{DD}2$	V_{IN}=V_{OUT}+0.5		2.1	4.2	μA
EXT "High" On Resistance	R_{SWON}	Same as $I_{DD}1$, V_{EXT}=V_{OUT}−0.4V.		76	114	Ω
EXT "Low" On Resistance	I_{LXL}	Same as $I_{DD}1$, V_{EXT}=0.4V.		76	114	Ω
Duty Ratio	DTY	Same as $I_{DD}1$ Measuring of EXT waveform	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as $I_{DD}1$, 58% duty.	131.75	155	178.25	kHz
Efficiency	EFFI	L,SD,CL,Tr etc. connected		80		%

Measuring conditions: Unless otherwise specified, V_{IN}=V_{OUT} × 0.6, I_{OUT}=30mA. See Typical application circuits, Fig.2.

Note: "Supply current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates, which results in less average power consumption.

XC6381B501MR V_{OUT}=5.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,CL,Tr etc. connected	4.875	5.000	5.125	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Startup Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
Supply Current 1 (Note)	$I_{DD}1$	V_{IN}=V_{OUT} × 0.95		47.8	95.7	μA
Supply Current 2	$I_{DD}2$	V_{IN}=V_{OUT}+0.5		2.4	4.8	μA
EXT "High" On Resistance	R_{SWON}	Same as $I_{DD}1$, V_{EXT}=V_{OUT}−0.4V.		50	75	Ω
EXT "Low" On Resistance	I_{LXL}	Same as $I_{DD}1$, V_{EXT}=0.4V.		50	75	Ω
Duty Ratio	DTY	Same as $I_{DD}1$ Measuring of EXT waveform	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as $I_{DD}1$, 58% duty.	131.75	155	178.25	kHz
Efficiency	EFFI	L,SD,CL,Tr etc. connected		85		%

Measuring conditions: Unless otherwise specified, V_{IN}=V_{OUT} × 0.6, I_{OUT}=50mA. See Typical application circuits, Fig.2.

Note: "Supply current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates, which results in less average power consumption.

■ Electrical Characteristics

XC6381C201MR VOUT=2.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	VOUT	L,SD,CL etc. connected	1.950	2.000	2.050	V
Maximum Input Voltage	VIN		10			V
Oscillation Start-up Voltage	VST	IOUT=1mA		0.80	0.90	V
Oscillation Hold Voltage	VHLD	IOUT=1mA	0.70			V
No-Load Input Current	IIN	IOUT=0mA (Note1)		4.3	8.6	μA
Supply Current 1 (Note 2)	IDD1	VIN=VOUT × 0.95		20.1	40.2	μA
Supply Current 2	IDD2	VIN=VOUT+0.5V		1.9	3.9	μA
Lx Switch-On Resistance	RSWON	Same as IDD1. VLX=0.4V.		9.1	13.7	Ω
Lx Leakage Current	ILXL	No external components.. VOUT=VLX=10V.			1.0	μA
Duty Ratio	DTY	Same as IDD1. Measuring of Lx waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as IDD1. 58% duty.	131.75	155	178.25	kHz
Stand-by Current	ISTB	Same as IDD1.			0.5	μA
CE "High" Voltage	VCEH	Same as IDD1. Existence of Lx Oscilllation.	0.75			V
CE "Low" Voltage	VCEL	Same as IDD1. Disappearance of Lx Oscilllation.			0.20	V
CE "High" Current	ICEH	Same as IDD1. VCE=VOUT × 0.95.			0.25	μA
CE "Low" Current	ICEL	Same as IDD1. VCE=0V.			−0.25	μA
Lx Limit Voltage	VLxLMT	Same as IDD1. FOSC>MAXFOSC × 2	0.7		1.1	V
Efficiency	EFFI	L,SD,CL etc. connected		70		%

Measuring conditions: Unless otherwise specified, connect CE to VOUT, VIN=VOUT × 0.6, IOUT=10mA. See Typical Application Circuits, Fig.3.

Note: 1. The Schottky diode (SD) must be type MA735, with reverse current (IR)<1.0μA at reverse voltage (VR)=10.0V
2. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current acutually provided by an external VIN source is represented by "No-Load Input Current (IIN)".

XC6381C301MR VOUT=3.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	VOUT	L,SD,CL etc. connected	2.925	3.000	3.075	V
Maximum Input Voltage	VIN		10			V
Oscillation Start-up Voltage	VST	IOUT=1mA		0.80	0.90	V
Oscillation Hold Voltage	VHLD	IOUT=1mA	0.70			V
No-Load Input Current	IIN	IOUT=0mA, (Note1)		4.6	9.3	μA
Supply Current 1 (Note 2)	IDD1	VIN=VOUT × 0.95		29.3	58.7	μA
Supply Current 2	IDD2	VIN=VOUT+0.5V		2.1	4.2	μA
Lx Switch-On Resistance	RSWON	Same as IDD1. VLX=0.4V		5.2	7.9	Ω
Lx Leakage Current	ILXL	No external components. VOUT=VLX=10V.			1.0	μA
Duty Ratio	DTY	Same as IDD1. Measuring of Lx waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as IDD1. 58% duty.	131.75	155	178.25	kHz
Stand-by Current	ISTB	Same as IDD1.			0.5	μA
CE "High" Voltage	VCEH	Same as IDD1. Existence of Lx Oscillation.	0.75			V
CE "Low" Voltage	VCEL	Same as IDD1. Disappearance of Lx Oscillation.			0.20	V
CE "High" Current	ICEH	Same as IDD1. VCE=VOUT × 0.95.			0.25	μA
CE "Low" Current	ICEL	Same as IDD1. VCE=0V.			−0.25	μA
Lx Limit Voltage	VLxLMT		0.7		1.1	V
Efficiency	EFFI	L,SD,CL etc. connected		80		%

Measuring conditions: Unless otherwise specified, connect CE to VOUT, VIN=VOUT × 0.6, IOUT=30mA. See Typical Application Circuits, Fig.3.

Note: 1. The schottky diode (SD) must be type MA735, with reverse current (IR)<1.0μA at reverse voltage (VR)=10.0V
2. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current actually provided by an external VIN source is represented by "No-Load Input Current (IIN)".

■ Electrical Characteristics

XC6381C501MR V_{OUT}=5.0V

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L etc. connected	4.875	5.000	5.125	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
No-Load Input Current	I_{IN}	I_{OUT}=0mA(Note1)		5.3	10.6	μA
Supply Current 1 (Note 2)	I_{DD1}	V_{IN}=V_{OUT} × 0.95		47.8	95.7	μA
Supply Current 2	I_{DD2}	V_{IN}=V_{OUT}+0.5V		2.4	4.8	μA
Lx Switch-On Resistance	R_{SWON}	Same as I_{DD1}. V_{LX}=0.4V.		2.8	4.3	Ω
Lx Leakage Current	I_{LXL}	No external components. V_{OUT}=V_{LX}=10V.			1.0	μA
Duty Ratio	DTY	Same as I_{DD1}. Measuring of Lx waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as I_{DD1}. 58% duty.	131.75	155	178.25	kHz
Stand-by Current	I_{STB}	Same as I_{DD1}.			0.5	μA
CE "High" Voltage	V_{CEH}	Same as I_{DD1}. Existence of Lx Oscillation.	0.75			V
CE "Low" Voltage	V_{CEL}	Same as I_{DD1}. Disapperance of Lx Oscillation.			0.20	V
CE "High" Current	I_{CEH}	Same as I_{DD1}. V_{CE}=V_{OUT} × 0.95.			0.25	μA
CE "Low" Current	I_{CEL}	Same as I_{DD1}. V_{CE}=0V.			−0.25	μA
Lx Limit Voltage	VLxLMT	Same as I_{DD1}. FOSC>MAXFOSC × 2	0.7		1.1	V
Efficiency	EFFI	L,SD,C_L etc. connected		85		%

Measuring conditions: Unless otherwise specified, connect CE to V_{OUT}, V_{IN}=V_{OUT} × 0.6, I_{OUT}=50mA. See Typical Application Circuits, Fig.3.

Note: 1. The Schottky diode (SD) must be type MA735, with reverse current (I_R)<1.0μA at reverse voltage (V_R)=10.0V
2. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current actually provided by an external V_{IN} source is represented by "No-Load Input Current (I_{IN})".

XC6381D201MR V_{OUT}=2.0V

Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L etc. connected	1.950	2.000	2.050	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
Supply Current 1 (Note 1)	I_{DD1}	V_{IN}=V_{OUT} × 0.95		20.1	40.2	μA
Supply Current 2	I_{DD2}	V_{IN}=V_{OUT}+0.5V		1.9	3.9	μA
EXT "High" On Resistance	R_{EXTH}	Same as I_{DD1}. V_{EXT}=V_{OUT}−0.4V.		140	210	Ω
EXT "Low" On Resistance	R_{EXTL}	Same as I_{DD1}. V_{EXT}=0.4V		140	210	Ω
Duty Ratio	DTY	Same as I_{DD1}. Measuring of EXT waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as I_{DD1}. 58% duty.	131.75	155	178.25	kHz
Stand-by Current	I_{STB}	Same as I_{DD1}.			0.5	μA
CE "High" Voltage	V_{CEH}	Same as I_{DD1}. Existence of EXT Oscilllation.	0.75			V
CE "Low" Voltage	V_{CEL}	Same as I_{DD1}. Disappearance of EXT Oscilllation.			0.20	V
CE "High" Current	I_{CEH}	Same as I_{DD1}. V_{CE}=V_{OUT} × 0.95.			0.25	μA
CE "Low" Current	I_{CEL}	Same as I_{DD1}. V_{CE}=0V.			−0.25	μA
Efficiency	EFFI	L,SD,C_L etc. connected		70		%

Measuring conditions: Unless otherwise specified, connect CE to V_{OUT}, V_{IN}=V_{OUT} × 0.6, I_{OUT}=10mA. See Typical Application Circuits, Fig.4.

Note: 1. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current actually provided by an external V_{IN} source is represented by "No-Load Input Current (I_{IN}) ".

■ Electrical Characteristics

XC6381D301MR VOUT=3.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	VOUT	L,SD,CL etc. connected	2.925	3.000	3.075	V
Maximum Input Voltage	VIN		10			V
Oscillation Start-up Voltage	VST	IOUT=1mA		0.80	0.90	V
Oscillation Hold Voltage	VHLD	IOUT=1mA	0.70			V
Supply Current 1 (Note 1)	IDD1	VIN=VOUT × 0.95		29.3	58.7	μA
Supply Current 2	IDD2	VIN=VOUT+0.5V		2.1	4.2	μA
EXT "High" On Resistance	REXTH	Same as IDD1. VEXT=VOUT-0.4V.		76	114	Ω
EXT "Low" On Resistance	REXTL	Same as IDD1. VEXT=0.4V.		76	114	Ω
Duty Ratio	DTY	Same as IDD1. Measuring of EXTwaveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as IDD1. 58% duty.	131.75	155	178.25	kHz
Stand-by Current	ISTB	Same as IDD1.			0.5	μA
CE "High" Voltage	VCEH	Same as IDD1. Existence of EXT Oscillation.	0.75			V
CE "Low" Voltage	VCEL	Same as IDD1. Disappearance of EXT Oscillation.			0.20	V
CE "High" Current	ICEH	Same as IDD1. VCE=VOUT × 0.95.			0.25	μA
CE "Low" Current	ICEL	Same as IDD1. VCE=0V.			–0.25	μA
Efficiency	EFFI	L,SD,CL etc. connected		80		%

Measuring conditions: Unless otherwise specified, connect CE to VOUT, VIN=VOUT × 0.6, IOUT=30mA. See Typical Application Circuits, Fig.4.

Note: 1. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current actually provided by an external VIN source is represented by "No-Load Input Current (IIN) ".

XC6381D501MR VOUT=5.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	VOUT	L,SD,CL etc. connected	4.875	5.000	5.125	V
Maximum Input Voltage	VIN		10			V
Oscillation Start-up Voltage	VST	IOUT=1mA		0.80	0.90	V
Oscillation Hold Voltage	VHLD	IOUT=1mA	0.70			V
Supply Current 1 (Note 1)	IDD1	VIN=VOUT × 0.95		47.8	95.7	μA
Supply Current 2	IDD2	VIN=VOUT+0.5V		2.4	4.8	μA
EXT "High" On Resistance	REXTH	Same as IDD1. VEXT=VOUT-0.4V.		50	75	Ω
EXT "Low" On Resistance	REXTL	Same as IDD1. VEXT=0.4V.		50	75	Ω
Duty Ratio	DTY	Same as IDD1 Measuring of EXT waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as IDD1. 58% duty.	131.75	155	178.25	kHz
Stand-by Current	ISTB	Same as IDD1.			0.5	μA
CE "High" Voltage	VCEH	Same as IDD1. Existence of EXT Oscillation.	0.75			V
CE "Low" Voltage	VCEL	Same as IDD1. Dissapearance of EXT Oscillation.			0.20	V
CE "High" Current	ICEH	Same as IDD1. VCE=VOUT × 0.95.			0.25	μA
CE "Low" Current	ICEL	Same as IDD1. VCE=0V			–0.25	μA
Efficiency	EFFI	L,SD,CL etc. connected		80		%

Measuring conditions: Unless otherwise specified, connect CE to VOUT. VIN=VOUT × 0.6, IOUT=50mA. See Typical Application Circuits, Fig.4.

Note: 1. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current actually provided by an external VIN source is represented by "No-Load Input Current (IIN) ".

■ Electrical Characteristics

XC6381E201MR V_{OUT}=2.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L etc. connected	1.950	2.000	2.050	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA.		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA.	0.70			V
No-Load Input Current	I_{IN}	I_{OUT}=0mA(Note1)		4.3	8.6	μA
Supply Current 1 (Note 2)	I_{DD1}	V_{IN}=V_{OUT} × 0.95		20.1	40.2	μA
Supply Current 2	I_{DD2}	V_{IN}=V_{OUT}+0.5V.		1.9	3.9	μA
Lx Switch-On Resistance	R_{SWON}	Same as I_{DD1}. V_{LX}=0.4V		9.1	13.7	Ω
Lx Leakage Current	I_{LXL}	No external components. V_{OUT}=V_{LX}=10V.			1.0	μA
Duty Ratio	DTY	Same as I_{DD1} Measuring of Lx waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as I_{DD1}. 58% duty.	131.75	155	178.25	kHz
Lx Limit Voltage	VLxLMT	Same as I_{DD1}. F_{OSC}>MAXFOSC × 2	0.7		1.1	V
Efficiency	EFFI	L,SD,C_L etc. connected		0.7		%

Measuring conditions: Unless otherwise specified, connect V_{DD} to V_{OUT}, V_{IN}=V_{OUT} × 0.6, I_{OUT}=10mA. See Typical Application Circuits, Fig.5.

Note: 1. The Schottky diode (SD) must be type MA735, with reverse current (I_R)<1.0μA at reverse voltage (V_R)=10.0V.

2. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current actually provided by an external V_{IN} source is represented by "No-Load Input Current (I_{IN})".

※When the V_{DD} and V_{OUT} pins are independently used, the voltage range at the V_{DD} pin should be 2.2V to 10V.
The IC operates from V_{DD}=0.8V. However, output voltage and oscillator frequency are properly stabilized when V_{DD}=2.2V or higher.

XC6381E301MR V_{OUT}=3.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L etc. connected	2.925	3.000	3.075	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA.		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA.	0.70			V
No-Load Input Current	I_{IN}	I_{OUT}=0mA(Note1)		4.6	9.3	μA
Supply Current 1 (Note 2)	I_{DD1}	V_{IN}=V_{OUT} × 0.95		29.3	58.7	μA
Supply Current 2	I_{DD2}	V_{IN}=V_{OUT}+0.5V		2.1	4.2	μA
Lx Switch-On Resistance	R_{SWON}	Same as I_{DD1}. V_{LX}=0.4V		5.2	7.9	Ω
Lx Leakage Current	I_{LXL}	No external components. V_{OUT}=V_{LX}=10V			1.0	μA
Duty Ratio	DTY	Same as I_{DD1} Measuring of Lx waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as I_{DD1}. 58% duty.	131.75	155	178.25	kHz
Lx Limit Voltage	VLxLMT	Same as I_{DD1}. F_{OSC}>MAXFOSC × 2	0.7		1.1	V
Efficiency	EFFI	L,SD,C_L etc. connected		80		%

Measuring conditions: Unless otherwise specified, connect V_{DD} to V_{OUT}, V_{IN}=V_{OUT} × 0.6, I_{OUT}=30mA. See Typical Application Circuits, Fig.5.

Note: 1. The Schottky diode (SD) must be type MA735, with reverse current (I_R)<1.0μA at reverse voltage (V_R)=10.0V.

2. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current actually provided by an external V_{IN} source is represented by "No-Load Input Current (I_{IN})".

※When the V_{DD} and V_{OUT} pins are independently used, the voltage range at the V_{DD} pin should be 2.2V to 10V.
The IC operates from V_{DD}=0.8V. However, output voltage and oscillator frequency are properly stabilized when V_{DD}=2.2V or higher.

■ Electrical Characteristics

XC6381E501MR VOUT=5.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	VOUT	L,SD,CL etc. connected	4.875	5.000	5.125	V
Maximum Input Voltage	VIN		10			V
Oscillation Start-up Voltage	VST	IOUT=1mA		0.80	0.90	V
Oscillation Hold Voltage	VHLD	IOUT=1mA	0.70			V
No-Load Input Current	IIN	IOUT=0mA,(Note1)		5.3	10.6	μA
Supply Current 1 (Note 2)	IDD1	VIN=VOUT × 0.95		47.8	95.7	μA
Supply Current 2	IDD2	VIN=VOUT+0.5V		2.4	48	μA
Lx Switch-On Resistance	RSWON	Same as IDD1. VLX=0.4V.		2.8	4.3	Ω
Lx Leakage Current	ILXL	No external components. VOUT=VLX=10V.			1.0	μA
Duty Ratio	DTY	Same as IDD1. Measuring of Lx waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as IDD1. 58% duty.	131.75	155	178.25	kHz
Lx Limit Voltage	VLxLMT	Same as IDD1. FOSC>MAXFOSC × 2	0.7		1.1	V
Efficiency	EFFI	L,SD,CL etc. connected		85		%

Measuring conditions: Unless otherwise specified, connect VDD to VOUT, VIN=VOUT × 0.6, IOUT=50mA. See Typical Application Circuits, Fig.5.

Note: 1. The Schottky diode (SD) must be type MA735, with reverse current (IR)<1.0μA at reverse voltage (VR)=10.0V.
2. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption. The current actually provided by an external VIN source is represented by "No-Load Input Current (IIN)".
❋When the VDD and VOUT pins are independently used, the voltage range at the VDD pin should be 2.2V to 10V.
The IC operates from VDD=0.8V. However, output voltage and oscillator frequency are properly stabilized when VDD=2.2V or higher.

XC6381F201MR VOUT=2.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	VOUT	L,SD,CL etc. connected	1.950	2.000	2.050	V
Maximum Input Voltage	VIN		10			V
Oscillation Start-up Voltage	VST	IOUT=1mA		0.80	0.90	V
Oscillation Hold Voltage	VHLD	IOUT=1mA	0.70			V
Supply Current 1 (Note 1)	IDD1	VIN=VOUT × 0.95		20.1	40.2	μA
Supply Current 2	IDD2	VIN=VOUT+0.5V		1.9	3.9	μA
EXT "High" On Resistance	REXTH	Same as IDD1. VEXT=VOUT–0.4V.		140	210	Ω
EXT "Low" On Resistance	REXTL	Same as IDD1. VEXT=0.4V.		140	210	Ω
Duty Ratio	DTY	Same as IDD1. Measuring of EXT waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as IDD 1. 58% duty.	131.75	155	178.25	kHz
Efficiency	EFFI	L,SD,CL etc. connected		70		%

Measuring conditions: Unless otherwise specified, connect VDD to VOUT, VIN=VOUT × 0.6, IOUT=10mA. See Typical Application Circuits, Fig.6.

Note: 1."Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption.
❋When the VDD and VOUT pins are independently used, the voltage range at the VDD pin should be 2.2V to 10V.
The IC operates from VDD=0.8V. However, output voltage and oscillator frequency are properly stabilized when VDD=2.2V or higher.

■ Electrical Characteristics

XC6381F301MR V_{OUT}=3.0V Ta=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L etc. connected	2.925	3.000	3.075	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
Supply Current 1 (Note 1)	$I_{DD}1$	V_{IN}=V_{OUT} × 0.95		29.3	58.7	μA
Supply Current 2	$I_{DD}2$	V_{IN}=V_{OUT}+0.5V		2.1	4.2	μA
EXT "High" On Resistance	R_{EXTH}	Same as $I_{DD}1$. V_{EXT}=V_{OUT}–0.4V.		76	114	Ω
EXT "Low" On Resistance	R_{EXTL}	Same as $I_{DD}1$. V_{EXT}=0.4V.		76	114	Ω
Duty Ratio	DTY	Same as $I_{DD}1$. Measuring of EXT waveform.	53	58	63	%
Maximum Oscillation Frequency	MAXFOSC	Same as $I_{DD}1$. 58% duty.	131.75	155	178.25	kHz
Efficiency	EFFI	L,SD,C_L etc. connected		80		%

Measuring conditions: Unless otherwise specified, connect V_{DD} to V_{OUT}, V_{IN}=V_{OUT} × 0.6, I_{OUT}=30mA. See Typical Application Circuits, Fig.6.

Note: 1. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption.

❋When the V_{DD} and V_{OUT} pins are independently used, the voltage range at the V_{DD} pin should be 2.2V to 10V.
The IC operates from V_{DD}=0.8V. However, output voltage and oscillator frequency are properly stabilized when V_{DD}=2.2V or higher.

XC6381F501MR V_{OUT}=5.0V Ta=25℃

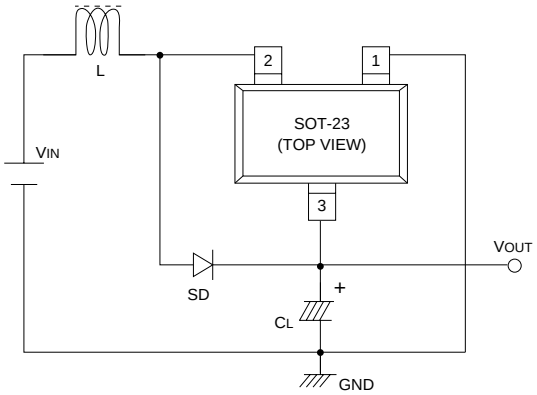
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	V_{OUT}	L,SD,C_L etc. connected	4.875	5.000	5.125	V
Maximum Input Voltage	V_{IN}		10			V
Oscillation Start-up Voltage	V_{ST}	I_{OUT}=1mA		0.80	0.90	V
Oscillation Hold Voltage	V_{HLD}	I_{OUT}=1mA	0.70			V
Supply Current 1 (Note 1)	$I_{DD}1$	V_{IN}=V_{OUT} × 0.95		47.8	95.7	μA
Supply Current 2	$I_{DD}2$	V_{IN}=V_{OUT}+0.5V		2.4	4.8	μA
EXT "High" On Resistance	R_{EXTH}	Same as $I_{DD}1$. V_{EXT}=V_{OUT}–0.4V.		50	75	Ω
EXT "Low" On Resistance	R_{EXTL}	Same as $I_{DD}1$. V_{EXT}=0.4V.		50	75	Ω
Duty Ratio	DTY	Same as $I_{DD}1$. Measuring of EXT waveform.	53	58	63	%
Maximum Oscillation Frequency	MAxFOSC	Same as $I_{DD}1$. 58% duty.	131.75	155	178.25	kHz
Efficiency	EFFI	L,SD,C_L etc. connected		85		%

Measuring conditions: Unless otherwise specified, connect V_{DD} to V_{OUT}, V_{IN}=V_{OUT} × 0.6, I_{OUT}=30mA. See Typical Application Circuits, Fig.6.

Note: 1. "Supply Current 1" is the supply current while the oscillator is continuously oscillating. In actual operation the oscillator periodically operates which results in less average power consumption.

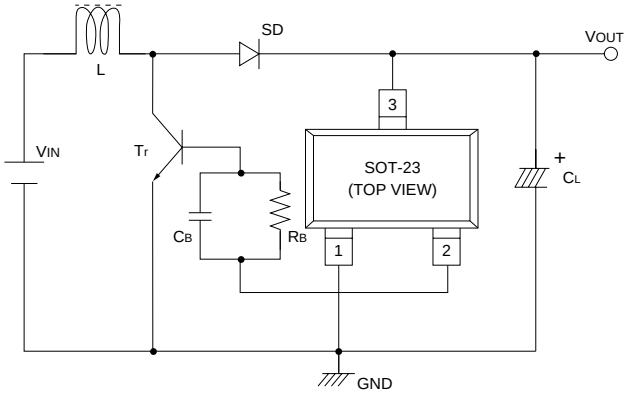
❋When the V_{DD} and V_{OUT} pins are independently used, the voltage range at the V_{DD} pin should be 2.2V to 10V.
The IC operates from V_{DD}=0.8V. However, output voltage and oscillator frequency are properly stabilized when V_{DD}=2.2V or higher.

■ Typical Application Circuits



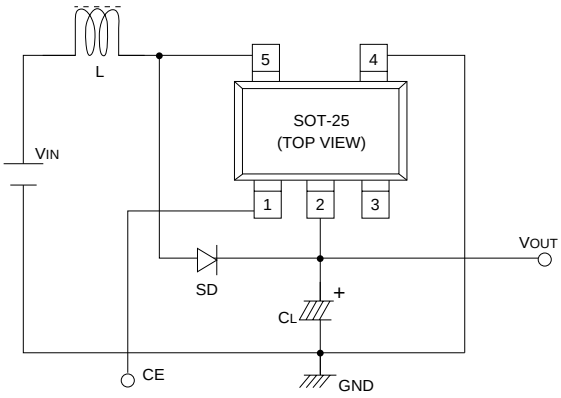
L: 100µH (SUMIDA, CD-54)
SD: MA735 (Schottky diode; MATSUSHITA)
CL: 16V 47µF (Tantalum capacitor, NICHICON, F93)

Fig.1 XC6381A Application



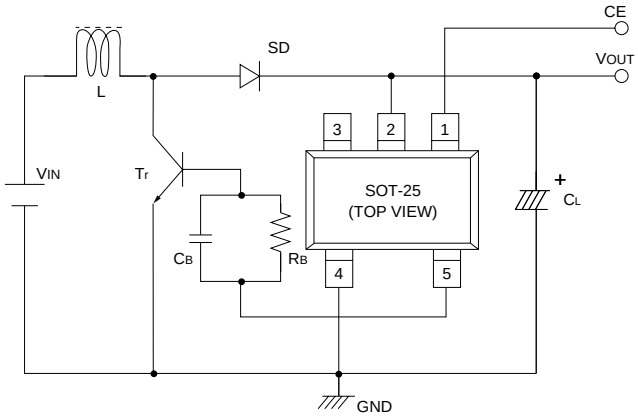
L: 47µH (SUMIDA, CD-54)
SD: MA735 (Schottky diode; MATSUSHITA)
CL: 16V 47µF (Tantalum capacitor, NICHICON, F93)
RB: 1kΩ, CB:3300pF
Tr: 2SC3279, 2SD1628G

Fig.2 XC6381B Application



L: 100µH (SUMIDA, CD-54)
SD: MA735 (Schottky diode; MATSUSHITA)
CL: 16V 47µF (Tantalum capacitor, NICHICON, F93)

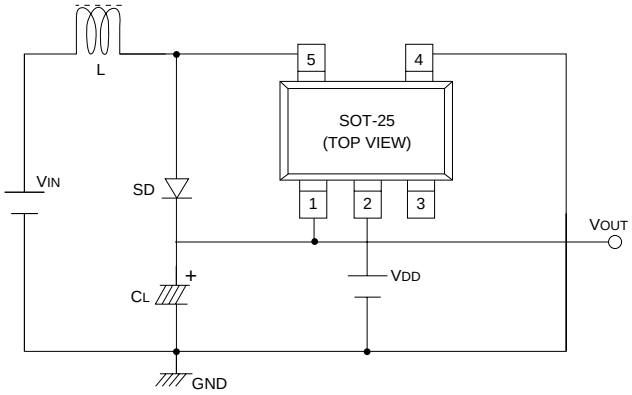
Fig.3 XC6381C Application



L: 47µH (SUMIDA, CD-54)
SD: MA735 (Schottky diode; MATSUSHITA)
CL: 16V 47µF (Tantalum capacitor, NICHICON, F93)
RB: 1kΩ, CB:3300pF
Tr: 2SC3279, 2SD1628G

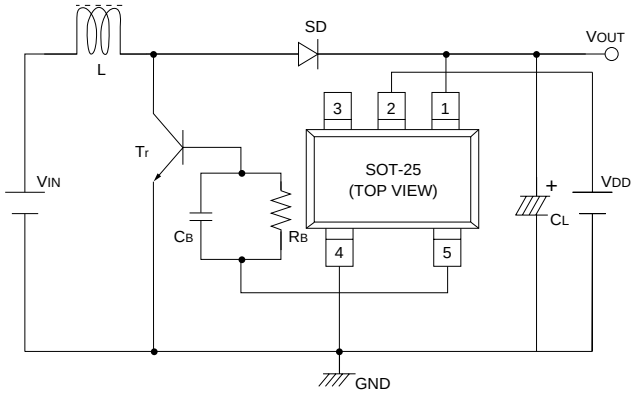
Fig.4 XC6381D Application

■ Typical Application Circuits



L: 100µH (SUMIDA, CD-54)
SD: MA735 (Schottky diode; MATSUSHITA)
CL: 16V 47µF (Tantalum capacitor, NICHICON, F93)

Fig.5 XC6381E Application



L: 47µH (SUMIDA, CD-54)
SD: MA735 (Schottky diode; MATSUSHITA)
CL: 16V 47µF (Tantalum capacitor, NICHICON, F93)
RB: 1kΩ, CB:3300pF (FOSC=100kHz)
Tr: 2SC3279, 2SD1628G

Fig.6 XC6381F Application

(Step-down circuit·····built-in switching transistor type)

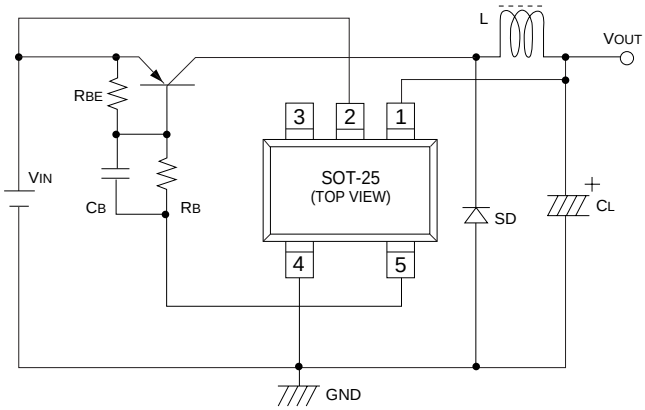


Fig.7 XC6381E Application

(High Output Voltage circuit·····external switching transistor type)

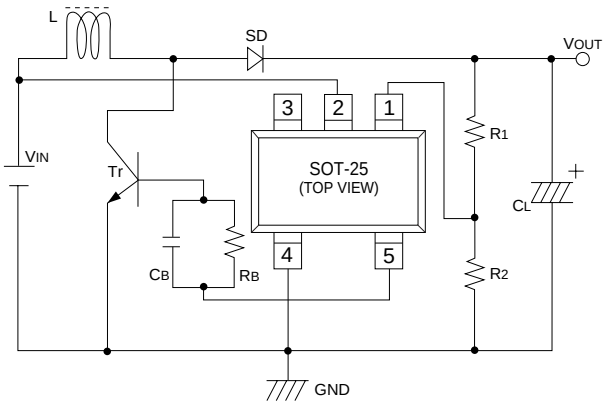


Fig.8 XC6381F Application

■ Typical Application circuits

(Polarity Reverse Circuit·····built-in switching transistor type)

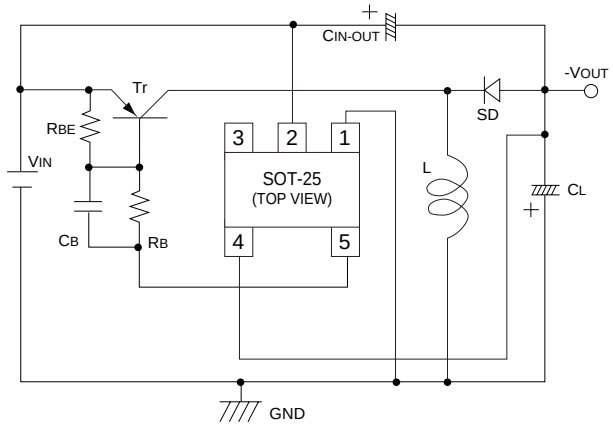


Fig.9 XC6381E Application

Note: It is recommended that the max input voltage between the VDD and the VSS pins should not exceed 10V.

(Low Output Voltage step-up circuit·····external switching transistor type)

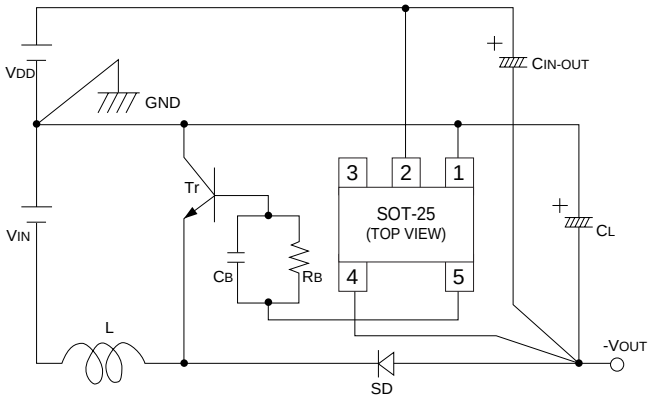


Fig.10 XC6381F Application

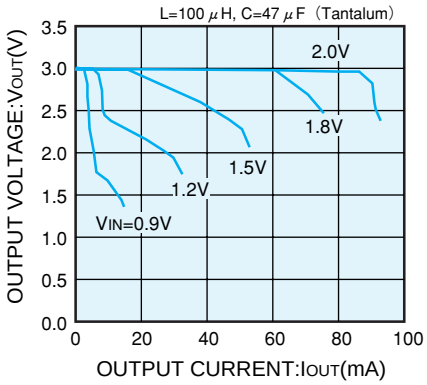
Note: It is recommended that the max input voltage between the VDD and the VSS pins should not exceed 10V.

※Also applicable to the XC6382 and XC6383 series.

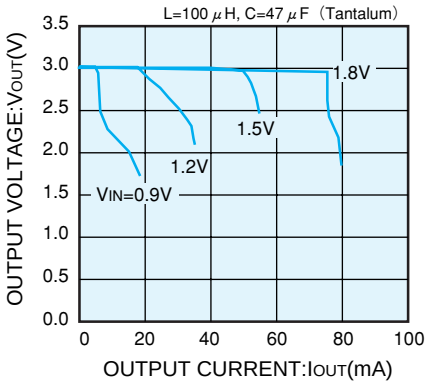
■ XC638xA (Built-in Switching Transistor)

(1)OUTPUT VOLTAGE vs. OUTPUT CURRENT

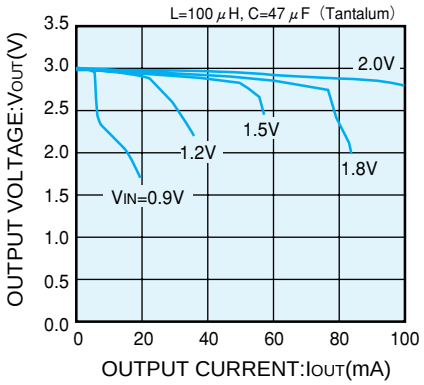
XC6381A301



XC6382A301



XC6383A301



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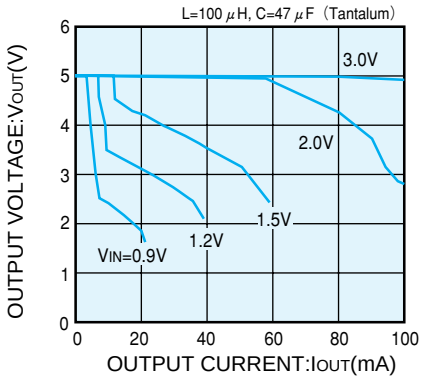

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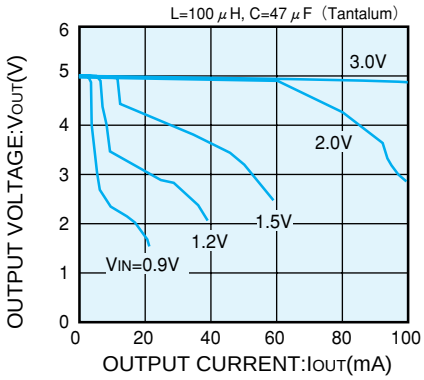
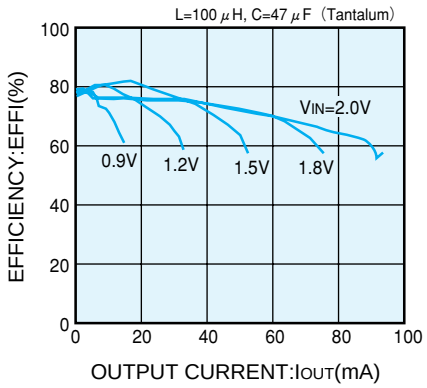


(2)EFFICIENCY vs. OUTPUT CURRENT

XC6381A301



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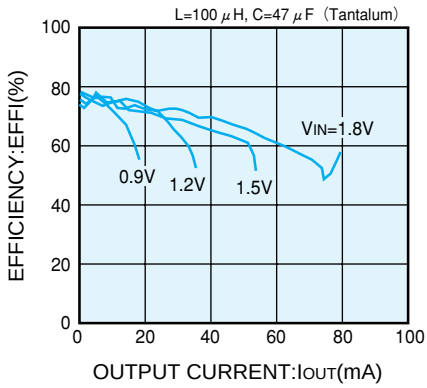

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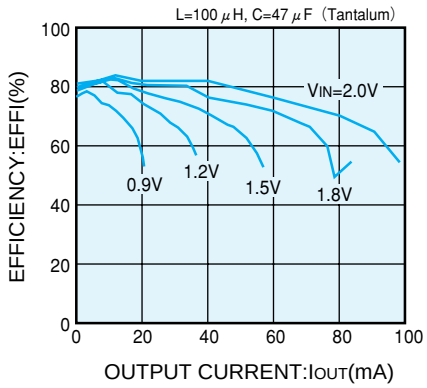

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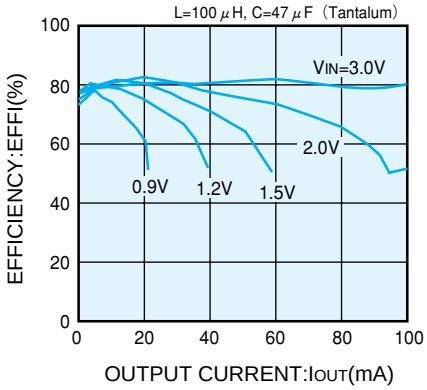

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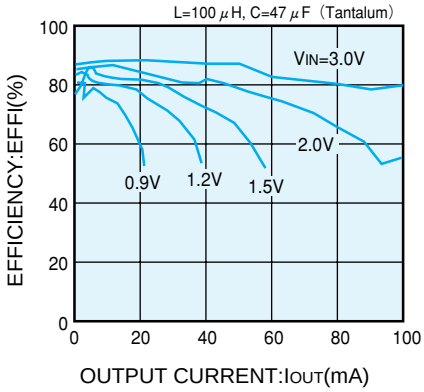
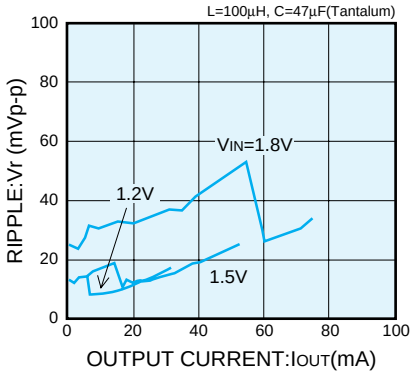


■ XC638xA (Built-in Switching Transistor)

(3)RIPPLE VOLTAGE vs. OUTPUT CURRENT

XC6381A301



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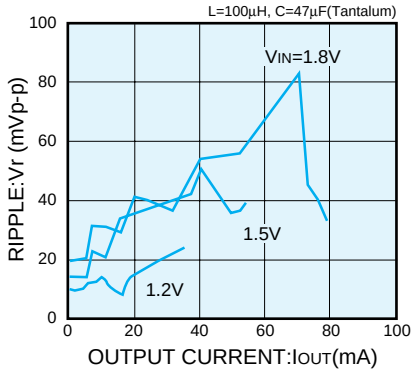

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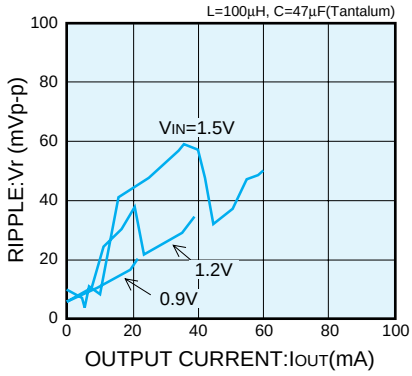

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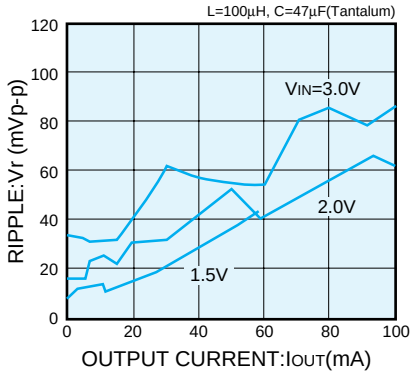

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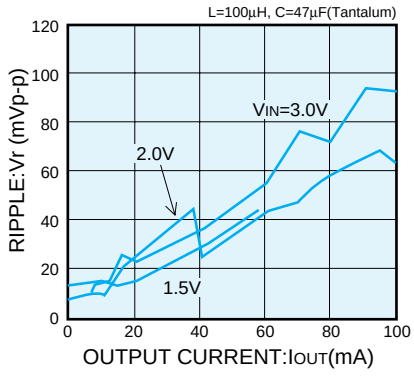
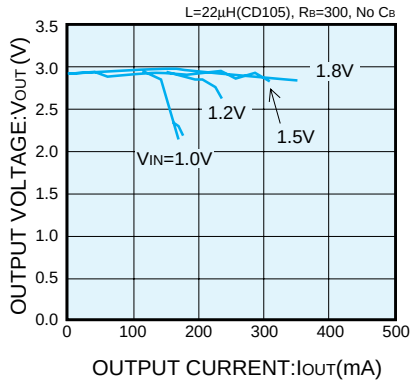


■ XC638xB (External Switching Transistor)

(1)TYPICAL OUTPUT VOLTAGE vs. OUTPUT CURRENT

XC6383B301



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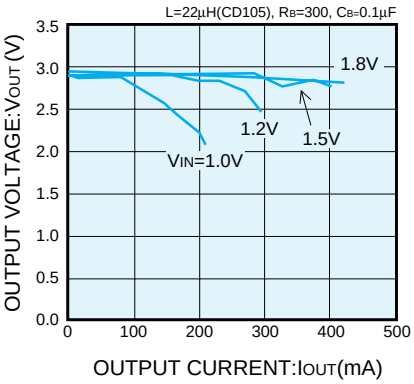

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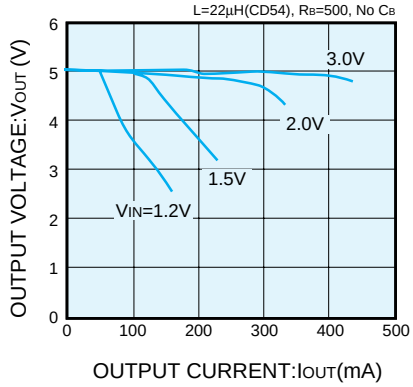

XC6383B501