# C 302040

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### Description

The NCP302040 integrates a MOSFET driver, high-side MOSFET and low-side MOSFET into a single package.

The driver and MOSFETs have been optimized for high-current DC–DC buck power conversion applications. The NCP302040 integrated solution greatly reduces package parasitics and board space compared to a discrete component solution.

### Features

- Capable of Average Currents up to 40 A
- Capable of Switching at Frequencies up to 2 MHz
- Capable of Peak Currents up to 75 A
- Compatible with 3.3 V or 5 V PWM Input
- Responds Properly to 3-level PWM Inputs
- Option for Zero Cross Detection with 3-level PWM
- Internal Bootstrap Diode
- Undervoltage Lockout
- Supports Intel<sup>®</sup>

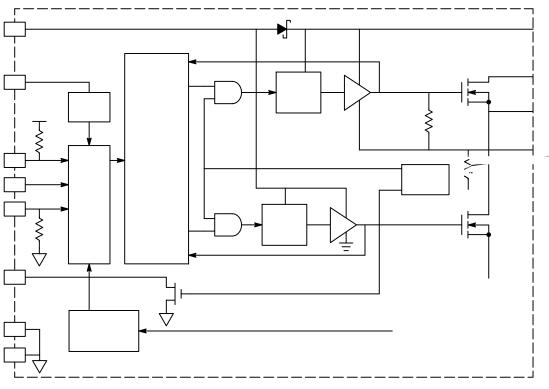


Figure 2. Block Diagram

### Table 5. ELECTRICAL CHARACTERISTICS

 $(V_{VCC} = V_{VCCD} = 5.0 \text{ V}, V_{VIN} = 12 \text{ V}, V_{DISB\#} = 2.0 \text{ V}, C_{VCCD} = C_{VCC} = 0.1 \mu\text{F} \text{ unless specified otherwise}) \text{ Min/Max values are valid for the temperature range } -40^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C} \text{ unless noted otherwise, and are guaranteed by test, design or statistical correlation.}$ 

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
CC SUPPLY CURRENT						
Operating		DISB# = 5 V, PWM = 400 kHz	-	1	2	mA
No switching		DISB# = 5 V, PWM = 0 V	_	-	2	mA
Disabled		DISB# = 0 V, SMOD# = VCC	-	0.4	1	μΑ
		DISB# = 0 V, SMOD# = GND	_	6	13	μA
UVLO Start Threshold	V <sub>UVLO</sub>	VCC Rising	2.9	-	3.3	V
UVLO Hysteresis			150	-	-	mV
VCCD SUPPLY CURRENT						
Enabled, No Switching		DISB# = 5 V, PWM = 0 V, V <sub>PHASED</sub> = 0 V	-	175	300	μA
Disabled		DISB# = 0 V	-	0.4	1	μA
Operating		DISB# = 5 V, PWM = 400 kHz	-	-	20	mA
DISB# INPUT						-
Input Resistance		To Ground	-	467	-	kΩ
Upper Threshold	V <sub>UPPER</sub>		-	-	2.0	V
Lower Threshold	V <sub>LOWER</sub>		0.8	-	-	V
Hysteresis		V <sub>UPPER</sub> – V <sub>LOWER</sub>	200	_		mV
Enable Delay Time		Time from DISB# transitioning HI to when VSW responds to PWM.		_	40	μ

### Table 5. ELECTRICAL CHARACTERISTICS (continued)

 $(V_{VCC} = V_{VCCD} = 5.0 \text{ V}, V_{VIN} = 12 \text{ V}, V_{DISB\#} = 2.0 \text{ V}, C_{VCCD} = C_{VCC} = 0.1 \mu\text{F}$  unless specified otherwise) Min/Max values are valid for the temperature range  $-40^{\circ}\text{C} \le T_J \le 125^{\circ}\text{C}$  unless noted otherwise, and are guaranteed by test, design or statistical correlation.

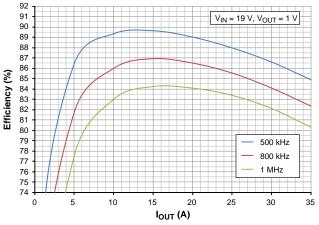
Parameter	Symbol	Conditions	Min	Тур	Max	Unit
PWM INPUT						
Input Resistance	R <sub>PWM_BIAS</sub>	SMOD# = V <sub>SMOD#_MID</sub>	-	68	_	kΩ
PWM Input Bias Voltage	V <sub>PWM_BIAS</sub>	SMOD# = V <sub>SMOD#_MID</sub>	-	1.7	-	V
Non-overlap Delay, Leading Edge	T <sub>NOL_L</sub>	GL Falling = 1 V to GH–VSW Rising = 1 V	-	13	-	ns
Non-overlap Delay, Trailing Edge	T <sub>NOL_T</sub>	GH–VSW Falling = 1 V to GL Rising = 1 V	-	12	-	ns
PWM Propagation Delay, Rising	T <sub>PWM,PD_R</sub>	PWM = High to GL = 90%	-	13	35	ns
PWM Propagation Delay, Falling	T <sub>PWM,PD_F</sub>	PWM = Low to VSW = 90%	-	47	52	ns
Exiting PWM Mid-state Propagation Delay, Mid-to-Low	T <sub>PWM_EXIT_L</sub>					

### Table 6. LOGIC TABLE

INPUT TRUTH TABLE						
DISB#	PWM	SMOD# (Note 4)	GH (Not a Pin)	GL		
L	Х	Х	L	L		
н	Н	Х	Н	L		

### **TYPICAL PERFORMANCE CHARACTERISTICS**

(Test Conditions:  $V_{IN}$  = 12 V,  $V_{CC}$  =  $PV_{CC}$  = 5 V,  $V_{OUT}$  = 1 V,  $L_{OUT}$  = 250 nH,  $T_A$  = 25°C and natural convection cooling, unless otherwise noted.)



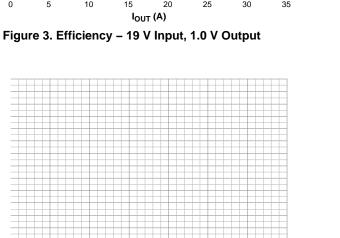


Figure 5. Efficiency – 12 V Input, 1.0 V Output

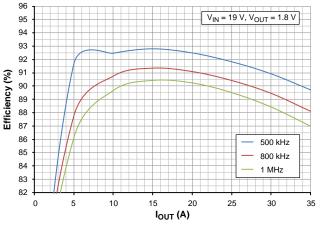


Figure 4. Efficiency – 19 V Input, 1.8 V Output

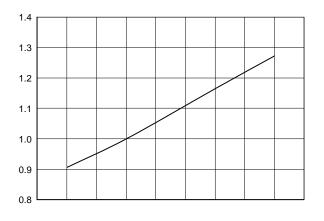
Figure 6. Efficiency – 12 V Input, 1.8 V Output

Figure 7. Power Losses vs. Output Current, 12 VIN

Figure 8. Power Losses vs. Output Current, 19 VIN

### **TYPICAL PERFORMANCE CHARACTERISTICS**

(Test Conditions:  $V_{IN}$  = 12 V,  $V_{CC}$  =  $PV_{CC}$  = 5 V,  $V_{OUT}$  = 1 V,  $L_{OUT}$  = 250 nH,  $T_A$  = 25°C and natural convection cooling, unless otherwise noted.)



### Figure 9. Power Loss vs. Switching Frequency

Figure 10. Power Loss vs. Input Voltage

Figure 11. Power Loss vs. Driver Supply Voltage

Figure 12. Power Loss vs. Output Voltage

Figure 13. Driver Supply Current vs. Switching Frequency Figure 14. Driver Supply Current vs. Driver Supply Voltage

### www.

# NCP302040

Disable Input (DISB#)

For Use with Controllers with 3-state PWM and Zero

## **RECOMMENDED PCB LAYOUT**

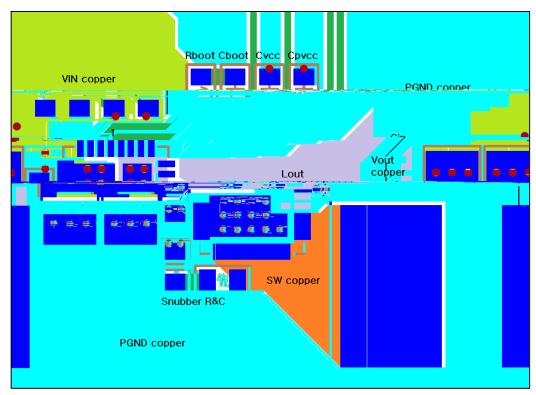


Figure 18. Top Copper Layer (Viewed from Top)

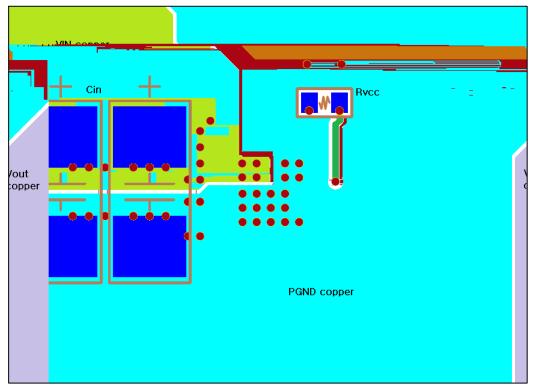


Figure 19. Bottom Copper Layer (Viewed from Top)

# **RECOMMENDED PCB FOOTPRINT (OPTION 1)**



# LAND PATTERN RECOMMENDATION

### **RECOMMENDED MOUNTING FOOTPRINT**

For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

Figure 20. Recommended PCB Footprint (Option 1)

### **RECOMMENDED PCB FOOTPRINT (OPTION 2)**



# LAND PATTERN RECOMMENDATION

### **RECOMMENDED MOUNTING FOOTPRINT**

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Figure 21. Recommended PCB Footprint (Option 2)

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SCALE 2.5:1

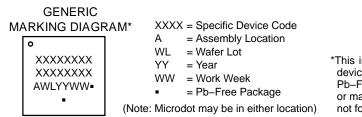
PQFN31 5X5, 0.5P CASE 483BR ISSUE D

DATE 13 FEB 2023

DATE 13 FEB 2023

RECOMMENDED MOUNTING FOOTPRINT\* (2X SCALE)

\* For additional informatior



\*This information is generic. Please refer to device data sheet for actual part marking. Pb–Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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