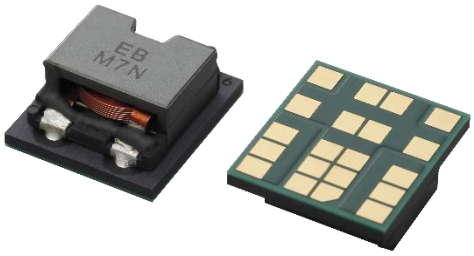
MonoBK™, High input voltage, 6A DC-DC converter

Product Description

The MYSGK02506BRSR is miniature MonoBK™ (Mono Block) non-isolated Point-of-Load (PoL) DC-DC power converters designed for embedded applications.
The module has a small form factor, measuring only 14.7 × 16.3 × 7.5 mm.
The converter operates over input voltage ranges of 9.6 to 42V with a maximum output current of 6 A.
Based on a fixed frequency synchronous buck converter switching topology, the high-power conversion efficient PoL module features settable output voltage 5 to 25 and On/Off control.
The converter also includes undervoltage lockout (UVLO), output short circuit protection.



Efficiency

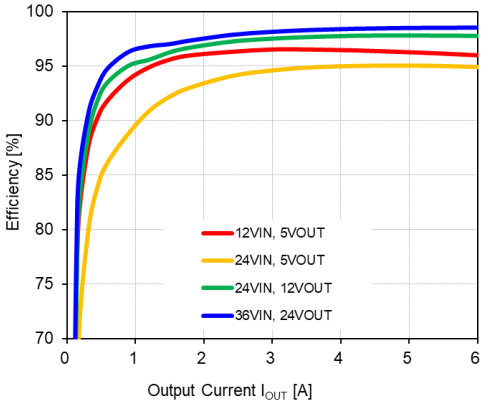


Figure 1. Efficiency Curve

Features

- Input Voltage range 9.6 to 42V (Absolute maximum input voltage:50V)
- Settable output voltage range 5 to 25V
- Up to 6A of output current
- Small surface mount package
- 14.7 x 16.3 x 7.5mm
- High efficiency: 98% (at Vo=24V)
- Outstanding thermal derating performance
- Short Circuit Protection
- Settable UVLO
- On/Off control (Positive logic)
- Operating Temperature range -40 to +85 degC

Simplified Application Circuit

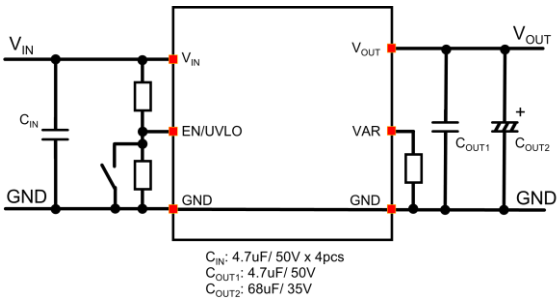


Figure 2. Simplified Circuit Diagram

Typical Applications

- Industrial PC
- Programmable Logic Controller (PLC)
- Human Machine Interface (HMI)
- Healthcare device
- 24V Input Bus Converter

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Product Description **1**
Features **1**
Typical Applications **1**
Simplified Application Circuit **1**
Performance Specifications Summary and Ordering Information **3**
Top Marking Specifications **3**
Pin Configuration **4**
Pin Function and Descriptions 4
Absolute Maximum Ratings **5**
Recommended Operating Conditions **5**
Electrical Characteristics **6**
Electrical Characteristics Table 6
Typical Performance Characteristics **8**
Thermal Deratings (Reference Data) 14
Test Circuit **15**
Detailed Description **16**
Input Under-Voltage Shutdown and Start-Up Threshold 16
Start-Up Time 17
Output Noise 17
Minimum Output Loading Requirements 17
Thermal Shutdown 17
Temperature Derating Curves 18
Output Short Circuit Condition 18
Remote On/Off Control 18
Output Capacitive Load 19
Output Voltage Adjustment 19
Application Information **20**
Application Circuit & Part List 20
Example of Pattern Layout (Top View) 21
Application Board Example 21
Component Selection **22**
Input Fuse 22
Recommended Input Filtering 22
Recommended Output Filtering 22
Packaging Information **23**
Package Drawing 23
Recommended Board Land Pattern **24**
Tape and Reel Information **25**
Tape Dimensions 25
Reel Dimensions 25
Tape Specifications 26
Soldering Guidelines **27**
Recommended Lead-free Solder Reflow Profile 27
Pb-free Solder Processes 27
Dry Pack Information 27
Revision History **28**
Notices **29**
Scope 29
CAUTION **29**
Limitation of Applications 29
Storage 30
Fail-Safe Function 30
Note **30**
Product Specification 30
Contact Form 30
Disclaimers **31**
Patent Statement 31
Copyright and Trademark 31

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Performance Specifications Summary and Ordering Information

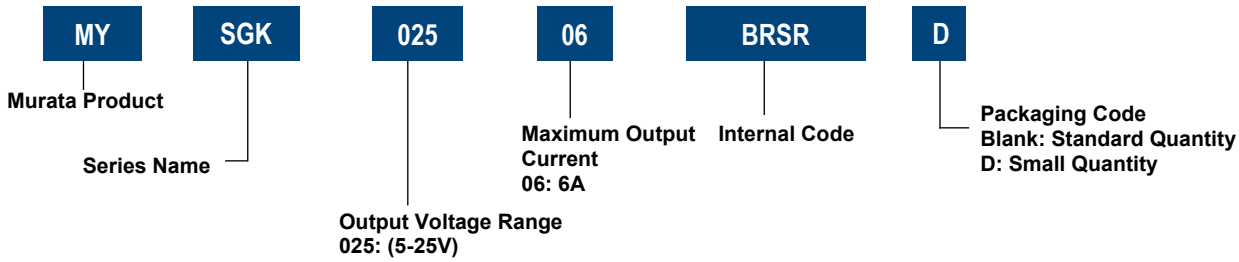
Table 1. Performance Specifications Summary and Ordering Information

PART NUMBER	OUTPUT		INPUT			Efficiency [%]	EN	Package [mm]	MSL	Quantity/ Packing
	V_{OUT} [V]	I_{OUT} (max.) [A]	V_{IN} (typ.) [V]	Range [V]	I_{IN} full load [A]					
MYSGK02506BRSR	5.0-25.0	6	36	9.6-42.0	4.1	98	Yes (Positive)	14.7 x 16.3 x 7.5 LGA	3	150 units/T&R
NRND MYSGK02506BRSRD	5.0-25.0	6	36	9.6-42.0	4.1	98	Yes (Positive)	14.7 x 16.3 x 7.5 LGA	3	50 units/T&R

1. All Specifications are typical at 25degC, V_{IN} = typical 36V, V_{OUT} = typical +24V, full load, external capacitors and natural convection unless otherwise indicated. The model is tested and specified with external 4.7uF ceramic and 68uF conductive polymer hybrid aluminum electrolytic as output capacitor. Input capacitors are 4.7uFx 4 ceramic and plenty electrolytic capacitors. See detailed specifications. Input and output capacitors are necessary for our test equipment.
2. Use adequate ground plane and copper thickness adjacent to the converter.

Table 2. Part Numbering

PART NUMBER STRUCTURE



Top Marking Specifications

Because of the small size of the product, the product marking contains a character-reduced code to indicate the model number and manufacturing date code. Not all items on the marking are always used. Please note that the marking differs from the product photograph. Here is the layout of the marking.

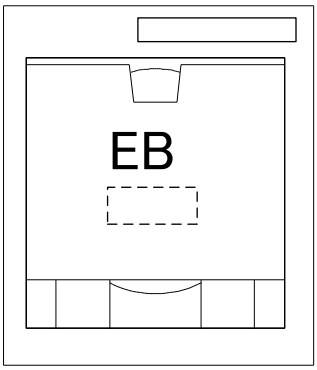


Figure 3. Top Marking Specification

Table 3. Code Description

CODE	DESCRIPTION
EB	Product code
	Internal manufacturing code 1
	Internal manufacturing code 2

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Pin Configuration

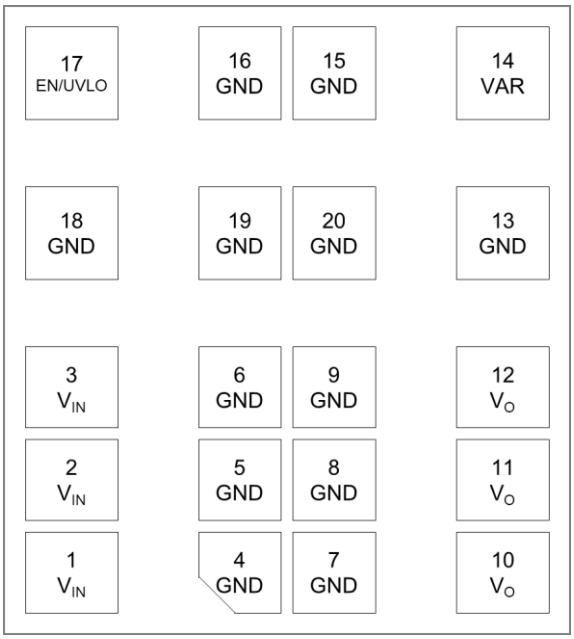

Figure 1. Module Terminals (Top View)

Pin Function and Descriptions

Table 4. Pin Function and Descriptions

PIN No.	NAME	FUNCTION and DESCRIPTION
1, 2, 3	V_{IN}	Power input voltage.
4, 5, 6, 7, 8, 9, 13, 15, 16, 18, 19, 20	GND	Ground pins. Connect to the GND plane.
10, 11, 12	V_{OUT}	Power output voltage.
14	VAR	Output voltage setting pin. The resistor must be located between GND to set output voltage correctly.
17	EN/UVLO	The pin can enable or disable the converter and be used to set the Shutdown and Startup Threshold with some resistors.

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Absolute Maximum Ratings (1)(2)

Table 5. Absolute Maximum Ratings

PARAMETER	MIN	MAX	UNITS
V_{IN}	-0.3	50	V
EN/UVLO	-0.3	8.8	V
VAR	-0.3	3.3	V
V_{OUT}	4.82	25.88	V
Output Current (I_{OUT})	0	6	A
Storage Temperature (T_{stg})	-40	125	degC
Soldering / Reflow Temperature (3)	-	250	degC
Maximum Number of Reflows Allowed	-	1	
ESD Tolerance, HBM	-	±1000	V

Notes:
(1) The application of any stress beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device, and exposure at any of these ratings for extended periods may reduce the reliability of the device. The above "Absolute Maximum Ratings" are stress ratings only; the notation of these conditions does not imply functional operation of the device at these or any other conditions that fall outside of the range identified by the operational sections of this specification.
(2) All Voltages are with respect to GND plane.
(3) Recommended Reflow profile is written in "Soldering Guidelines".

Recommended Operating Conditions (1)

Table 6. Recommended Operating Conditions

PARAMETER	MIN	MAX	UNITS
Input Voltage (V_{IN})	9.6	42	V
Ambient Temperature (T_A) (2)	-40	85	degC
Output Current (I_{OUT})	0	6	A

Notes:
(1) Device should not be operated outside the operating conditions. The reliability is tested at the maximum voltage of the recommended operating condition. Above of recommended operation may reduce reliability of the device.
(2) See the temperature derating curves in the thermal deratings. However, avoid condensate.

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Electrical Characteristics (1)

Electrical Characteristics Table

MYSGK02506BRSR: V_{IN} = 36V, I_{OUT} = 6A, T_A = 25degC, unless otherwise noted

Table 7. Electrical Characteristics Table

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT SUPPLY						
Input Voltage	V_{IN}	Vo x 1.17 < V_{IN}	9.6	36	42	V
V_{IN} Under Voltage Lockout Threshold, V_{IN} Rising	V_{IN_UVH}	I_{OUT} = 0A R1 = OPEN, R2 = OPEN	-	8.82	-	V
V_{IN} Under Voltage Lockout Threshold, V_{IN} Falling (11)	V_{IN_UVL}	I_{OUT} = 0A R1 = OPEN, R2 = OPEN	-	4.42	-	V
V_{IN} Current Supply, Full load	I_{IN_FULL}	V_{IN} = 36V, V_{OUT} = 24V, I_{OUT} = 6A	-	4.1	-	A
V_{IN} Current Supply, Switching	I_{IN_SW}	V_{IN} = 36V, I_{OUT} = 0A	-	22	-	mA
V_{IN} Current Supply, Shutdown	I_{IN_SD}	V_{IN} = 42V, EN = 0V	-	-	1	mA
ENABLE INPUT (EN/UVLO PIN) (3)						
Threshold High	V_{TH_ENH}		1.0	-	8.0	V
				OPEN		
Threshold Low	V_{TH_ENL}		-0.3	-	0.1	V
EN/UVLO Pin Input Current	I_{EN}	see Figure 8				
CONVERTER						
Efficiency	EFF	V_{IN} = 36V, V_{OUT} = 24V, I_{OUT} = 6A	-	98.0	-	%
Fixed Switching Frequency	F_{SW}		-	380	-	kHz
Start-up Time (Vin ON)	T_{START_UP}	5% to 90% of V_{OUT}	-	24	-	ms
Start-up Time (Enable ON)		5% to 90% of V_{OUT}	-	24	-	ms
OUTPUT						
Output Current (2)	I_{OUT}	36V < V_{IN} and 15.53 < V_{OUT}	0	-	5	A
		V_{IN} ≤ 36V or V_{OUT} ≤ 15.53V	0	-	6	A
Output Voltage (7)	V_{OUT}		5	-	25	V
Total Output Voltage Accuracy (7)	V_{OUT_TACC}	R_{VAR} = 0	24.12	25	25.88	V
		R_{VAR} = OPEN	4.82	5	5.18	V
Line Regulation (11)	V_{OUT_LINE}	V_{IN} = min. to max.	-	±2.0	-	%
Load Regulation (11)	V_{OUT_LOAD}	I_{OUT} = min. to max.	-	±2.0	-	%
Ripple and Noise (20MHz bandwidth) (5)	V_{RIP}	V_{IN} = 36V, V_{OUT} = 24V, I_{OUT} = 6A	-	50	-	mVp-p
External Output Capacitance Range (8)	C_{OUT}		60	-	150	uF
PROTECTION						
Short Circuit Protection	I_{OCPTH}	HICCUP operating (4)	Non-latching			
Thermal Protection (6)(10)	T_{OTPTH}	Shutdown operating	-	165	-	degC
Thermal Protection Hysteresis (6)(10)	T_{OTPHYS}		-	30	-	degC
Pre-bias Start-up			The converter has a circuit to prevent current from being pulled out of the output during startup in case the output is pre-biased.			
ENVIRONMENTAL						
Moisture Sensitivity Level			3			

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Notes

(1) Specifications are typical at 25degC, V_{IN} = typical +36V, V_{OUT} = typical +24V, full load, external capacitors and natural convection unless otherwise indicated.
The model is tested and specified with external 4.7uF x 1 ceramic and 68uF x 1 electrolytic output capacitors and 4.7uF x 4 ceramic and plenty of electrolytic external input capacitors. All capacitors are low ESR types. These capacitors are necessary to accommodate our test equipment and may not be required to achieve specified performance in your applications. However, Murata recommends installation of these capacitors.

(2) Note that Maximum Power Derating curves indicate an average current at typical input voltage. At higher temperatures and/or no airflow, the converter will tolerate brief full current outputs if the total RMS current over time does not exceed the Derating curve.

(3) The ON/OFF Control Input should use either a switch or an open collector/open drain transistor referenced to GND. A logic gate may also be used by applying appropriate external voltages which do not exceed absolute maximum ratings.

(4) “Hiccup” overcurrent operation repeatedly attempts to restart the converter with a brief, full-current output. If the overcurrent condition still exists, the restart current will be removed and then tried again. This short current pulse prevents overheating and damaging the converter. Once the fault is removed, the converter immediately recovers normal operation.

(5) Output noise may be further reduced by adding an external filter. At zero output current, the output may contain low frequency components which exceed the ripple specification. The output may be operated indefinitely with no load.

(6) Thermal Protection/Shutdown temperature is measured with the semiconductor in the converter.

(7) Do not exceed maximum power specifications when adjusting the output trim.

(8) The maximum output capacitive loads depend on the Equivalent Series Resistance (ESR) of the external output capacitor and, to a lesser extent, the distance and series impedance to the load. Larger caps will reduce output noise but may change the transient response. Newer ceramic caps with very low ESR may require lower capacitor values to avoid instability. Thoroughly test your capacitors in the application.

(9) Do not allow the input voltage to degrade lower than the input undervoltage shutdown voltage at all times. Otherwise, you risk having the converter turn off. The Under-voltage shutdown is not latching and will attempt to recover when the input is brought back into normal operating range.

(10) When the temperature decreases below the turn-in threshold, the converter will automatically restart.

(11) Ensured by design. Not production tested.

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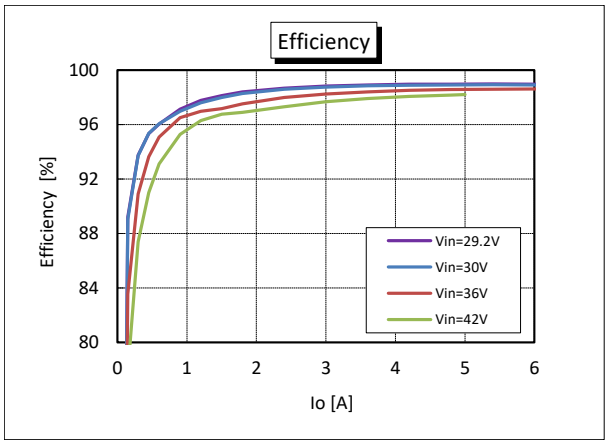
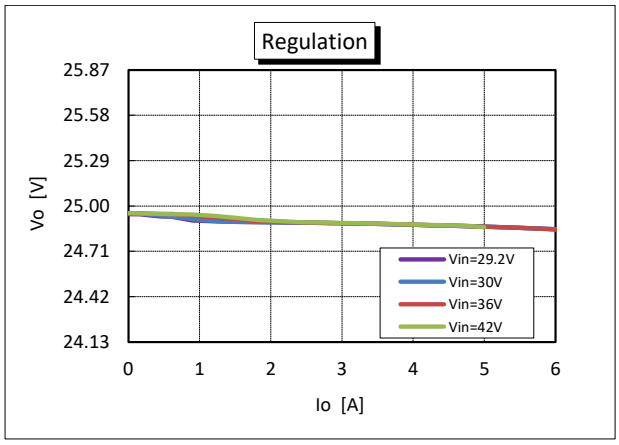
Typical Performance Characteristics

In this document, all characteristics are measured with the test board. The schematic and part list of the board are shown in Figure 7 and Table 8. The board is under T_A = 25degC with no airflow unless otherwise noted.

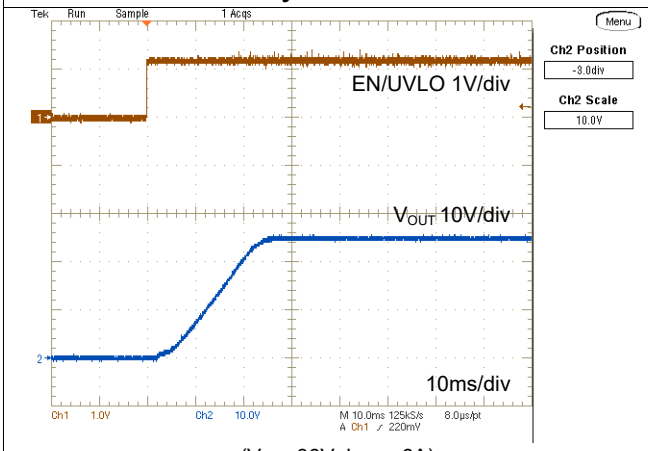
MYSGK02506BRSR V_{OUT} = 25V



Efficiency vs. Load Current

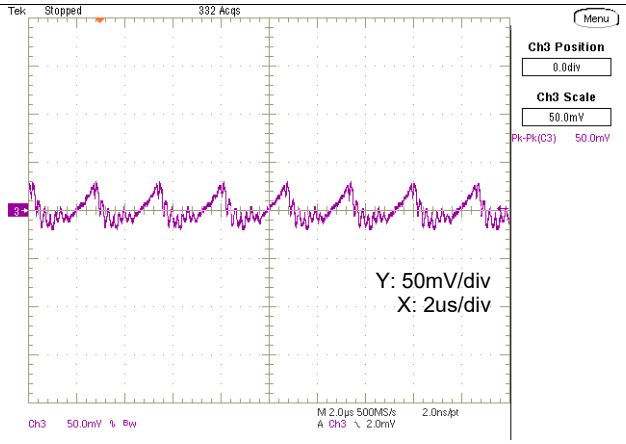


V_{OUT} vs. Load Current



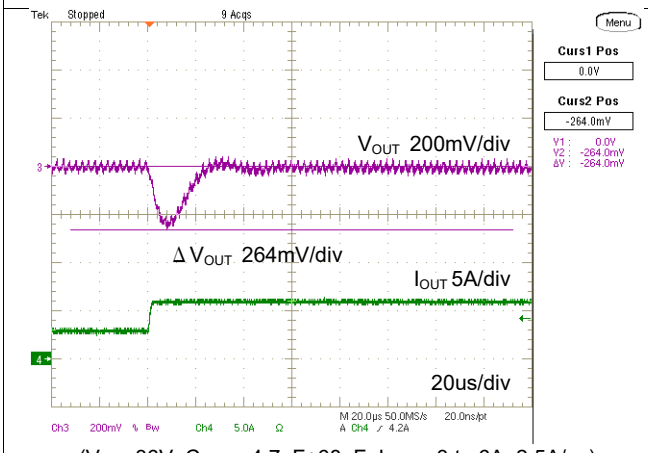
(V_{IN} = 36V, I_{OUT} = 6A)

On/Off Enable Waveform



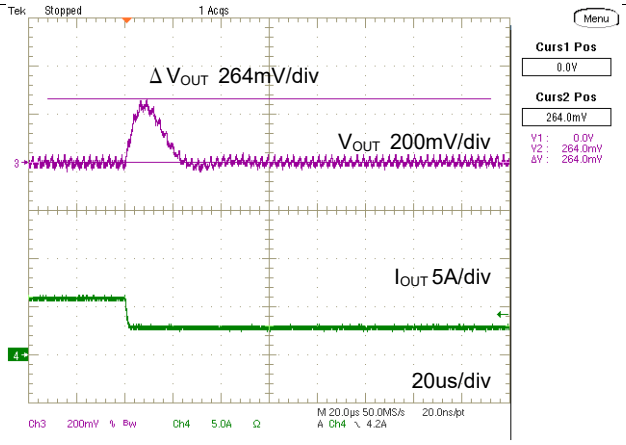
(V_{IN} = 36V, I_{OUT} = 6A, C_{OUT} = 4.7uF+68uF, ScopeBW = 20MHz)

Output Ripple and Noise



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 3 to 6A, 2.5A/us)

Step Load Transient Response



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 6 to 3.5A, 2.5A/us)

Step Load Transient Response

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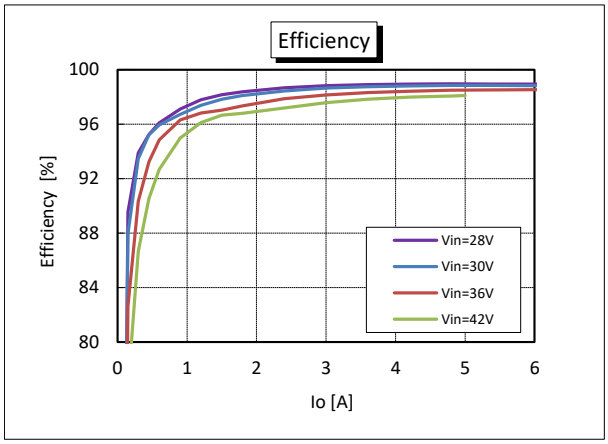
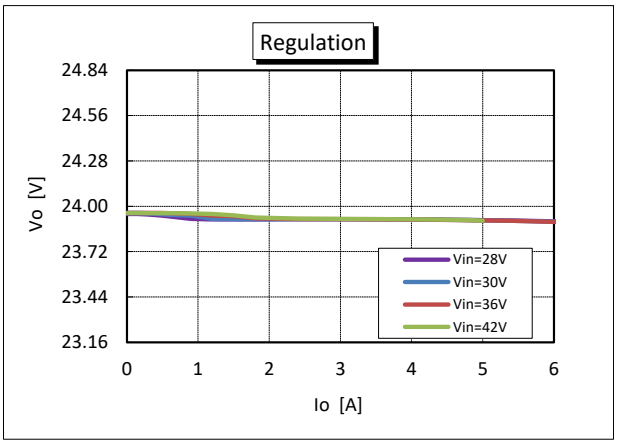
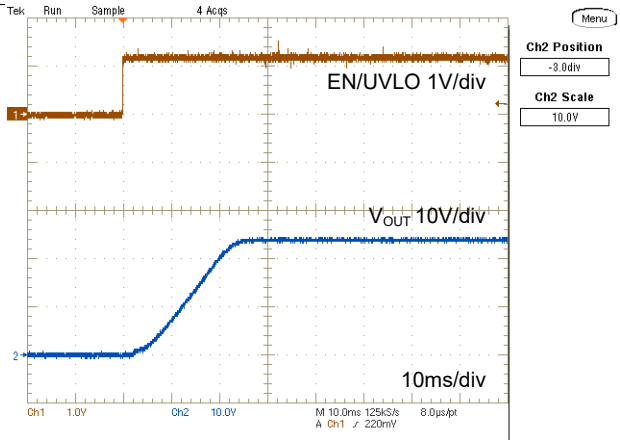
MYSGK02506BRSR V_{OUT} = 24V



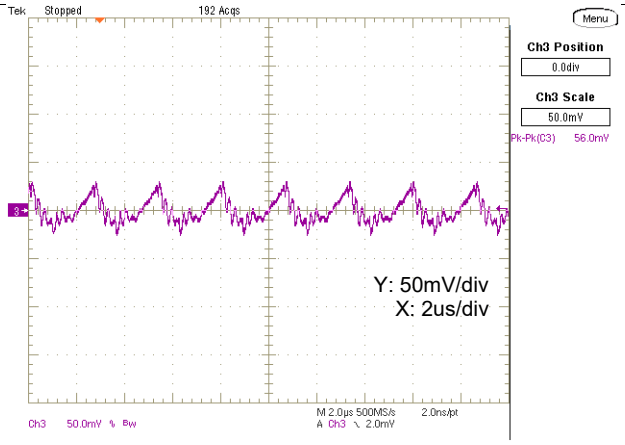


Efficiency vs. Load Current



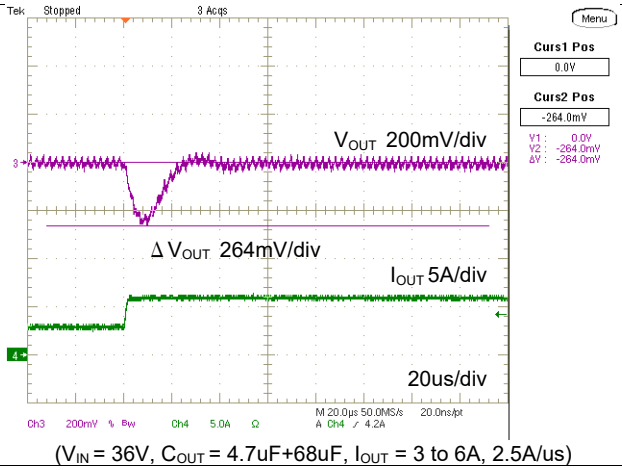
(V_{IN} = 36V, I_{OUT} = 6A)

V_{OUT} vs. Load Current



(V_{IN} = 36V, I_{OUT} = 6A, C_{OUT} = 47uF+68uF, ScopeBW = 20MHz)

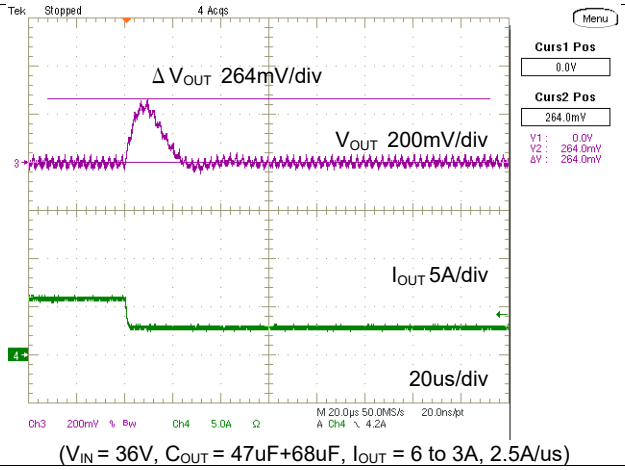
On/Off Enable Waveform



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 3 to 6A, 2.5A/us)

Step Load Transient Response

Output Ripple and Noise



(V_{IN} = 36V, C_{OUT} = 47uF+68uF, I_{OUT} = 6 to 3A, 2.5A/us)

Step Load Transient Response

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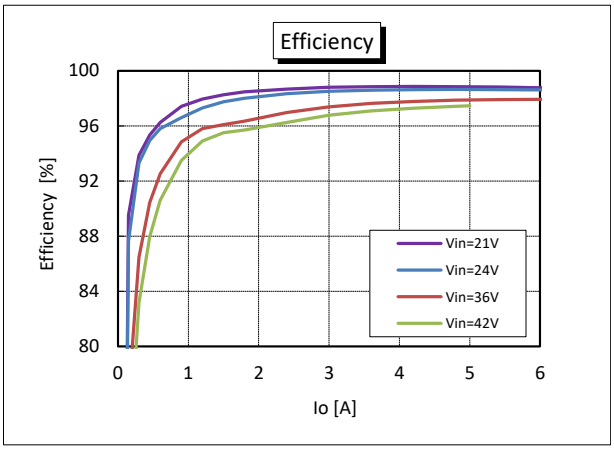
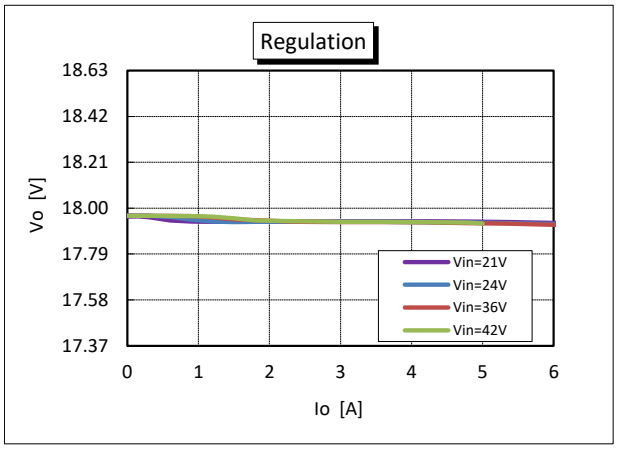
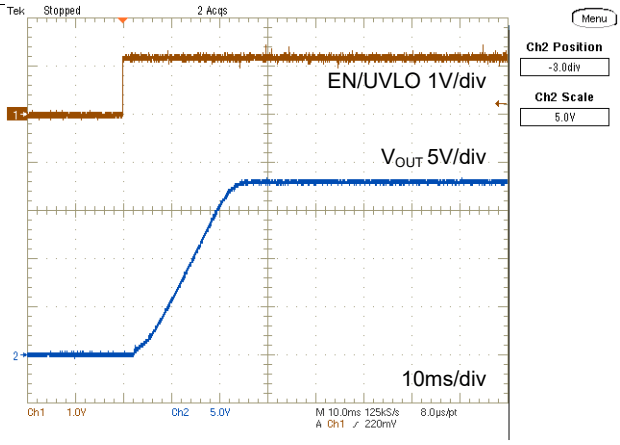
MYSGK02506BRSR V_{OUT} = 18V



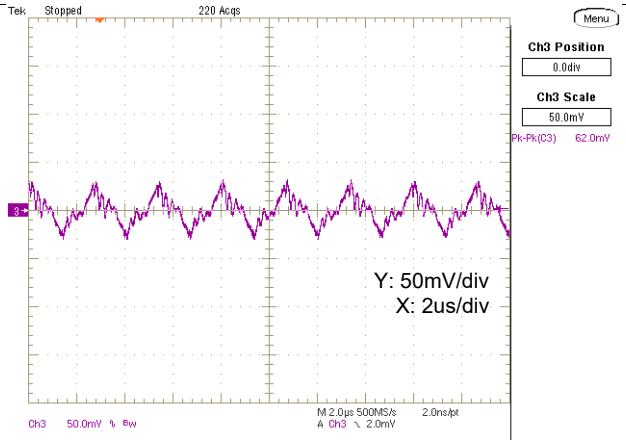


Efficiency vs. Load Current



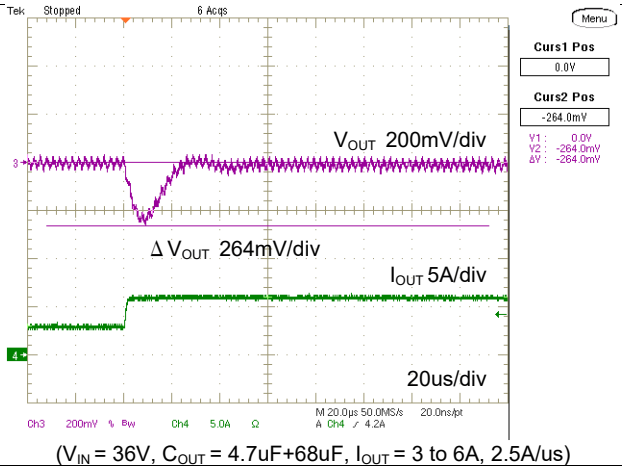
(V_{IN} = 36V, I_{OUT} = 6A)

V_{OUT} vs. Load Current



(V_{IN} = 36V, I_{OUT} = 6A, C_{OUT} = 4.7uF+68uF, ScopeBW = 20MHz)

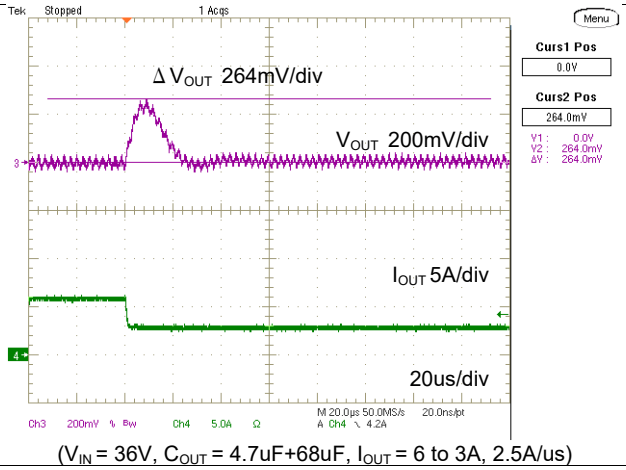
On/Off Enable Waveform



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 3 to 6A, 2.5A/us)

Step Load Transient Response

Output Ripple and Noise



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 6 to 3A, 2.5A/us)

Step Load Transient Response

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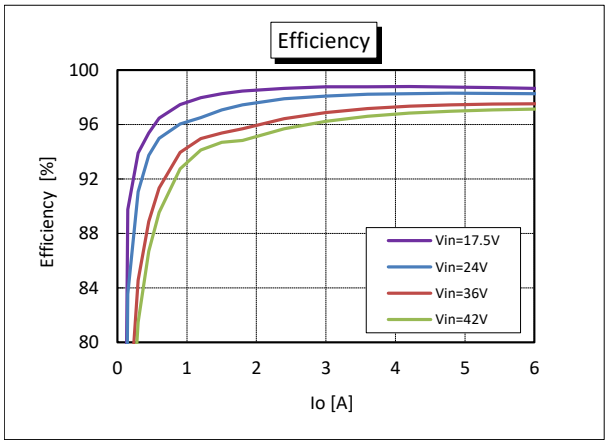
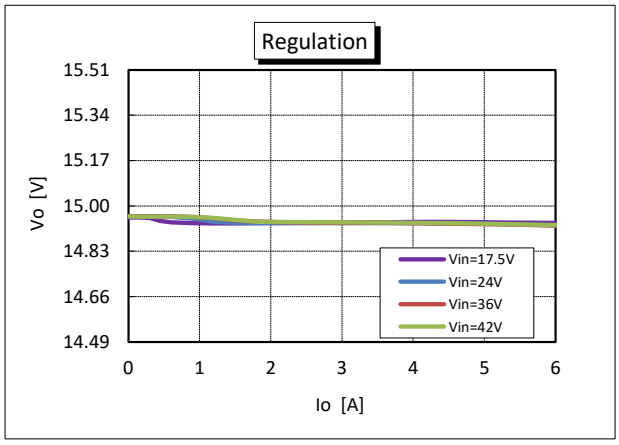
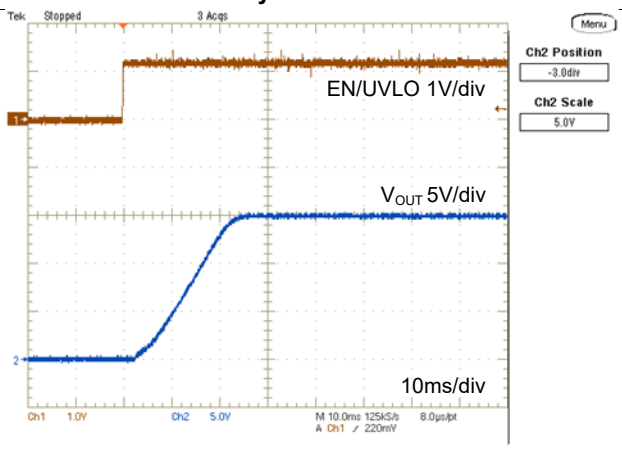
MYSGK02506BRSR V_{OUT} = 15V



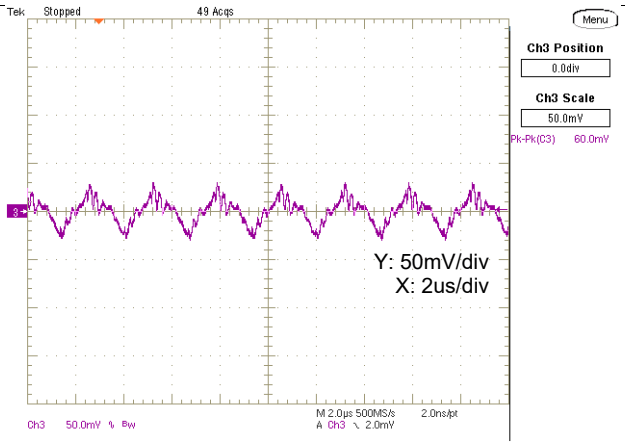


Efficiency vs. Load Current



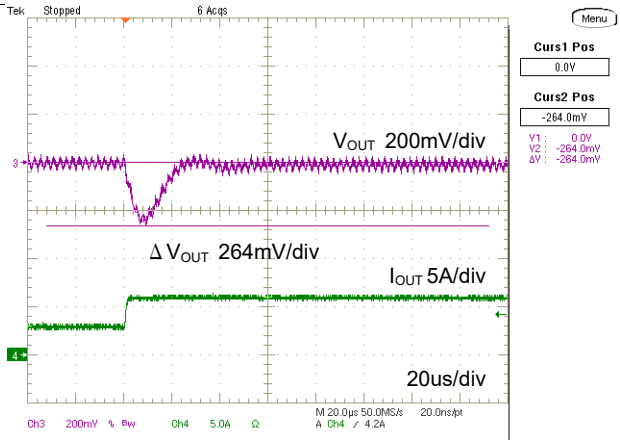
(V_{IN} = 36V, I_{OUT} = 6A)

V_{OUT} vs. Load Current



(V_{IN} = 36V, I_{OUT} = 6A, C_{OUT} = 4.7uF+68uF, ScopeBW = 20MHz)

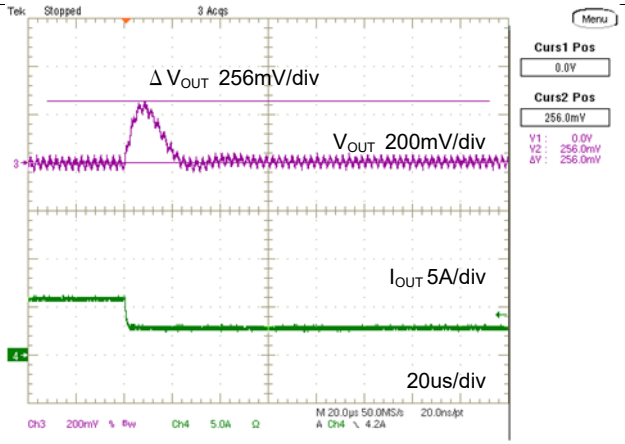
On/Off Enable Waveform



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 3 to 6A, 2.5A/us)

Step Load Transient Response

Output Ripple and Noise



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 6 to 3A, 2.5A/us)

Step Load Transient Response

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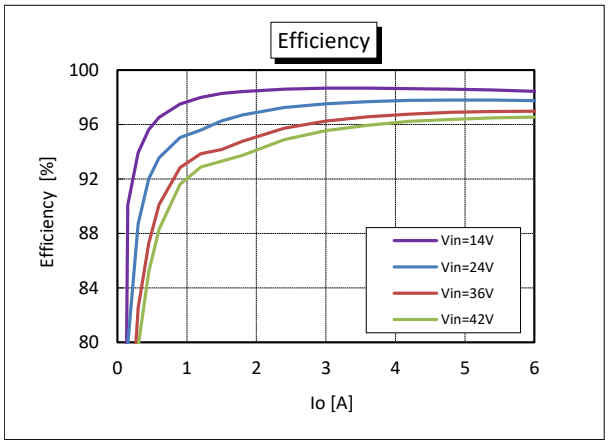
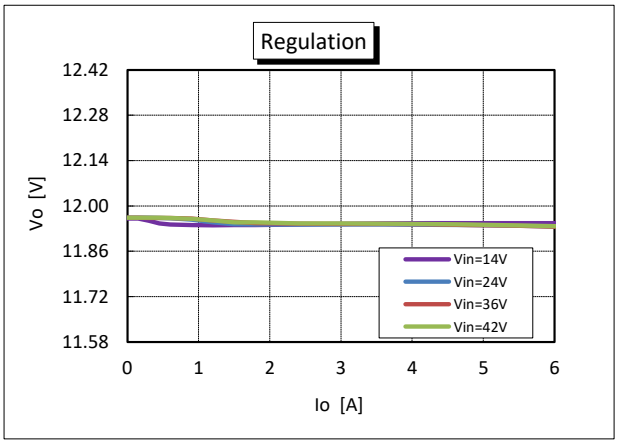
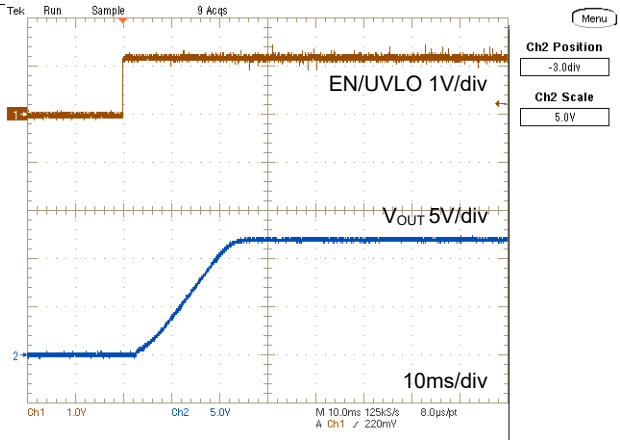
MYSGK02506BRSR V_{OUT} = 12V



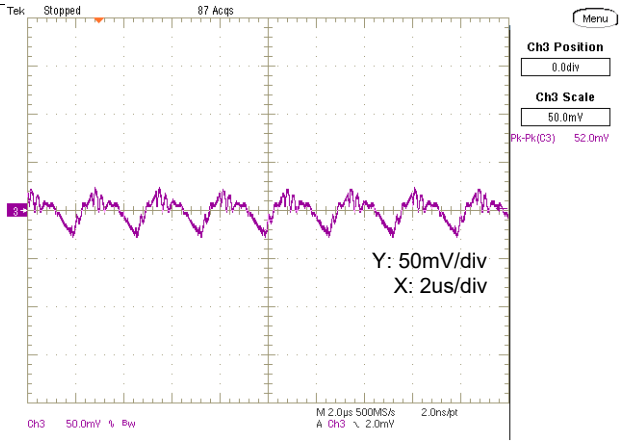


Efficiency vs. Load Current



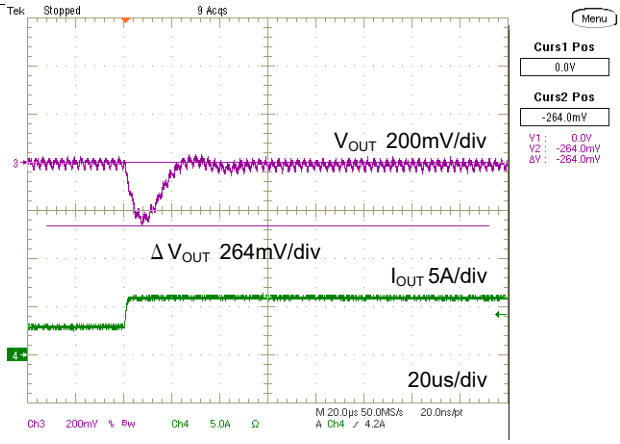
(V_{IN} = 36V, I_{OUT} = 6A)

V_{OUT} vs. Load Current



(V_{IN} = 36V, I_{OUT} = 6A, C_{OUT} = 4.7uF+68uF, ScopeBW = 20MHz)

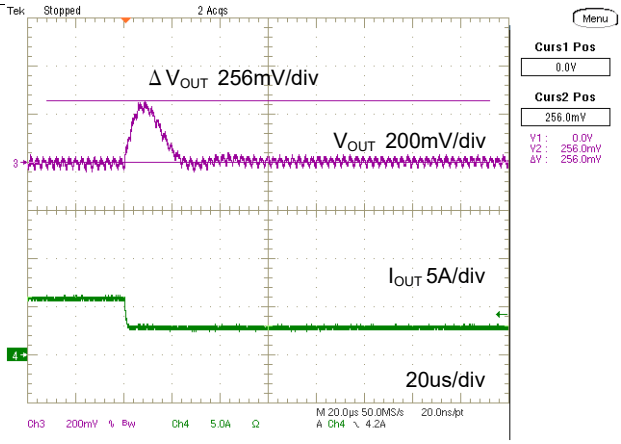
On/Off Enable Waveform



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 3 to 6A, 2.5A/us)

Step Load Transient Response

Output Ripple and Noise



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 6 to 3A, 2.5A/us)

Step Load Transient Response

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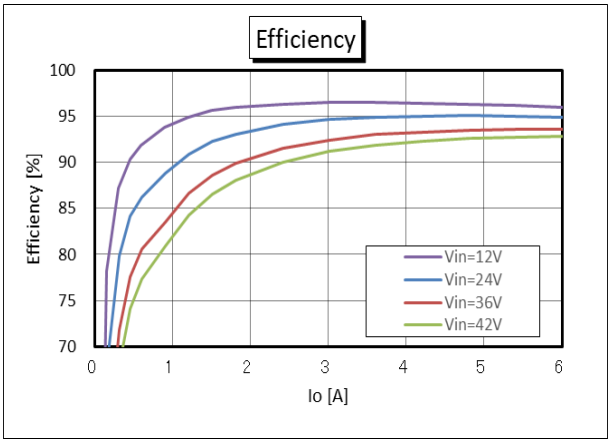
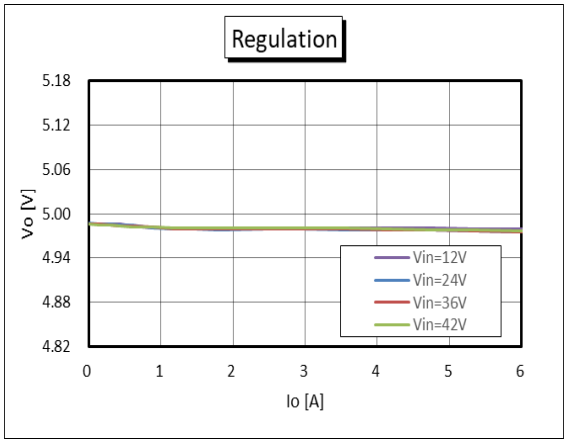
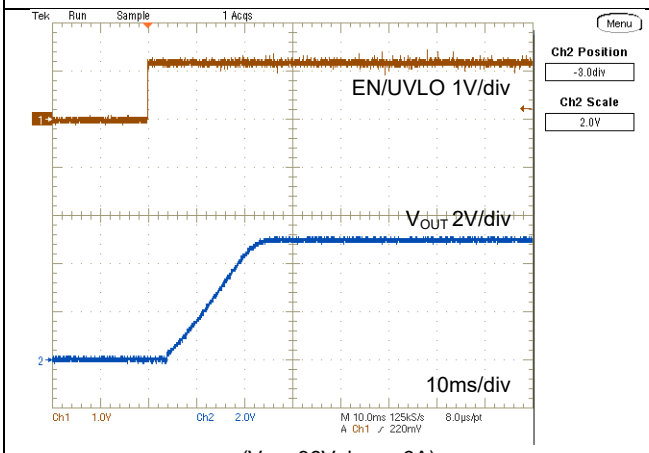
MYSGK02506BRSR V_{OUT} = 5V



Efficiency vs. Load Current

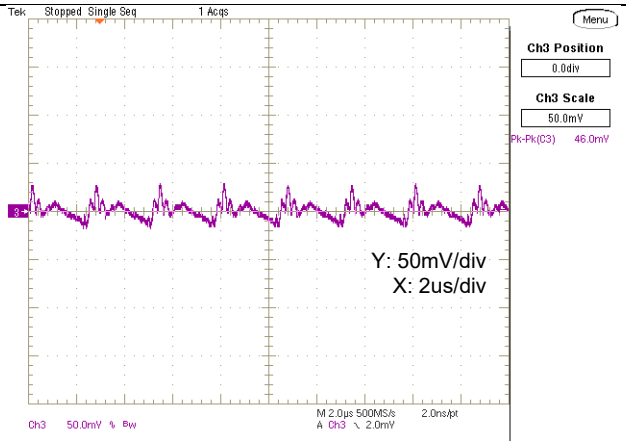


V_{OUT} vs. Load Current



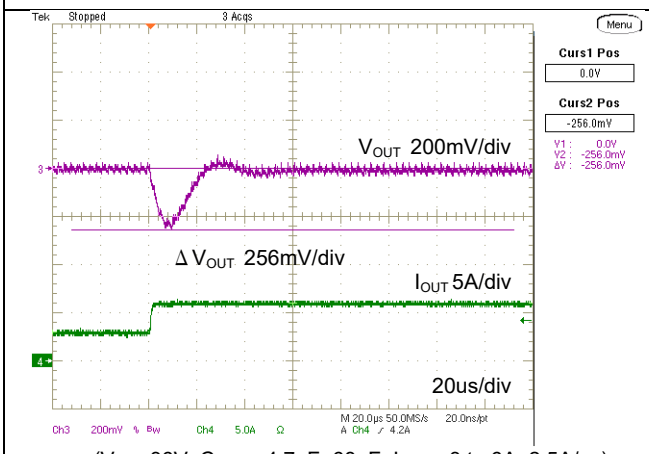
(V_{IN} = 36V, I_{OUT} = 6A)

On/Off Enable Waveform



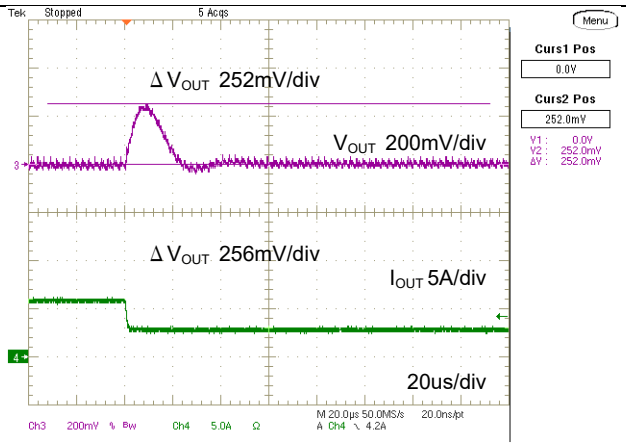
(V_{IN} = 36V, I_{OUT} = 6A, C_{OUT} = 4.7uF+68uF, ScopeBW = 20MHz)

Output Ripple and Noise



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 3 to 6A, 2.5A/us)

Step Load Transient Response



(V_{IN} = 36V, C_{OUT} = 4.7uF+68uF, I_{OUT} = 6 to 3A, 2.5A/us)

Step Load Transient Response

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Thermal Deratings (Reference Data)

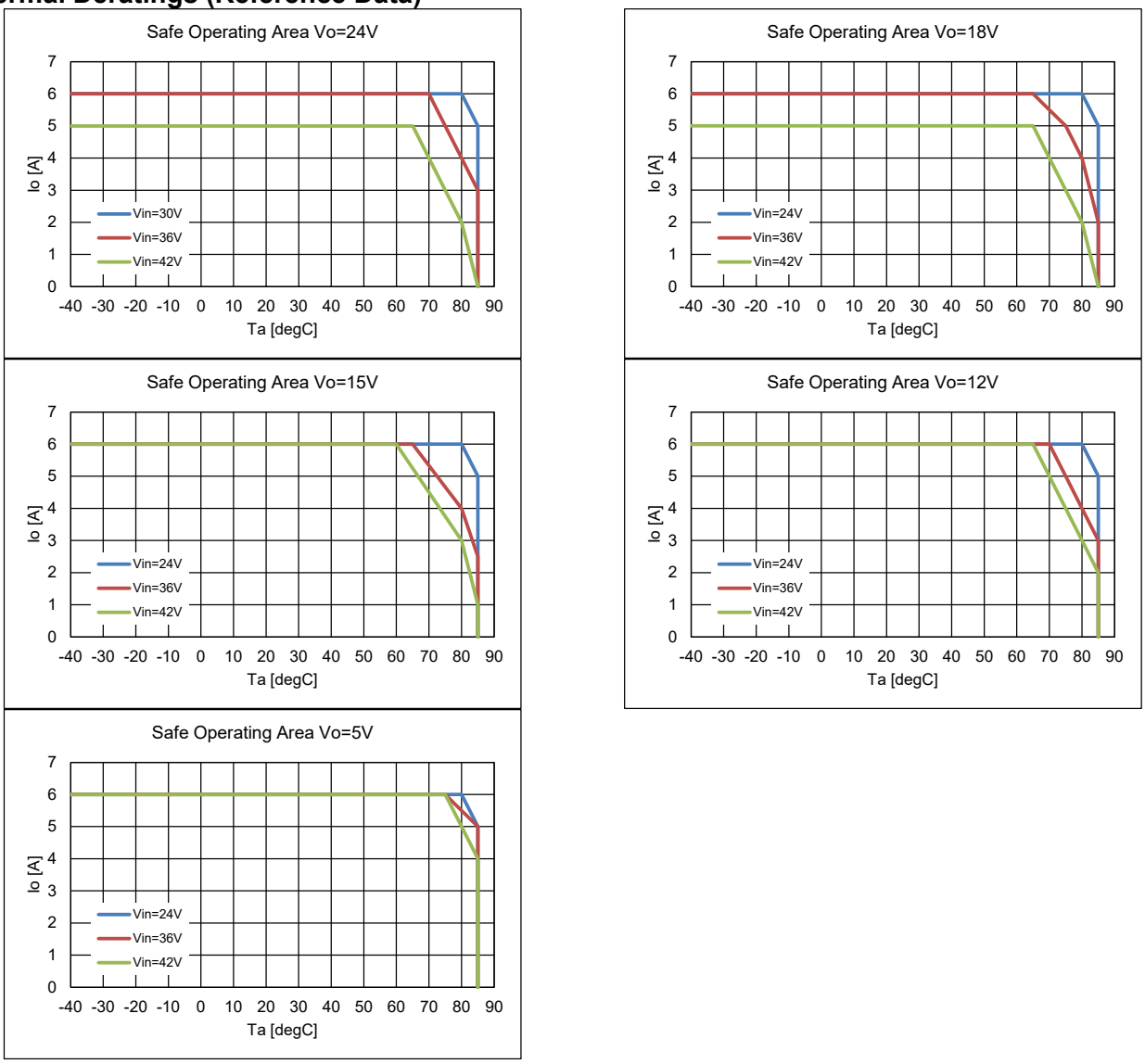

Figure 5. Safe Operating Area

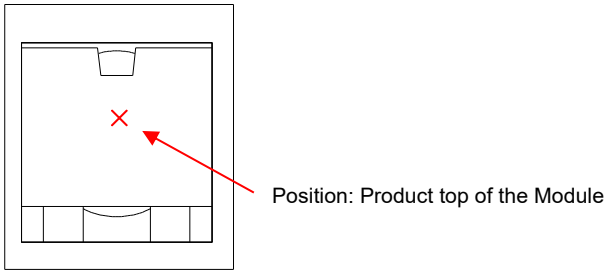

Figure 6. Temperature Measuring Area

Thermal deratings are evaluated in following condition.

・The product is mounted on 101.6mm x 60.0mm x 1.6mm (4 Layer, 1oz copper each) FR-4 board respectively.
・No forced air flow

Surface temperature of the product: 110degC max.

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Test Circuit

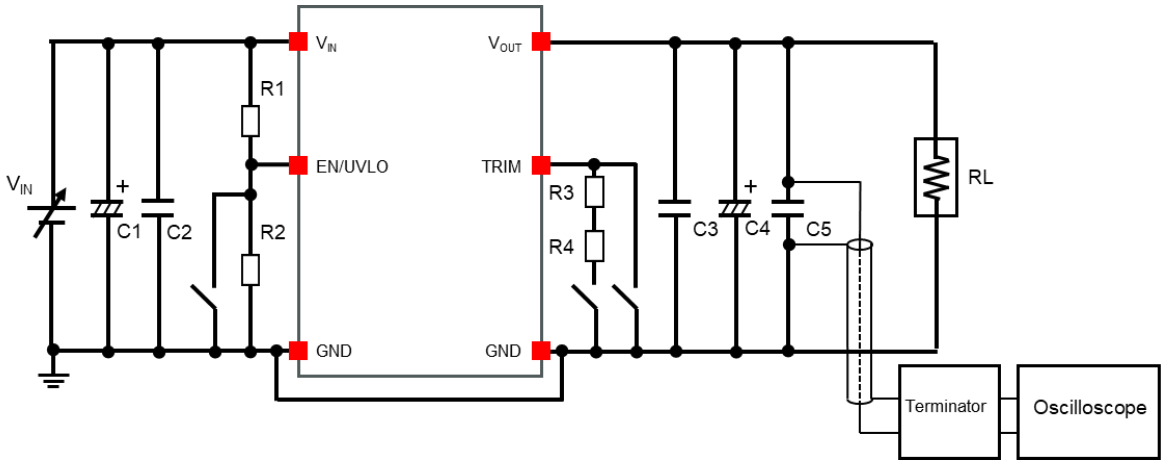

Figure 7. Test Circuit

*1: If there is a non-negligible parasitic impedance between the power supply and the converter, such as during evaluation, the optional input capacitor “C1” may be required to reduce the impedance. The recommended optional capacitor is an example. Please consider the optimum value for the case. This capacitor is usually an aluminum electrolytic type. It is not necessary to place the capacitor near the input terminal of the converter.

Table 8. Test Circuit Part List

REFERENCE	VALUE	DESCRIPTION	PART AND EQUIPMENT
C2	4.7uF x 4	Input Capacitor Ceramic capacitor, 4.7uF, 50V, ±10%, X7R	GRM31CR71H475KA12 (Murata)
C3	4.7uF x 1	Output Capacitor Ceramic capacitor, 4.7uF, 50V, ±10%, X7R	GRM31CR71H475KA12 (Murata)
C4	68uF x 1	Output Capacitor Conductive polymer hybrid aluminum electrolytic capacitor 68uF, 35V, ±20%,	HHXD350ARA680MF80G (Nippon Chemi-Con)
C5	0.1uF x 1	Output Capacitor Ceramic capacitor, 0.1uF, 50V, ±10%, X7R	GRM155R71H104KE14 (Murata)
R1	300 kohm	Chip resistor, 1/10W, ±0.5% The value is determined by the target UVLO voltage.	RK73H1ETTP3003D
R2	7.5 kohm	Chip resistor, 1/10W, ±0.5% The value is determined by the target UVLO voltage.	RK73H1ETTP7501D
R3, R4	-	Chip resistor, 1/10W, ±0.5% The value is determined by the target output voltage.	
C1	1000uF/50V	Electrolytic Capacitor (Optional)	
Oscilloscope	-	Digital Oscilloscope	DPO5034 or TDS5034 (Tektronix)
Terminator	-	Terminator	TRC-50F2 (KEISOKU GIKEN)

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Detailed Description

Input Under-Voltage Shutdown and Start-Up Threshold

Under normal Startup conditions, converter will not begin to regulate properly until the ramping-up input voltage exceeds and remains at the Startup Threshold Voltage.
Once operating, converter will not turn off until the input voltage drops below the Under-Voltage Shutdown Limit. Subsequent restart will not occur until the input voltage rises again above the Startup Threshold. This built-in hysteresis prevents any unstable on/off operation at a single input voltage. Users should be aware however of input sources near the Under-Voltage Shutdown whose voltage decays as input current is consumed (such as capacitor inputs), the converter shutdown and then restarts as the external capacitor recharges. Such situations could oscillate. To prevent this, make sure the operating input voltage is well above the Under-Voltage Shutdown voltage at all times.

R_{UVLO1} and R_{UVLO2} can be used to set the Shutdown-threshold and Startup-threshold.

Determine the R_{VAR} value using the following formula.

R_{UVLO1} [kohm] = (V_{START} - $V_{SHUTDOWN}$) / [0.005 - {(V_{START} - $V_{SHUTDOWN}$) / 880}]
R_{UVLO2} [kohm] = 0.9 / [(V_{START} - 0.9) / {1 / (1 / R_{UVLO1} + 1 / 880)} - 0.009]

V_{START}: Startup-threshold
$V_{SHUTDOWN}$: Shutdown-threshold

Table 9. Recommended R_{UVLO1} and R_{UVLO2}

OUTPUT VOLTAGE [V]	R_{UVLO1} [ohm]	R_{UVLO2} [ohm]	$V_{SHUTDOWN}$ [V]	$V_{SHUTDOWN}$ [V]
25	330k	7.5k	31.9	30.7
24	330k	8.2k	29.4	28.2
18	330k	11k	22.7	21.5
15	330k	13k	19.7	18.5
12	330k	18k	15.1	13.9
5	330k	36k	9.1	7.9

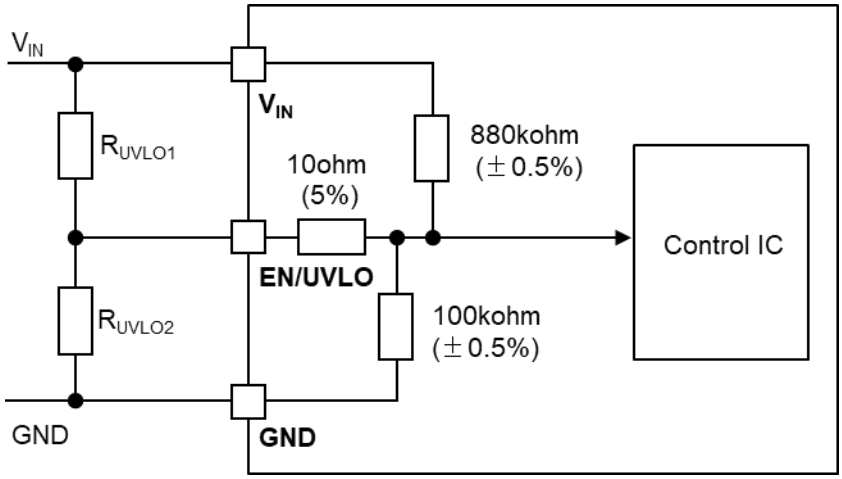

Figure 8. EN/UVLO Internal Circuit Diagram

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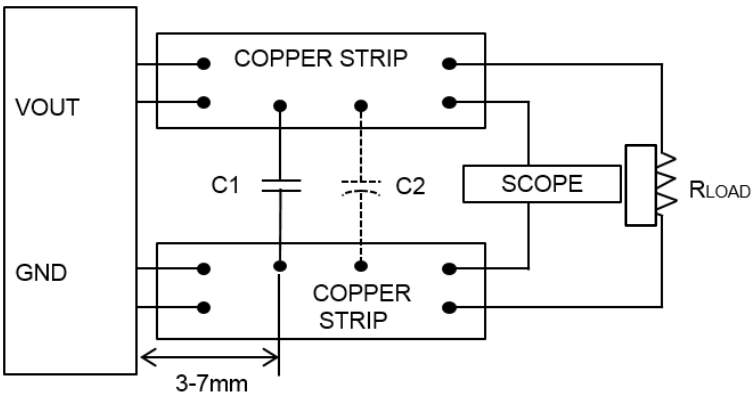
Start-Up Time

Assuming that the output current is set at the rated maximum, the V_{IN} to V_{OUT} Start-Up Time (see Specifications) is the time interval between the point when the ramping input voltage crosses the Start-Up Threshold and the fully loaded regulated output voltage enters and remains within its specified accuracy band. Actual measured times will vary with input source impedance, external input capacitance, input voltage slew rate and final value of the input voltage as it appears at the converter.
The converter includes a soft start circuit to moderate the duty cycle of its PWM controller at power up, thereby limiting the input inrush current.
The ON/OFF Remote Control interval from ON command to V_{OUT} regulated assumes that the converter already has its input voltage stabilized above the Start-Up Threshold before the ON command. The interval is measured from the ON command until the output enters and remains within its specified accuracy band. The specification assumes that the output is fully loaded at maximum rated current. Similar conditions apply to the ON to V_{OUT} regulated specification such as external load capacitance and soft start circuitry.

Output Noise

The converter is tested and specified for output noise using designated external output components, circuits and layout as shown in the figures below. In the figure below, the two copper strips simulate real-world printed circuit impedances between the power supply and its load. In order to minimize circuit errors and standardize tests between units, scope measurements should be made using BNC connectors or the probe ground should not exceed one half inch and soldered directly to the test circuit.



C1 = 4.7uF x 1 Ceramic
C2 = 68uF x 1 Conductive polymer hybrid aluminum electrolytic capacitor

Figure 9. Circuits and Layout

Minimum Output Loading Requirements

The converters regulate within specification and are stable under no load to full load conditions. Operation under no load might slightly increase output ripple and noise.

Thermal Shutdown

To prevent many over temperature problems and damage, the converters include thermal shutdown circuitry. If environmental conditions cause the temperature of the converter to rise above the Operating Temperature Range up to the shutdown temperature, an on-board electronic temperature sensor will shut down the unit. When the temperature decreases below the turn-on threshold, the converter will automatically restart.
CAUTION: If you operate too close to the thermal limits, the converter may shut down suddenly without warning. Be sure to thoroughly test your application to avoid unplanned thermal shutdown.

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Temperature Derating Curves

The graph in this data sheet illustrates typical operation under a variety of conditions. The derating curves show the maximum continuous ambient air temperature. Note that these are AVERAGE measurements.
Note that the temperatures are of the ambient airflow, not the converter itself which is obviously running at higher temperature than the outside air. Also note that very low flow rates (below about 25 LFM) are similar to "natural convection," that is, not using fan-forced airflow. We use both thermocouples and an infrared camera system to observe thermal performance.
CAUTION: This graph is collected at slightly above Sea Level altitude. Be sure to reduce the derating for higher density altitude.

Output Short Circuit Condition

In the case of a heavy overload setting such as a short circuit, the converter temporarily stops output. Following a time-out period, the converter will restart, causing the output voltage to begin ramping up to its appropriate value. If the short-circuit condition persists, another shutdown cycle will initiate. This rapid on/off cycling is called "hiccup mode". The hiccup cycling reduces the average output current, thereby preventing excessive internal temperatures and/or component damage. A short circuit can be tolerated indefinitely.
The "hiccup" system differs from older latching short circuit systems because you do not have to power down the converter to make it restart. The system will automatically restore operation as soon as the short circuit condition is removed.

Remote On/Off Control

The converter is enabled when the EN/UVLO pin is left open since the pin is pulled up to V_{IN} with a resistor internally. The converter is disabled when the On/Off is grounded or brought to within a low voltage (see Specifications) with respect to GND.
Dynamic control of the On/Off function should be able to sink appropriate signal current when brought low and withstand appropriate voltage when brought high.
Be aware too that there is a finite time in milliseconds (see Specifications) between the time of On/Off Control activation and stable, regulated output.
This time will vary slightly with output load type and current and input conditions instability.

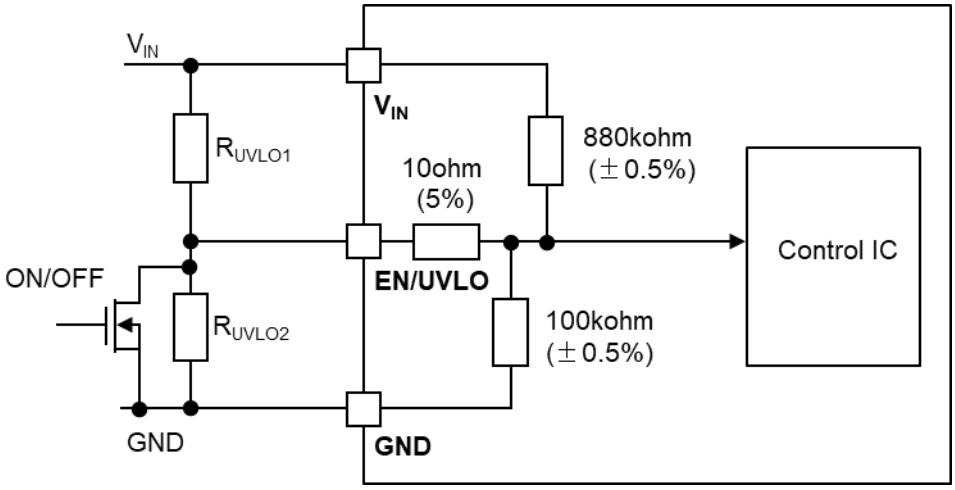

Figure 10. ON/OFF Circuit Diagram

Table 10. ON/OFF Control

OUTPUT	EN/UVLO PIN
ON	H
	OPEN
OFF	L

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Output Capacitive Load

Users should only consider adding capacitance to reduce switching noise and/or to handle spike current load steps. Install only enough capacitance to achieve noise objectives. Excess external capacitance may cause regulation problems, degraded transient response and possible oscillation or instability.

Output Voltage Adjustment

The output voltage can be adjusted within a specified range by connecting an external VAR resistor (R_{VAR}) between the TRIM pin and GND pin. The R_{VAR} resistor must be a 1/10W precision metal film type, ±0.5% accuracy (or better) with low temperature coefficient, ±100 ppm/ degC or better. Mount the resistor close to the converter with very short leads or use a surface mount trim resistor.

*Determine the R_{VAR} value using the following formula.

R_{VAR} [kohm] = 33 / (V_{OUT} - 5) – 1.65

Table 11. R_{VAR} Calculation Example

OUTPUT VOLTAGE [V]	ESTIMATED R_{VAR} [ohm]
25	0
24	82+4.7
18	820+68
15	1.5k+150
12	3.0k+68
5	OPEN

CAUTION

Do not exceed the specified limits of the output voltage or the converter's maximum power rating when applying these resistors.

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Application Information

Application Circuit & Part List

An Example of the standard components are shown in Table 12. Components must be chosen referring the system requirement like Voltage, Temperature, etc.

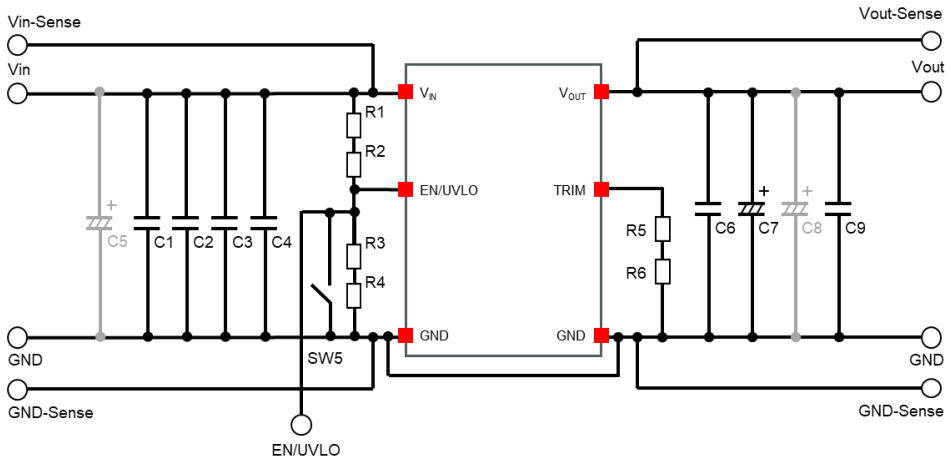

Figure 11. Application Circuit

Table 12. Application Circuit Part List

REFERENCE	VALUE	DESCRIPTION	PART AND EQUIPMENT
C1, C2, C3, C4	4.7uF	Input Capacitor Ceramic capacitor, 4.7uF, 50V, ±10%, X7R	GRM31CR71H475KA12 (Murata)
C6	4.7uF	Output Capacitor Ceramic capacitor, 4.7uF, 50V, ±10%, X7R	GRM31CR71H475KA12 (Murata)
C7	68uF	Output Capacitor Conductive polymer hybrid aluminum electrolytic capacitor 68uF, 35V, ±20%,	HHXD350ARA680MF80G (Nippon Chemi-Con)
C9	0.1uF	Output Capacitor Ceramic capacitor, 0.1uF, 50V, ±10%, R	GRM188R11H104KA93 (Murata)
R1	330 kohm	Chip resistor, 1/10W, ±0.5% The value is determined by the target UVLO voltage.	RK73H1JTTD3303D (KOA)
R3	8.2 kohm	Chip resistor, 1/10W, ±0.5% The value is determined by the target UVLO voltage.	RK73G1JTTD8201D (KOA)
R2, R4	0 ohm	Chip resistor	RK73Z1JTTD (KOA)
R5, R6	-	Chip resistor, 1/10W, ±0.5% The value is determined by the target output voltage.	
SW5		Switch	2UD1-T1-A1-M2-R-E (marutsu)
C5, C8		OPEN	

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Example of Pattern Layout (Top View)

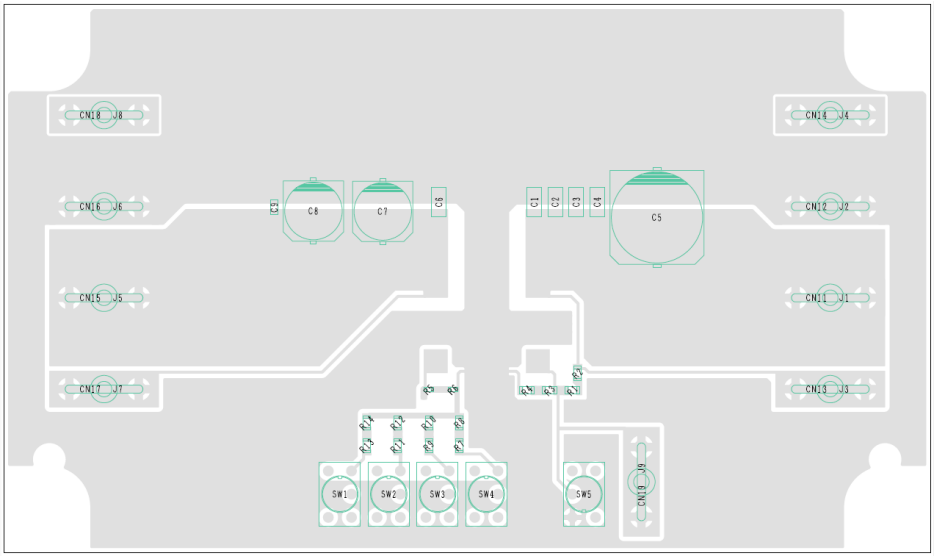

Figure 12. Example of Pattern Layout (Top View)

Application Board Example

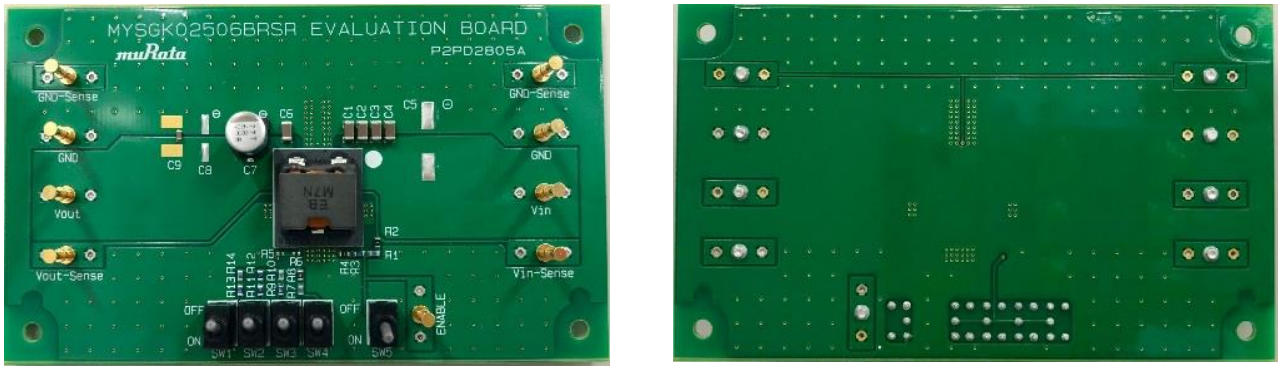

Figure 13. Application Board Example

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Component Selection

Input Fuse

Certain applications and/or safety agencies may require fuses at the inputs of power conversion components. Fuses should also be used when there is the possibility of sustained input voltage reversal which is not current limited. For greatest safety, we recommend a fast blow fuse installed in the ungrounded input supply line. The installer must observe all relevant safety standards and regulations. For safety agency approvals, install the converter in compliance with the end-user safety standard.

Recommended Input Filtering

The user must assure that the input source has low AC impedance to provide dynamic stability and that the input supply has little or no inductive content, including long distributed wiring to a remote power supply. For best performance, we recommend installing a low-ESR capacitor immediately adjacent to the converter's input terminals.
The capacitor should be a ceramic type such as the Murata GRM32 series or GRM31 series and an electrolytic type such as Panasonic OS-CON series. Initial suggested capacitor values are 4.7uF x 4 ceramic type and 1000uF x 1 electrolytic type, rated at twice the expected maximum input voltage. Make sure that the input terminals do not go below the undervoltage shutdown voltage at all times. More input bulk capacitance may be added in parallel (either electrolytic or tantalum) if needed.

Recommended Output Filtering

The converter will achieve its rated output ripple and noise with additional external capacitor. The user may install more external output capacitance reduce the ripple even further or for improved dynamic response.
Initial suggested capacitor values are 4.7uF ceramic type and 68uF conductive polymer hybrid aluminum electrolytic capacitor. Measure the output ripple under your load conditions.
Use only as much capacitance as required to achieve your ripple and noise objectives. Excessive capacitance can make step load recovery sluggish or possibly introduce instability. Do not exceed the maximum rated output capacitance listed in the specifications.

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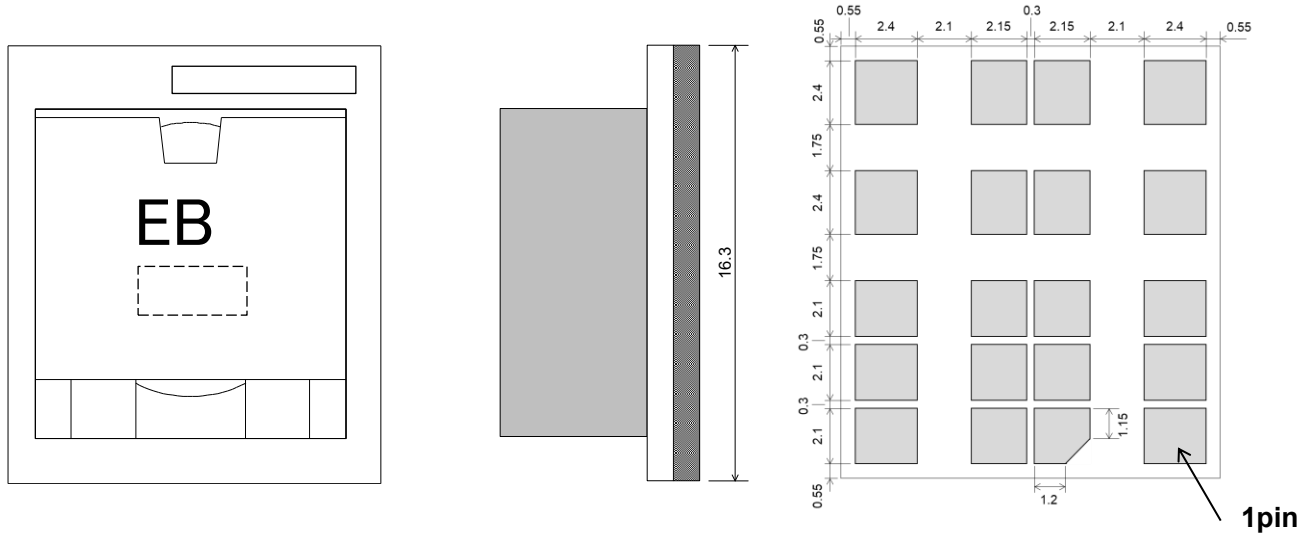
Packaging Information

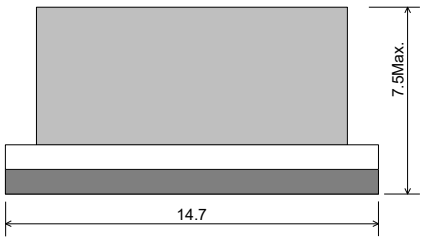
This section provides packaging data including the moisture sensitivity level, package drawing, package marking and tape-and-reel information.

Package Drawing



Top View / Side View

Bottom View



Side View

Unit: mm
Tolerances
± 0.4mm

Figure 14. Package Outline Drawing

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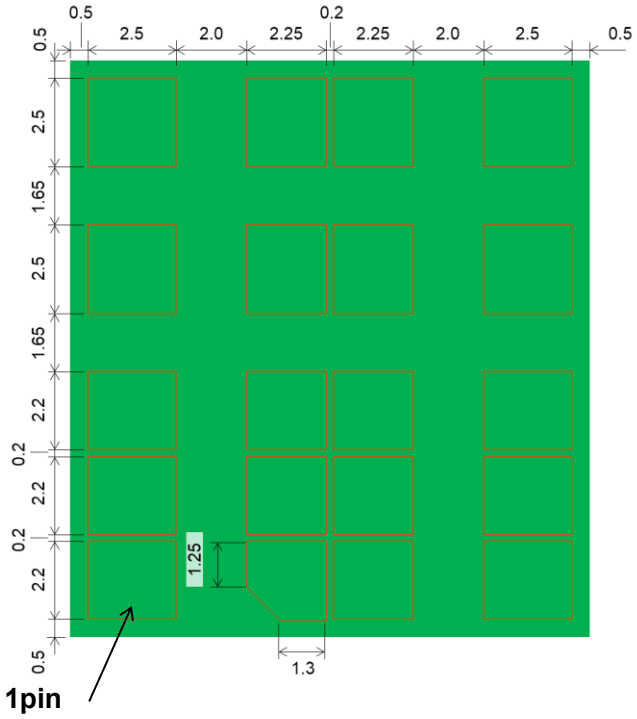
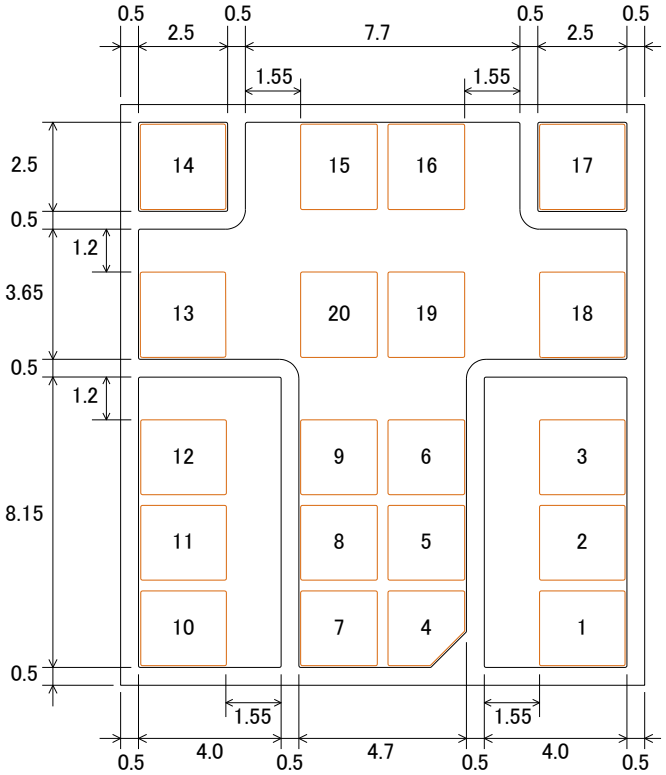
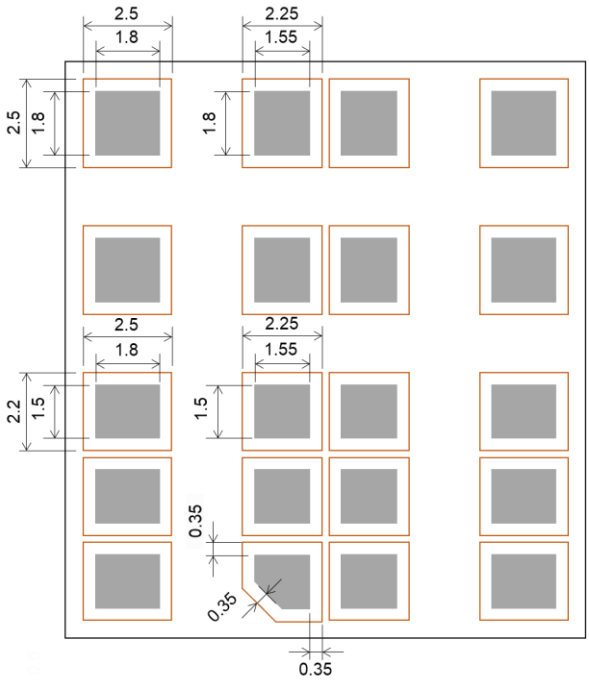
Recommended Board Land Pattern



(a) Board Land Pattern (Top View)



(b) Board Backside Pattern (Bottom View)



Solder thickness:120um (Ref.)
(c) Metal Mask Design

Figure 15. Recommended Board Pattern

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Tape and Reel Information

Tape Dimensions

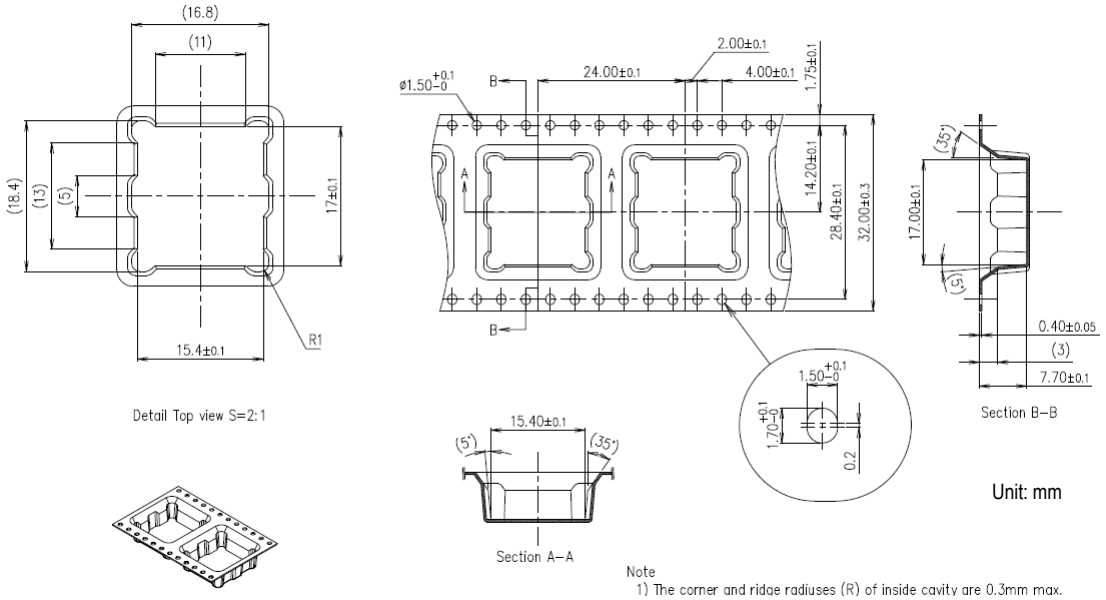

Figure 16. Tape Dimension

Reel Dimensions

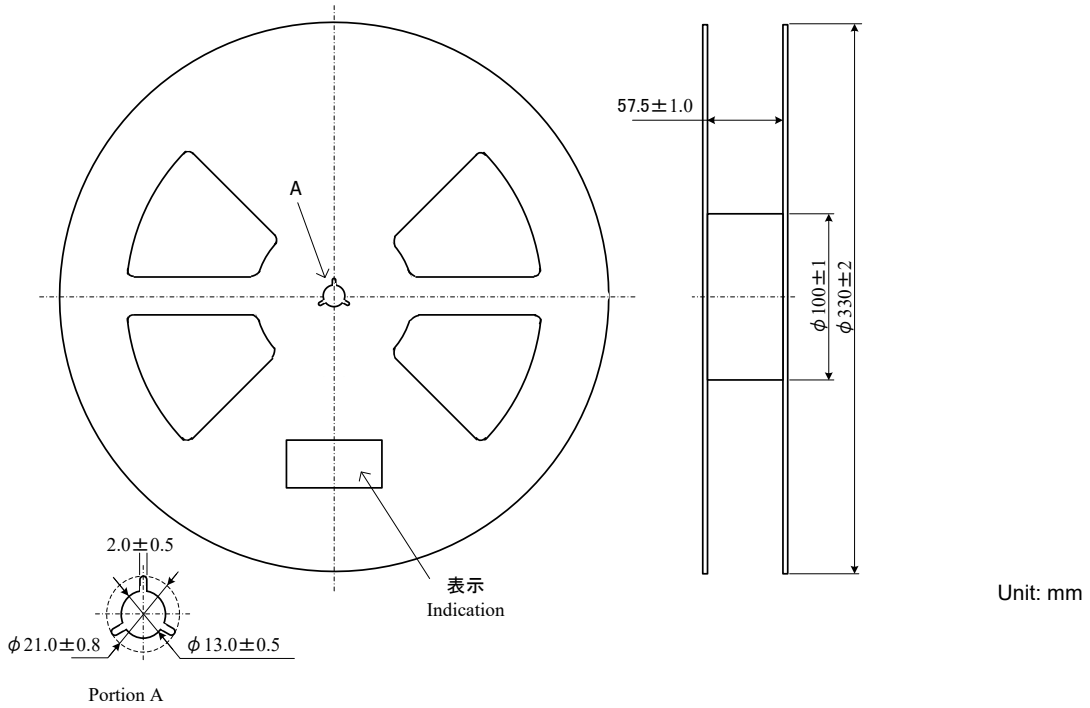

Figure 17. Reel Dimension

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Tape Specifications

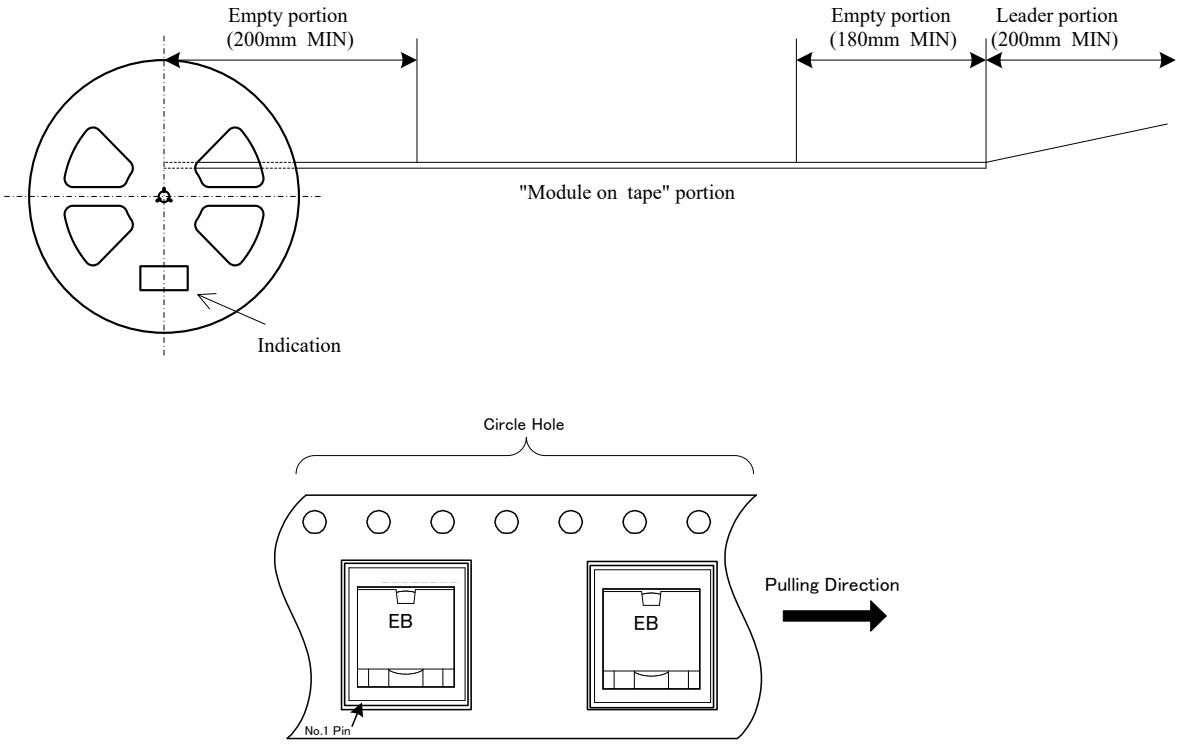

Figure 18. Tape Specifications

Notes
1. The adhesive strength of the protective tape must be within 0.1-1.3N.
2. Each reel contains the quantities such as the table below.
3. Each reel set in moisture-proof packaging because of MSL 3.
4. No vacant pocket in “Module on tape” section.
5. The reel is labeled with Murata part number and quantity.
6. The color of reel is not specified.

PART NUMBER	QTY
MYSGK02506BRSR	150
MYSGK02506BRSRD	50

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Soldering Guidelines

Murata recommends the specifications below when installing these converters. These specifications vary depending on the solder type.
Exceeding these specifications may cause damage to the product. Your production environment may differ therefore please thoroughly review these guidelines with your process engineers.
This product can be reflowed once.

Table 13. Reflow Solder Operations for Surface-Mount Products

For Sn/Ag/Cu BASED SOLDERS:	
Preheat Temperature	Less than 1degC per second
Time Over Liquidus.	45 to 75 seconds
Maximum Peak Temperature	250degC
Cooling Rate	Less than 3degC per second

Recommended Lead-free Solder Reflow Profile

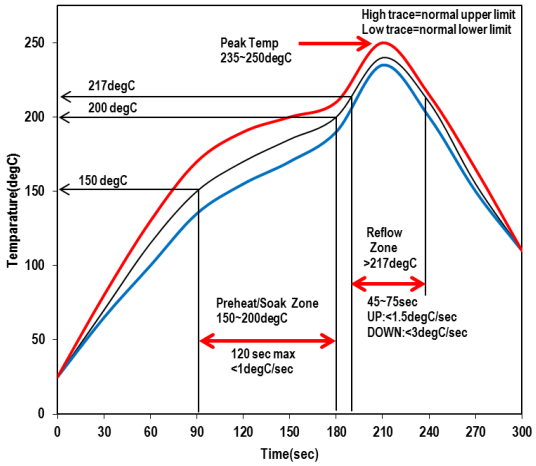
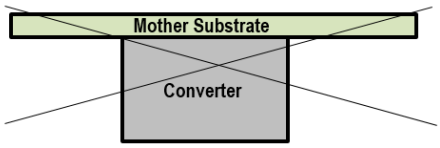


Figure 19. Recommended Lead-free Solder Reflow Profile

CAUTION: Do not reflow the converter as follows, because the converter may fall from the substrate during reflowing.



Pb-free Solder Processes

For Pb-free solder processes, the product is qualified for MSL 3 according to IPC/JEDEC standard J-STD-020D.
During reflow PRODUCT must not exceed 250degC at any time.

Dry Pack Information

Products intended for Pb-free reflow soldering processes are delivered in standard moisture barrier bags according to IPC/JEDEC standard J-STD-033.
(Handling, packing, shipping and use of moisture/reflow sensitivity surface mount devices.)
Using products in high temperature Pb-free soldering processes requires dry pack storage and handling. In case the products have been stored in an uncontrolled environment and no longer can be considered dry, the modules must be baked according to J-STD-033.

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Revision History

VERSION	DATE	MODIFICATION	PAGE
A01	-	New document	
A08	JAN-2025	Added NRND status to MYSGK02506BRSRD	p.3
A09	MAR-2026	Added Storage	p.30

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Notices

Scope
This datasheet is applied to MYSGK02506BRSR and MYSGK02506BRSRD.
- Specific applications: Consumer Electronics, Industrial Equipment

⚠ CAUTION

Limitation of Applications
The products listed in the datasheet (hereinafter the product(s) is called the “Product(s)”) are designed and manufactured for applications specified in the specification or the datasheet. (hereinafter called the “Specific Application”). We shall not warrant anything in connection with the Products including fitness, performance, adequateness, safety, or quality, in the case of applications listed in from (1) to (11) written at the end of this precautions, which may generally require high performance, function, quality, management of production or safety. Therefore, the Product shall be applied in compliance with the specific application.

We disclaim any loss and damages arising from or in connection with the products including but not limited to the case such loss and damages caused by the unexpected accident, in event that (i) the product is applied for the purpose which is not specified as the specific application for the product, and/or (ii) the product is applied for any following application purposes from (1) to (11) (except that such application purpose is unambiguously specified as specific application for the product in our catalog specification forms, datasheets, or other documents officially issued by us*).

(1) Aircraft equipment
(2) Aerospace equipment
(3) Undersea equipment
(4) Power plant control equipment
(5) Medical equipment
(6) Transportation equipment (such as vehicles, trains, ships)
(7) Traffic control equipment
(8) Disaster prevention / crime prevention equipment
(9) Industrial data-processing equipment
(10) Combustion/explosion control equipment
(11) Application of similar complexity and/or reliability requirements to the applications listed in the above

For exploring information of the Products which will be compatible with the particular purpose other than those specified in the datasheet, please contact our sales offices, distribution agents, or trading companies with which you make a deal, or via our web contact form.
Contact form: https://www.murata.com/contactform
*We may design and manufacture particular Products for applications listed in (1) to (11). Provided that, in such case we shall unambiguously specify such Specific Application in specification or datasheet without any exception. Therefore, any other documents and/or performances, whether exist or non-exist, shall not be deemed as the evidence to imply that we accept the applications listed in (1) to (11).

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Storage

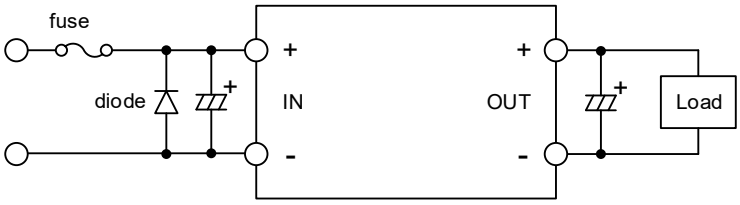
Please store the products in room where direct sunlight cannot come in and use the products within 6 months after delivery
and maintain an appropriate storage condition using the following conditions.
- A temperature is +5 degC to +40 degC and a relative humidity is 20% to 70% as a standard condition. The temperature recommendation is less than 30 degC.
- If the storage period exceeds six months, check packaging, mounting, etc. before use.
- In addition, this may cause oxidation of the electrodes. If more than one year has elapsed since delivery, also check the solderability before use.
- Please do not store the products in the places such as : in a dusty place, in a place exposed directly to sea breeze, in an atmosphere containing corrosive gas (Cl2, NH3, SO2, NOX and so on).

This product is MSL3.
After opening bags, please store the products under maximum condition of 35degC, 5%RH in desiccator and use the products within 168 hours.
If the MSL floor life exceeds, it is recommended to proceed baking under the following conditions.
・125 +10/-0 degC, 48 hours (for product)
・40 degC, 5 %RH, 79 days (for reel packing or tray)

Fail-Safe Function

Be sure to add an appropriate fail-safe function to your finished product to prevent secondary damage in the unlikely event of an abnormality function or malfunction in our product.

Please connect the input terminal by right polarity. If you mistake the connection, it may break the DC-DC converter. In the case of destruction of the DC-DC converter inside, over input current may flow. Please add a diode and fuse as following to protect them.



Please select diode and fuse after confirming the operation.

Figure 20. Circuit example with a diode and fuse

⚠ Note

1. Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
2. You are requested not to use our product deviating from the reference specifications.
3. If you have any concerns about materials other than those listed in the RoHS directive, please contact us.
4. Please don't wash this product under any conditions.

Product Specification

Product Specifications in this datasheet are as of March 2026. Specifications and features may change in any manner without notice. Please check with our sales representatives.

Contact Form

https://www.murata.com/contactform?Product=Power%20Device

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Furthermore, the buyer and developer are responsible for predicting hazards and taking adequate safeguards against potential events at your own risk in order to prevent personal accidents, fire accidents, or other social damage. When using this product, perform thorough evaluation and verification of the safety design designed at your own risk for this product and the application.

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