

2A Synchronous Buck Converter for POL

■FEATURES

- Synchronous Rectification
- Current Mode Control
- Operating Voltage Range 2.7V to 5.5V
- Switching Current 2.64A min.
- Adjustable Oscillating Frequency 100kHz to 2.4MHz
- External Clock Synchronization
- PWM Control
- Maximum Duty Cycle 100%
- External Compensation Circuit
- Correspond to Ceramic Capacitor (MLCC)
- Soft Start Function 1ms typ.
- UVLO (Under Voltage Lockout)
- Over Current Protection (Hiccup type)
- Thermal Shutdown Protection
- Standby Function
- Package Outline DFN8-U1 (ESON8-U1)

■GENERAL DESCRIPTION

The NJW4122 is a synchronous buck converter with 2A MOSFET. The NJW4122 has wide switching oscillating frequency range, 100kHz to 2.4MHz and external clock synchronization function. Therefore it can avoid interference with the AM radio frequency.

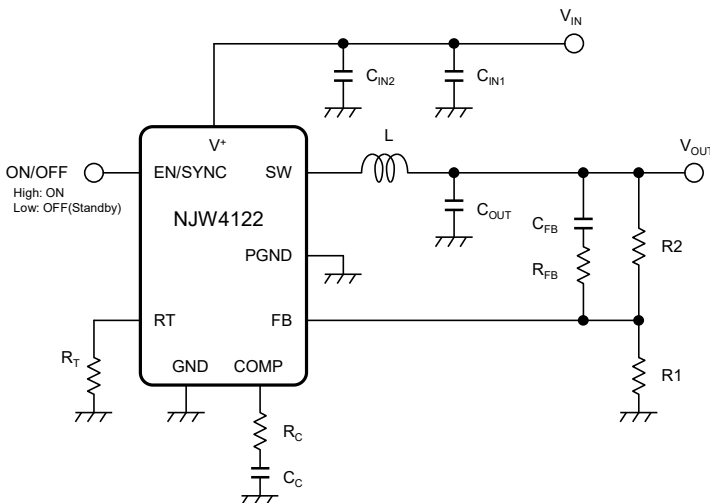
Internal protection functions: UVLO, an over current protection and a thermal shutdown circuit can protect at abnormal condition.

It is suitable for power supply circuit of SoC, DSP, DDR memory and so on that needs fast transient response.

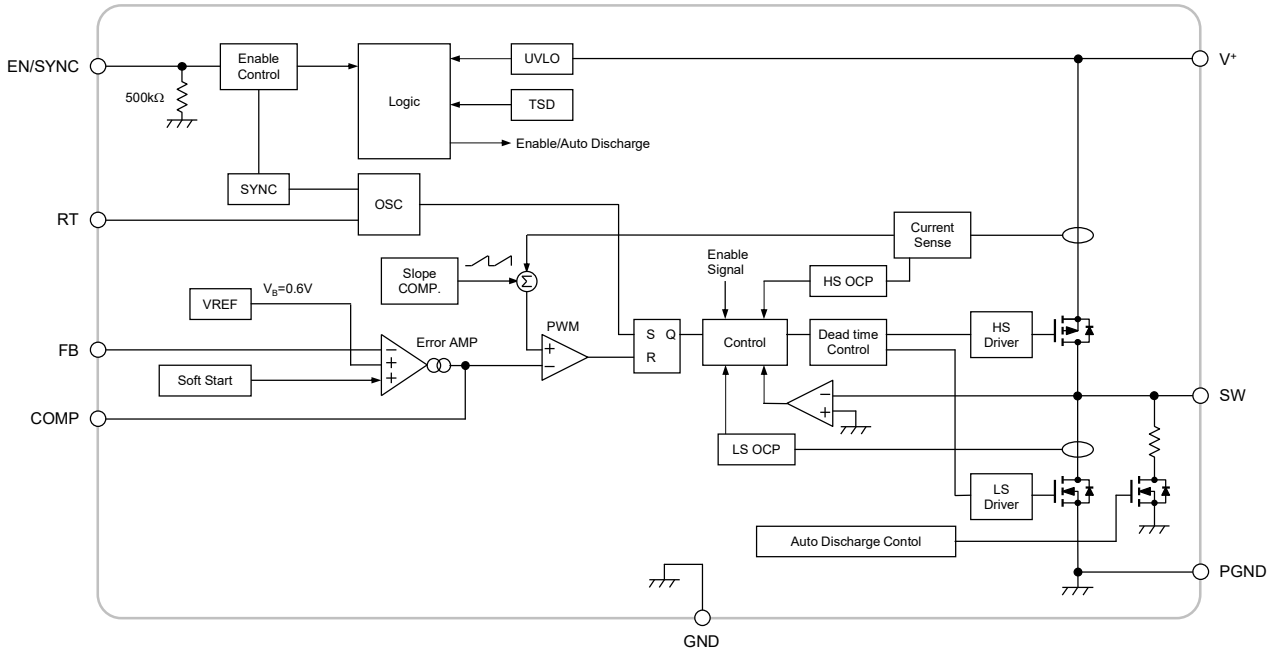
■APPLICATION

- Power supply for SoC, ASIC, DDR and the others

■TYPICAL APPLICATION

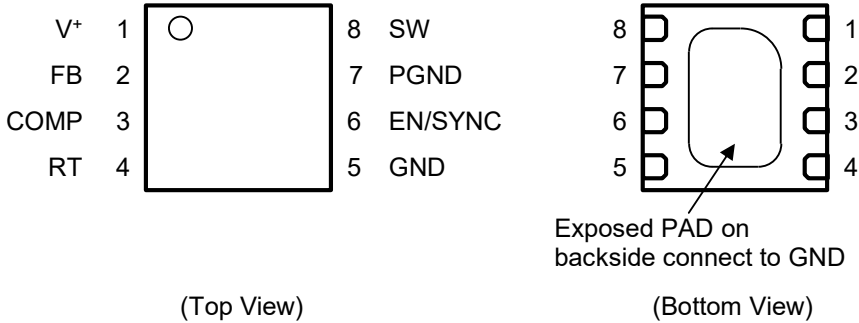


■BLOCK DIAGRAM



■PIN CONFIGURATION

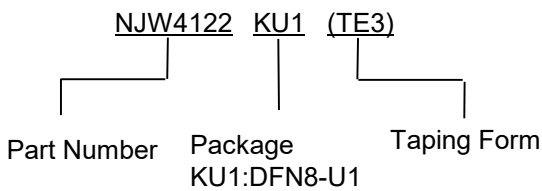
DFN8-U1 (ESON8-U1)



Note) Exposed Pad on backside should be connected to ground and soldered to PCB.

PIN NO.	SYMBOL	DESCRIPTION
1	V ⁺	Power supply for IC
2	FB	Feedback input
3	COMP	Error Amplifier output
4	RT	Oscillating frequency setting
5	GND	Signal ground
6	EN/SYNC	Enable control and external clock synchronization
7	PGND	Power ground
8	SW	Switch output

■PRODUCT NAME INFORMATION



■ORDERING INFORMATION

PRODUCT NAME	PACKAGE OUTLINE	RoHS	HALOGEN-FREE	TERMINAL FINISH	MARKING	WEIGHT (mg)	MOQ(pcs)
NJW4122KU1 (TE3)	DFN8-U1	yes	yes	Sn2Bi	4122	5.3	3,000

■ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	-0.3 to +7	V
SW pin Voltage	V_{SW}	-0.3 to +7	V
EN/SYNC pin Voltage	$V_{EN/SYNC}$	-0.3 to +7	V
FB pin Voltage	V_{FB}	-0.3 to +7	V
Power Dissipation($T_a=25^{\circ}C$) DFN8-U1	P_D	(2-layer / 4-layer) 520 ⁽¹⁾ / 1,400 ⁽²⁾	mW
Junction Temperature	T_j	-40 to +150	$^{\circ}C$
Operating Temperature	T_{opr}	-40 to +125	$^{\circ}C$
Storage Temperature	T_{stg}	-50 to +150	$^{\circ}C$

(1): Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIA/JEDEC standard, 2Layers FR-4, with Exposed Pad)

(2): Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIA/JEDEC standard, 4Layers FR-4, with Exposed Pad)

(For 4Layers: Applying 99.5×99.5mm inner Cu area and thermal via holes to a board based on JEDEC standard JESD51-5)

■RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	2.7 to 5.5	V
Timing Resistor	R_T	1.8 to 56	$k\Omega$
Oscillating Frequency	f_{OSC}	100 to 2,400	kHz
External Clock Input	f_{SYNC}	$f_{OSC} \times 0.9$ to $f_{OSC} \times 1.9$ (Maximum 2,800kHz)	kHz

■ ELECTRICAL CHARACTERISTICS

 (Unless otherwise noted, $V^+ = V_{EN/SYNC} = 3.3V$, $R_T = 5.1k\Omega$, $T_a = 25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
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Under Voltage Lockout Block

ON Threshold Voltage	V_{T_ON}	$V^+ = L \rightarrow H$	2.5	2.6	2.7	V
OFF Threshold Voltage	V_{T_OFF}	$V^+ = H \rightarrow L$	2.4	2.5	2.6	V
Hysteresis Voltage	V_{HYS}		80	100	–	mV

Soft Start Block

Soft Start Time	t_{SS}	$V_B = 0.55V$	0.5	1	2.5	ms
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Oscillator Block

Oscillating Frequency 1	f_{OSC1}	$R_T = 18k\Omega$	270	300	330	kHz
Oscillating Frequency 2	f_{OSC2}	$R_T = 5.1k\Omega$	870	970	1,070	kHz
Oscillating Frequency 3	f_{OSC3}	$R_T = 1.8k\Omega$	2,200	2,400	2,600	kHz

Error Amplifier Block

Reference Voltage	V_B		-1.0%	0.6	+1.0%	V
Input Bias Current	I_B		-0.1	–	0.1	μA
Error Amplifier Transconductance	g_m		–	380	–	$\mu A/V$
Error Amplifier Gain	A_v		–	1,000	–	–
Output Source Current	I_{OM+}		35	45	55	μA
Output Sink Current	I_{OM-}		35	45	55	μA

PWM Compare Block

Maximum Duty Cycle	$M_{AX}D_{UTY}$	$V_{FB} = 0.5V$	100	–	–	%
Minimum OFF Time	$t_{OFF-min}$		–	55	–	ns
Minimum ON Time	t_{ON-min}		–	60	–	ns

■ ELECTRICAL CHARACTERISTICS (CONTINUED)

 (Unless otherwise noted, $V^+ = V_{EN/SYNC} = 3.3V$, $R_T = 5.1k\Omega$, $T_a = 25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
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OCP Block

COOL DOWN Time	t_{COOL}		–	120	–	ms
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Output Block

High-side SW ON Resistance	R_{ONH}	$I_{SW} = -2A$	–	125	175	$m\Omega$
Low-side SW ON Resistance	R_{ONL}	$I_{SW} = 2A$	–	80	130	$m\Omega$
High-side Switching Current Limit	I_{LIMH}		2.64	3.3	3.96	A
Low-side Switching Current Limit	I_{LIML}		2.2	2.9	3.96	A
Auto Discharge Resistance	$R_{AUTODIS}$	$I_{SW} = 10mA$	–	85	140	Ω
High-side SW Leak Current	I_{LEAKH}	$V^+ - V_{SW} = 5.5V$	–	–	1	μA
Low-side SW Leak Current	I_{LEAKL}	$V_{SW} - PGND = 5.5V$	–	–	1	μA

Enable Control / Sync Block

EN/SYNC pin High Threshold Voltage	$V_{THH_EN/SYNC}$	$V_{EN/SYNC} = L \rightarrow H$	1.2	–	V^+	V
EN/SYNC pin Low Threshold Voltage	$V_{THL_EN/SYNC}$	$V_{EN/SYNC} = H \rightarrow L$	0	–	0.4	V
EN/SYNC pin Input Bias Current	$I_{EN/SYNC}$	$V_{EN/SYNC} = 5.5V$	–	10	15	μA

General Characteristics

Quiescent Current	I_{DD}	$R_L = \text{no load, Not Switching}$	–	2.2	2.7	mA
Standby Current	I_{DD_STB}	$V_{EN/SYNC} = 0V$	–	–	1	μA

■ THERMAL CHARACTERISTICS

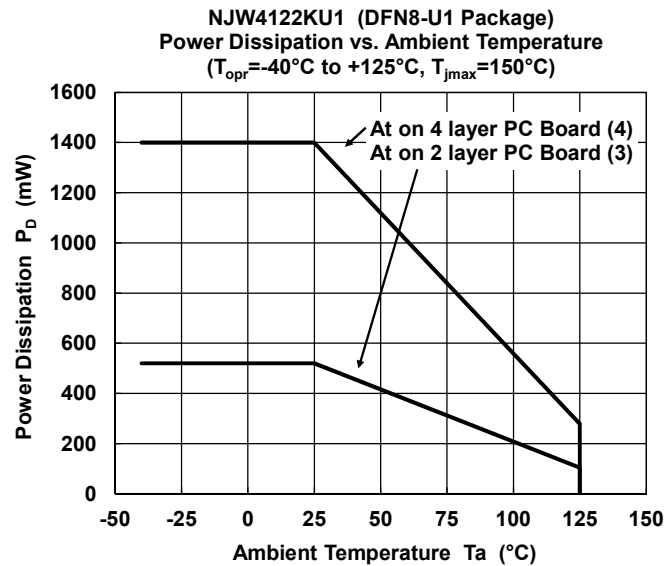
PARAMETER	SYMBOL	VALUE		UNIT
Junction-to-ambient thermal resistance	θ_{ja}	DFN8-U1 (ESON8-U1)	242 ⁽³⁾ 87 ⁽⁴⁾	°C/W
Junction-to-Top of package characterization parameter	ψ_{jt}	DFN8-U1 (ESON8-U1)	24.1 ⁽³⁾ 10.1 ⁽⁴⁾	°C/W

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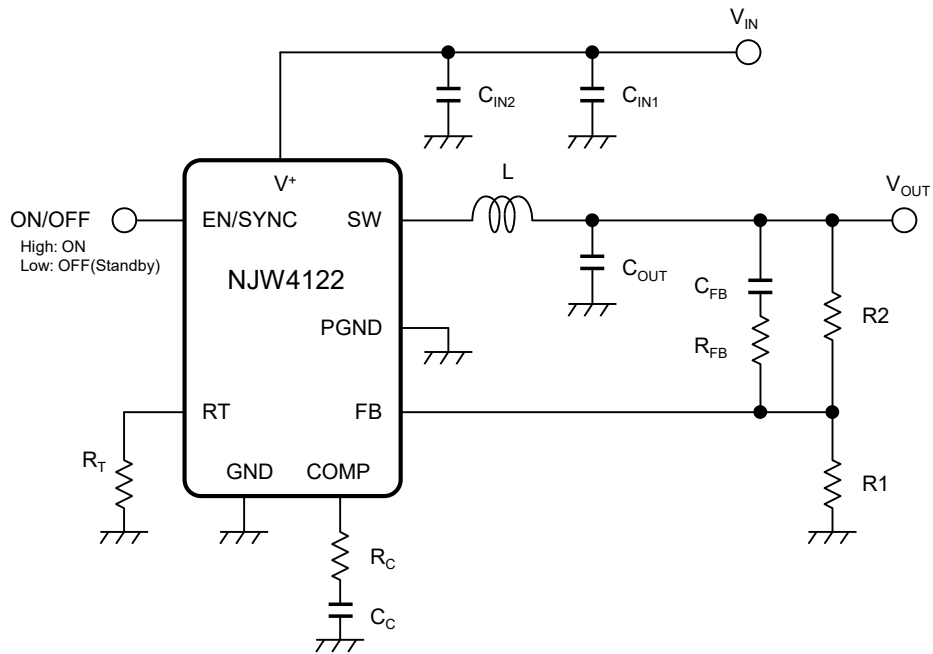
(4): Mounted on glass epoxy board. (101.5×114.5×1.6mm: based on EIA/JEDEC standard, 4Layers FR-4, with Exposed Pad)

(For 4Layers: Applying 99.5×99.5mm inner Cu area and thermal via holes to a board based on JEDEC standard JESD51-5)

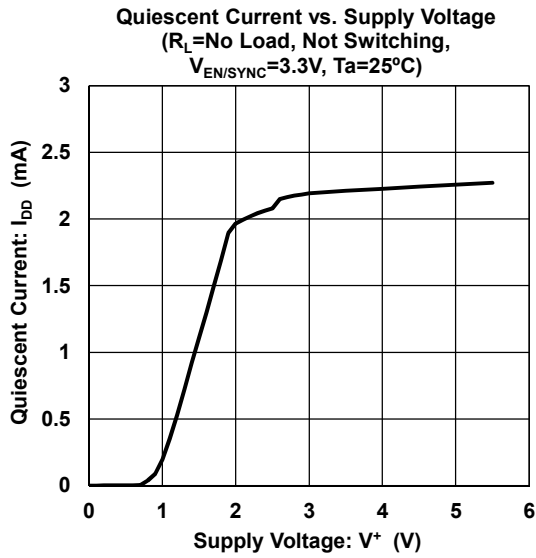
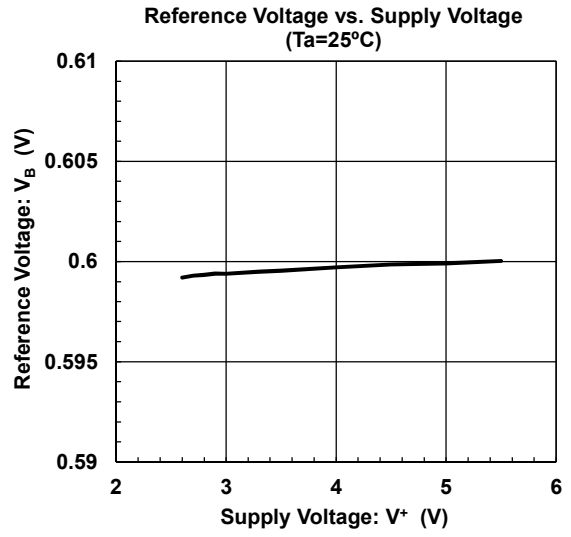
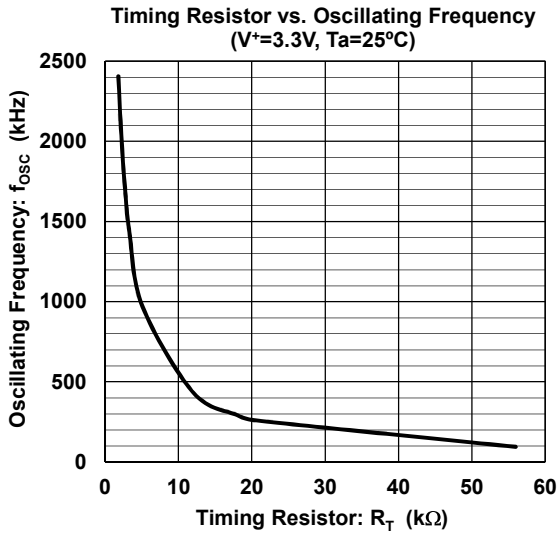
■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



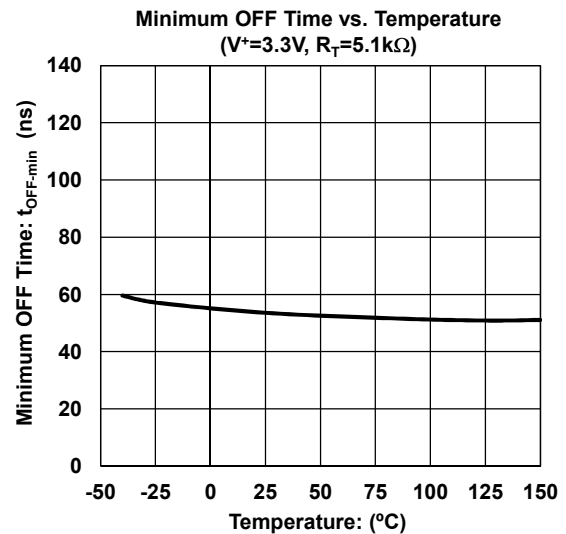
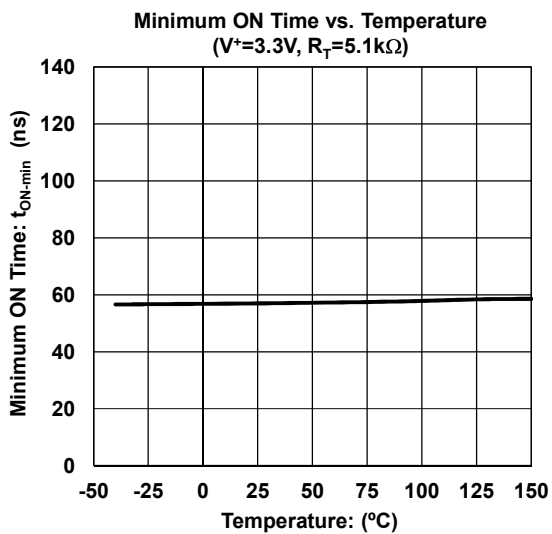
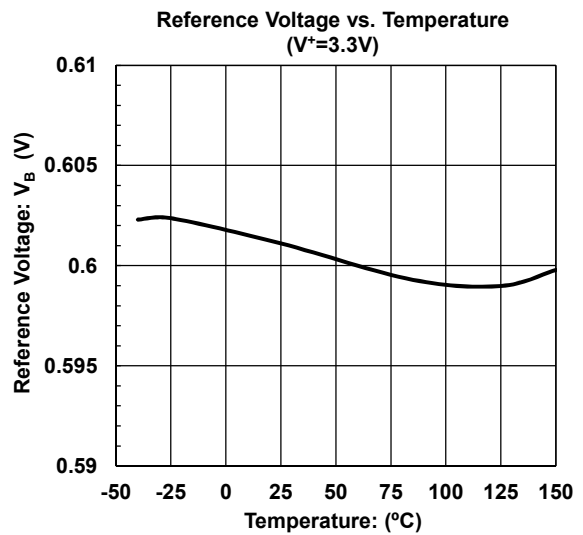
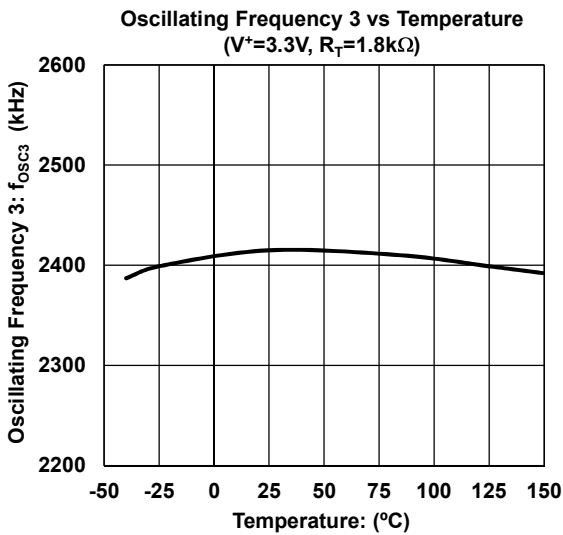
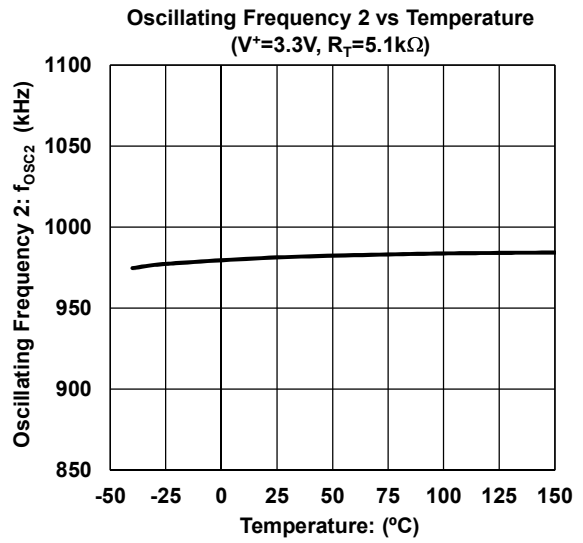
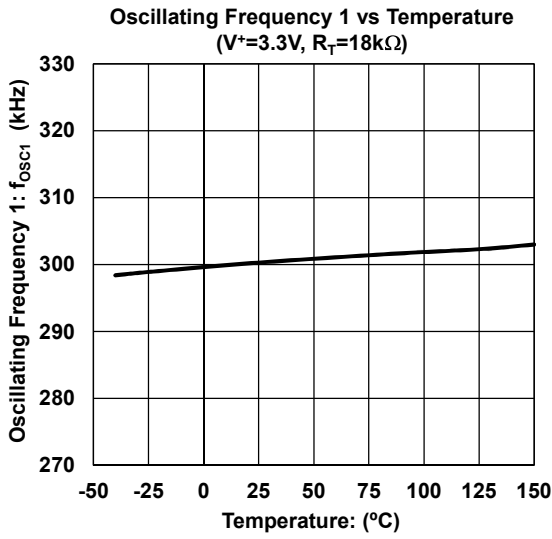
■TYPICAL APPLICATION



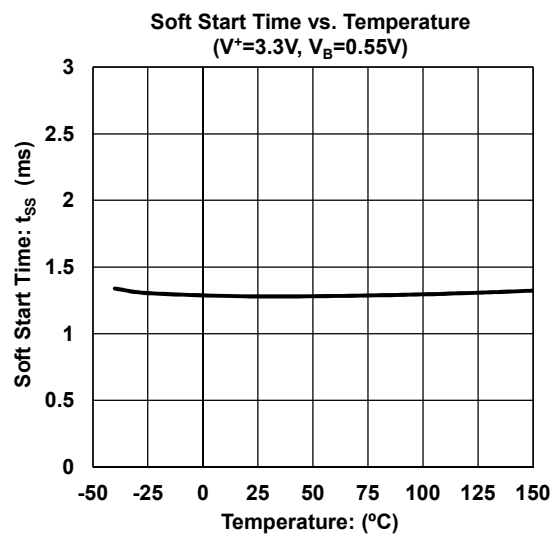
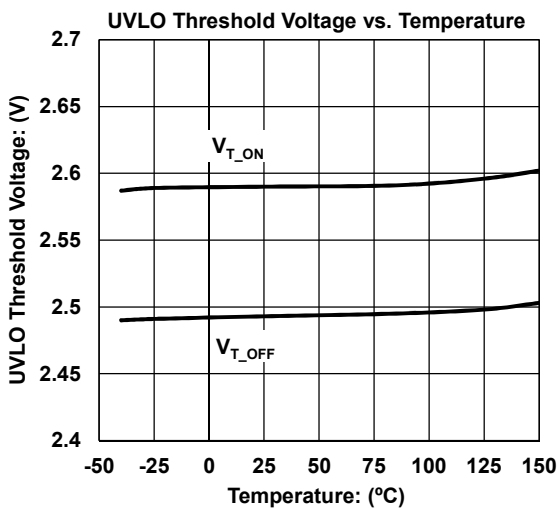
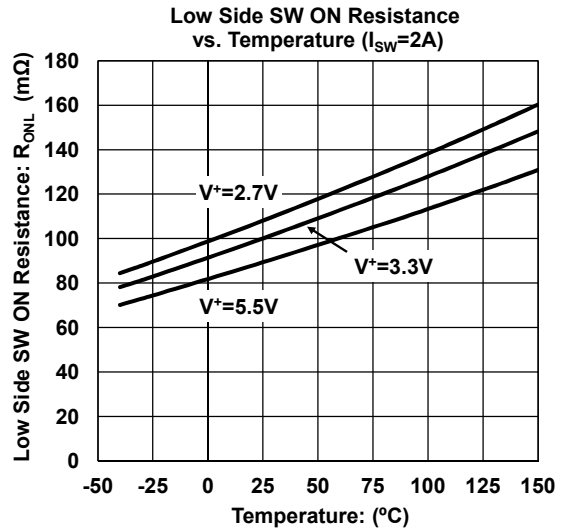
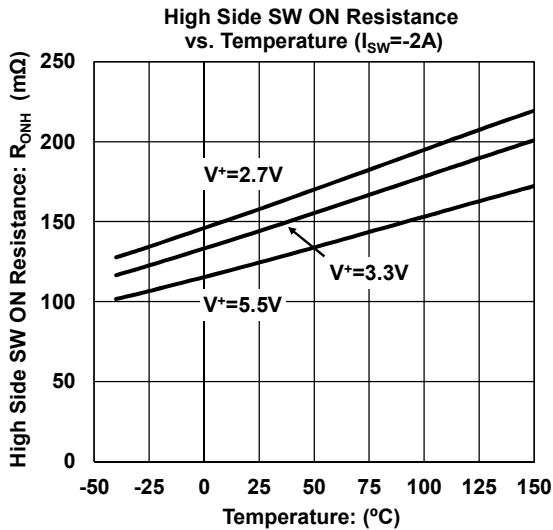
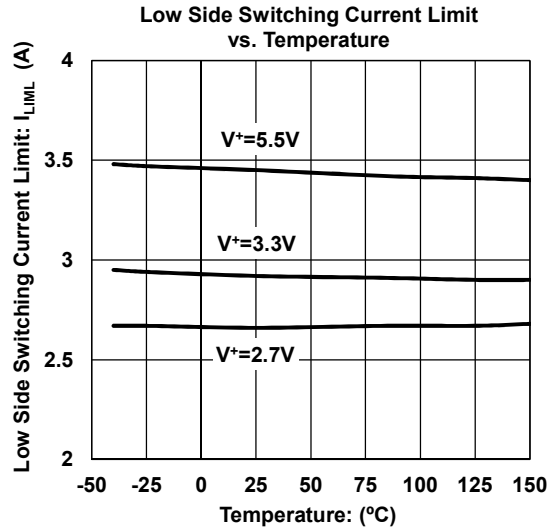
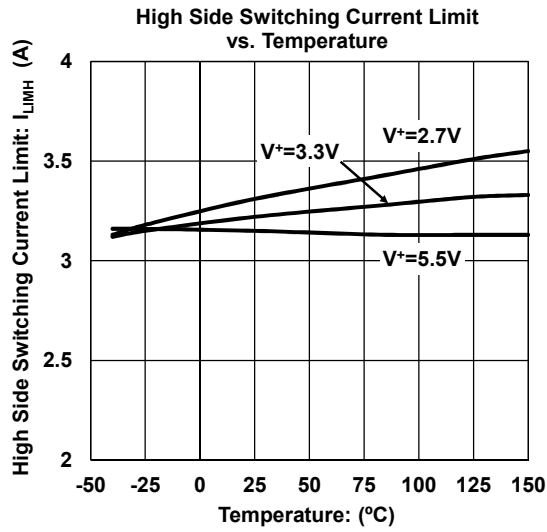
■ TYPICAL CHARACTERISTICS



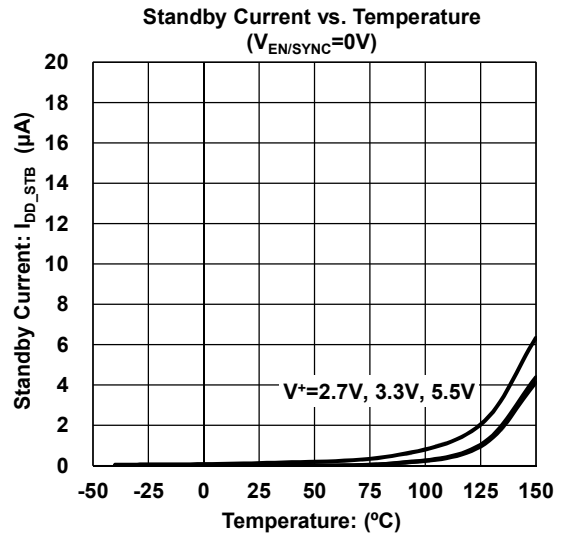
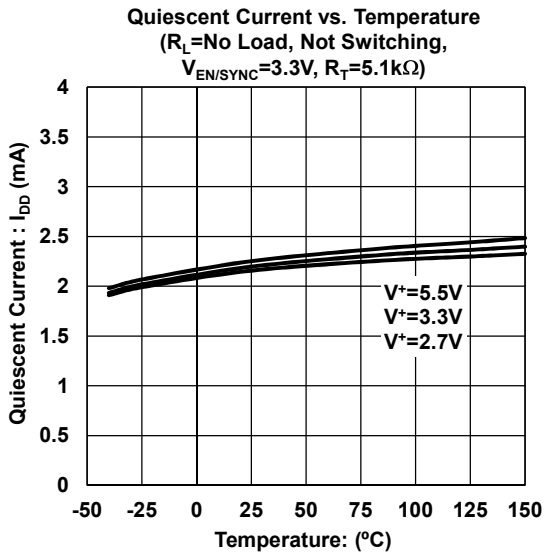
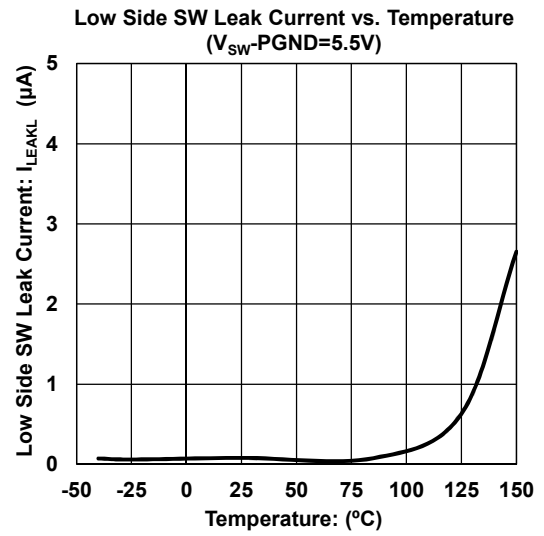
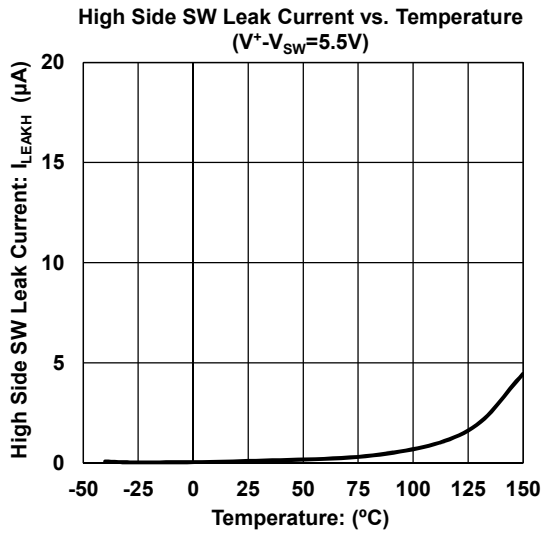
■ TYPICAL CHARACTERISTICS



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■ PIN DESCRIPTIONS

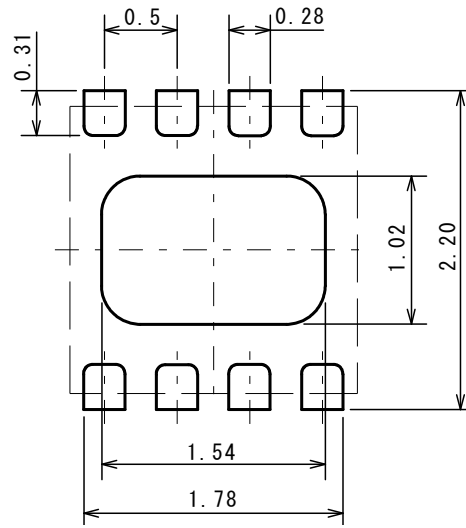
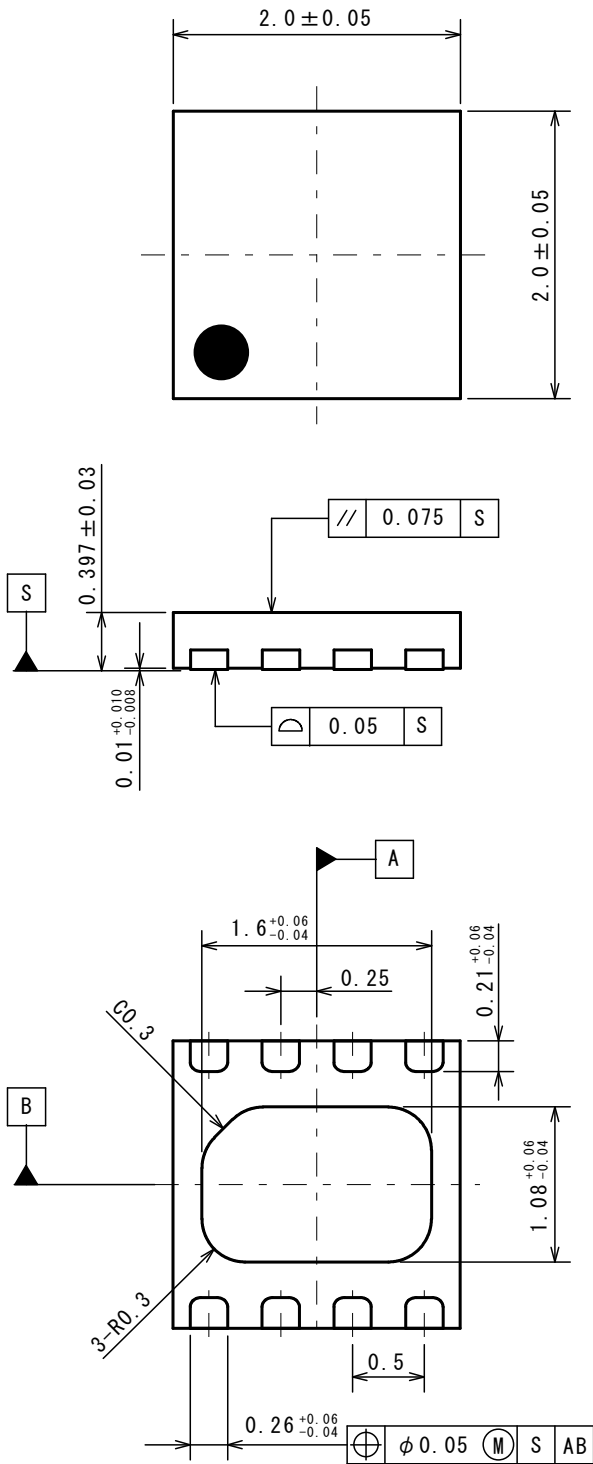
PIN NAME	PIN NUMBER	FUNCTION
V ⁺	1	Power Supply pin for Power Line. Insert a bypass capacitor close to the V ⁺ pin – the GND pin connection in order to lower high frequency impedance.
FB	2	Output Voltage Detecting pin. Connects output voltage through the resistor divider tap to this pin in order to voltage of the FB pin become 0.6V.
COMP	3	Output pin of the Error Amplifier. A resistor and capacitors for compensation are connected between the COMP pin and the GND.
RT	2	Oscillating Frequency Setting pin by Timing Resistor. Oscillating Frequency should be set between 100kHz and 2.4MHz.
GND	4	GND pin
EN/SYNC	6	Standby Control pin The EN/SYNC pin internally pulls down to GND by resistor. Normal Operation at the time of High Level. Standby Mode at the time of Low Level or OPEN. Moreover, it operates at a frequency synchronized with the external clock signal.
PGND	7	Power GND pin for Power Line
SW	8	Switch Output pin of Power MOSFET
Exposed PAD	–	Exposed PAD on backside should be connected to ground and soldered to PCB.

DFN8-U1(ESON8-U1)

■PACKAGE DIMENSIONS

■EXAMPLE OF SOLDER PADS DIMENSIONS

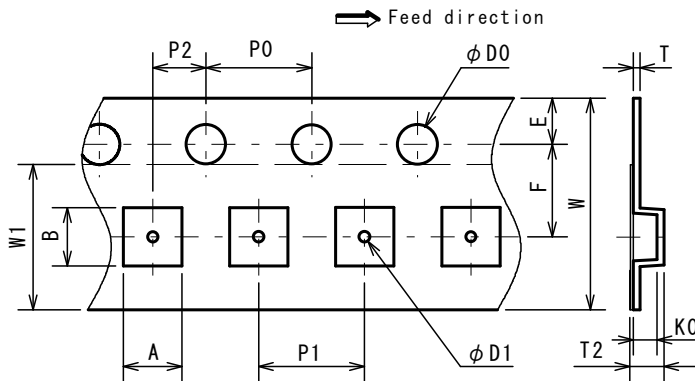
Unit: mm



Unit: mm

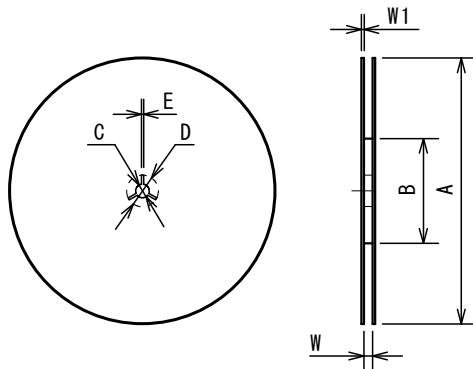
PACKING SPEC

TAPING DIMENSIONS



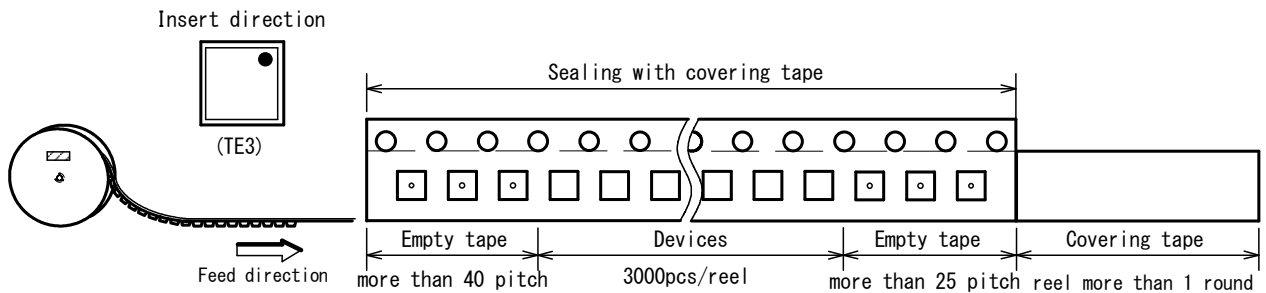
SYMBOL	DIMENSION	REMARKS
A	2.25±0.05	BOTTOM DIMENSION
B	2.25±0.05	BOTTOM DIMENSION
D0	1.5 ^{+0.1} ₀	
D1	0.5±0.1	
E	1.75±0.1	
F	3.5±0.05	
P0	4.0±0.1	
P1	4.0±0.1	
P2	2.0±0.05	
T	0.25±0.05	
T2	1.00±0.07	
K0	0.65±0.05	
W	8.0±0.2	
W1	5.5	THICKNESS 0.1max

REEL DIMENSIONS

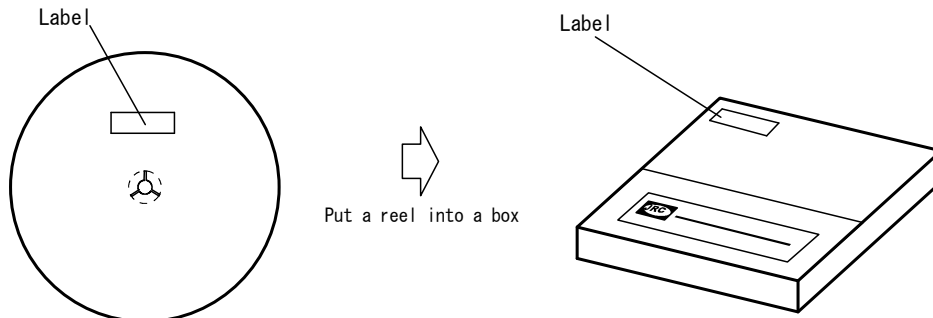


SYMBOL	DIMENSION
A	φ 180 ⁰ _{-1.5}
B	φ 60 ⁺¹ ₀
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	9 ^{+0.3} ₀
W1	1.2

TAPING STATE



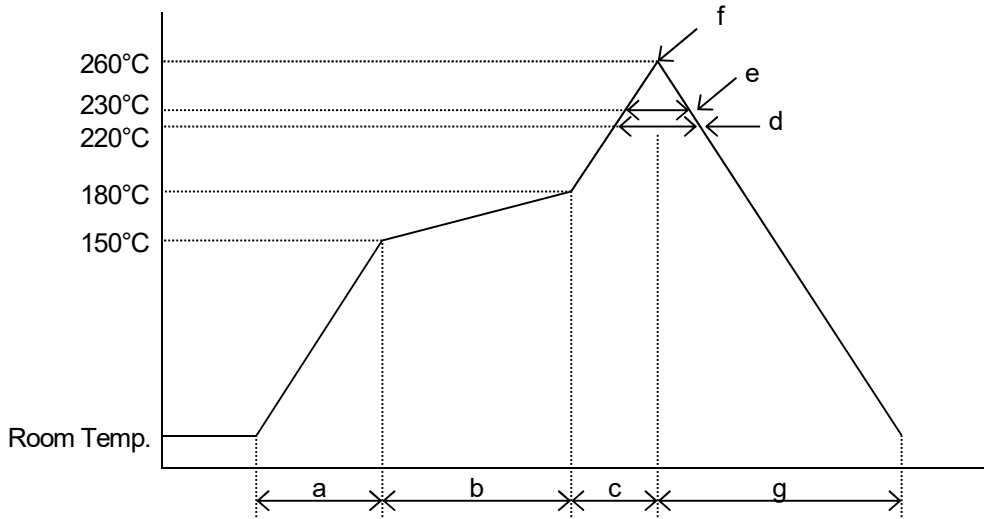
PACKING STATE



■MOUNTING METHOD

INFRARED REFLOW SOLDERING METHOD

Recommended reflow soldering procedure



- a: Temperature ramping rate : 1 to 4°C/s
- b: Pre-heating temperature : 150 to 180°C
- time : 60 to 120s
- c: Temperature ramp rate : 1 to 4°C/s
- d: 220°C or higher time : Shorter than 60s
- e: 230°C or higher time : Shorter than 40s
- f: Peak temperature : Lower than 260°C
- g: Temperature ramping rate : 1 to 6°C/s

The temperature indicates at the surface of mold package.

■REVISION HISTORY

DATE	REVISION	CHANGES
17.Mar.2020	Ver.1.0	New Release

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