DATASHEET

NPH770280Q

Automotive Dual-Channel 80mΩ Smart High-Side Driver

Revision	Date	Description
Rel 1.0	27 November 2023	Preliminary release.

1. Features

- Compliant with AEC-Q100
- Dual-channel high-side driver with integrated current sense feedback
- Operation voltage range: 4V to 28V, AMR 40V
- On resistance:
  - 40mΩ (Typ, T_J = 25°C)
  - 80mΩ (Max, T_J = 150°C)
- Load current $I_{L(NOM)}$: 1.5A (Typ)
- Maximum overcurrent limit: 15A (Typ)
- Very low standby current consumption: 0.1μA (Max)
- Support down to 2.85V VCC during deep cold crank
- 3V/5V CMOS compatible input
- Multiple diagnostics through CS pin
  - High accuracy analog output proportional to loading current
  - Overload and output short to ground alarm
  - Open load diagnostic in OFF state
  - Output short to VCC detection
  - Support CS output enable/disable
- Protections
  - V_{CC} undervoltage shutdown
  - VDS clamp for protection of inductive load
  - Thermal shutdown
  - Overcurrent protection
  - Dynamic overtemperature protection
  - Output latch/hiccup through the $\overline{\text{FaultRST}}$ pin
  - Loss of ground and loss of V_{CC} protection
  - Battery reverse insertion protection
  - ESD protection
- Packages: SSOP16PP and SSOP14PP

2. Applications

- All types of automotive resistive, inductive and capacitive loads
- Power supply protection in ADAS: radar and sensors
- Automotive headlamps

3. Description

The NPH770280Q is an automotive dual-channel smart high side driver. It features 3V/5V CMOS compatible input control interface and two independent output channels. It can also provide smart protections and diagnostics. The NPH770280Q is extensively used in 12V automotive power supply systems.

The NPH770280Q integrates advanced protection functions, including overcurrent limit protection, and dynamic overtemperature protection. Additionally, NPH770280QASSOP16P provides configurable output latch/hiccup function though the $\overline{\text{FaultRST}}$ pin when thermal shutdown or overcurrent event occurs.

The NPH770280Q also integrates multiplexed analog output through the CS pin to provide complex diagnostic functions, including accurate analog output proportional to loading current, over load, and output short to ground alarms, output short to V_{CC}, and open load detection in OFF state.

The NPH770280Q SEn pin provides the function of enable/disable of diagnostic functions in OFF state, which can be used to obtain low power consumption if disabled. When multiple NPH770280Q devices are used in one system, the SEn pin can also be used to achieve sampling CS voltage through one single ADC channel of MCU by paralleling CS outputs of multiple NPH770280Q devices, which greatly optimizes the system and reduces system cost.

The NPH770280Q supports the SSOP16PP and SSOP14PP packages. See **Table 1** for the order information.

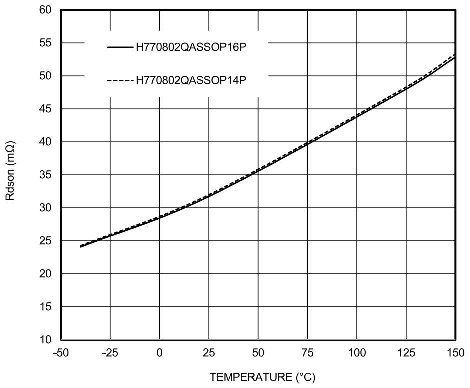
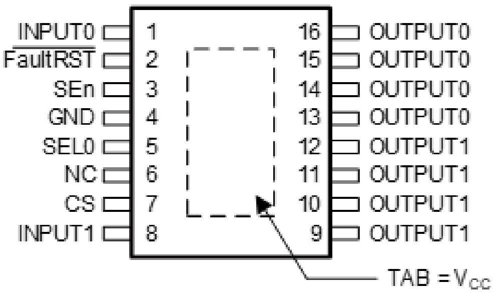

H770802QASSOP16P
H770802QASSOP14P
Rdson (mΩ)
TEMPERATURE (°C)
60
55
50
45
40
35
30
25
20
15
10
-50
-25
0
25
50
75
100
125
150

Table 1. Order Information

Order Number	Package	Mark	CH (#)	V_{CC} (V)	Rdson (mΩ)	K_2	I_{Limit} (A)	Rating	Pkg. Option
NPH770280QASSOP16P	SSOP16PP	H770280Q	2	4-28	40	1200	15	Auto	T/R-3000
NPH770280QASSOP14P	SSOP14PP	H770280Q	2	4-28	40	1200	15	Auto	T/R-3000

4. Pin Configuration and Functions

Figure 1 illustrates the pin configuration.



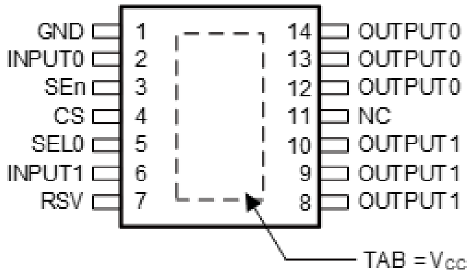


Figure 1. Pin Configuration

Table 2 lists the pin functions (NPH770280QASSOP16P).

Table 2. Pin Functions (NPH770280QASSOP16P)

Position	Name	Type	Description
1	INPUT0	Input	Voltage controlled input pin with hysteresis, compatible with 3V and 5V CMOS outputs. It controls output switch state.
2	$\overline{\text{FaultRST}}$	Input	Active low compatible with 3V and 5V CMOS outputs pin; it unlatches the output in case of fault; If kept low, sets the outputs in auto-restart mode.
3	SEn	Input	Active high compatible with 3V and 5V CMOS outputs pin; it enables the CS diagnostic pin.
4	GND	Ground	Ground connection. Must be reverse battery protected by an external diode / resistor network.
5	SEL0	Input	Active high compatible with 3V and 5V CMOS outputs pin; addressing the CS multiplexer.
6	NC	---	Not connect for this pin.
7	CS	Output	Analog current sense output pin. It delivers a current proportional to the load current.
8	INPUT1	Input	Voltage controlled input pin with hysteresis, compatible with 3V and 5V CMOS outputs. It controls output switch state.
9-12	OUTPUT1	Output	Power outputs. All the pins must be connected together.
13-16	OUTPUT0	Output	Power outputs. All the pins must be connected together.
---	V_{CC}	Power	Battery connection

Table 3 lists the pin functions (NPH770280QASSOP14P).

Table 3. Pin Functions (NPH770280QASSOP14P)

Position	Name	Type	Description
1	GND	Ground	Ground connection. Must be reverse battery protected by an external diode / resistor network.
2	INPUT0	Input	Voltage controlled input pin with hysteresis, compatible with 3V and 5V CMOS outputs. It controls output switch state.
3	SEn	Input	Active high compatible with 3V and 5V CMOS outputs pin; it enables the CS diagnostic pin.
4	CS	Output	Analog current sense output pin. It delivers a current proportional to the load current.
5	SEL0	Input	Active high compatible with 3V and 5V CMOS outputs pin, addressing the CS multiplexer.
6	INPUT1	Input	Voltage controlled input pin with hysteresis, compatible with 3V and 5V CMOS outputs. It controls output switch state.
7	RSV	---	Reserved for internal use. Pulled down to GND internally. Leave this pin floating in application.
8-10	OUTPUT1	Output	Power outputs. All the pins must be connected together.
11	NC	---	Not connect for this pin.
12-14	OUTPUT0	Output	Power outputs. All the pins must be connected together.
---	V_{CC}	Power	Battery connection

5. Specifications

5.1 Absolute Maximum Ratings

Table 4 lists the absolute maximum ratings of the NPH770280Q.

Table 4. Absolute Maximum Ratings

Parameter	Description	Min	Max	Units
Voltage	DC supply voltage, V_{CC}		38	V
	Reverse DC supply voltage, $-V_{CC}$		0.3	V
	Maximum transient supply voltage (ISO 16750-2:2010 Test B clamped to 40V; R_L = 4Ω), V_{CCPK}		40	V
	Maximum jump start voltage for single pulse short circuit protection, V_{CCJS}		28	V
Current	DC reverse ground pin current, $-I_{GND}$		200	mA
	OUTPUT DC output current, I_{OUT}		Internally limited	A
	Reverse DC output current, $-I_{OUT}$		TBD	A
	INPUT DC input current, I_{IN}	−1	10	mA
	SEn DC input current, I_{SEn}	−1	10	mA
	SEL0 DC input current, I_{SEL}	−1	10	mA
	$\overline{\text{FaultRST}}$ DC input current, I_{FR}	−1	1.5	mA
	CS pin DC output current (V_{GND} = V_{CC} and V_{SENSE} < 0V), I_{SENSE}		10	mA
	CS pin DC output current in reverse (V_{CC} < 0V), I_{SENSE}		−20	mA
	Maximum switching energy (single pulse) (T_{DEMAG} = 0.4ms; T_{JSTART} = 150°C), E_{MAX}		TBD	mJ
Temperature	Junction, T_J	−40	150	°C
	Storage, T_{stg}	−55	150	°C

Note: Stresses beyond those listed under **Table 4** may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under **Table 6**. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5.2 ESD Ratings

Table 5 lists the ESD ratings of the NPH770280Q.

Table 5. ESD Ratings

Parameter	Symbol	Description	Value	Units
Electrostatic Discharge	$V_{(ESD)}$	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001[1]	TBD	V
		Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001[1], V_{CC}, output 0, and output 1	TBD	
		Charged-device model (CDM), per JEDEC specification JESD22-C101[2]	TBD	

Note 1: The JEDEC document JEP155 indicates that 500V HBM allows safe manufacturing with a standard ESD control process.

Note 2: The JEDEC document JEP157 indicates that 250V CDM allows safe manufacturing with a standard ESD control process.

5.3 Recommended Operating Conditions

Table 6 lists the recommended operating conditions for the NPH770280Q.

Table 6. Recommended Operating Conditions

Parameter	Description	Symbol	Min	Nom	Max	Units
Power Supply						
Power Supply			4		28	V
Digital Inputs						
Digital Input Voltage		V_{DIG}	0		5.5	V
Temperature Range						
Operating Ambient Temperature		T_A	−40		125	°C

5.4 Thermal Information

Table 7 lists the thermal information for the NPH770280Q.

Table 7. Thermal Information

Parameter	Symbol	NPH770280QASSOP16P	NPH770280QASSOP14P	Units
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	30.3	29.8	°C/W
Junction-to-Top Characterization Parameter	Ψ_{JT}	3.2	3.0	°C/W
Junction-to-Case (Bottom) Thermal Resistance	$R_{\theta JC(bot)}$	1.2	1.2	°C/W

5.5 Electrical Characteristics

Table 8 lists the electrical characteristics of the NPH770280Q. 7V < V_{CC} < 28V; −40°C < T_J < 150°C, unless otherwise specified. All typical values refer to V_{CC} = 13V; T_J = 25°C, unless otherwise specified.

Table 8. Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
During Cranking						
Minimum Cranking Supply Voltage (V_{CC} Decreasing)	$V_{USD\_Cranking}$				2.85	V
Power						
Operating Supply Voltage	V_{CC}		4	13	28	V
Undervoltage Shutdown	V_{USD}				2.85	V
Undervoltage Shutdown Reset	$V_{USDReset}$				5	V
Undervoltage Shutdown Hysteresis	$V_{USDhyst}$			1.25		V
On-State Resistance(1) – NPH770280QASSOP16P	R_{ON}	I_{OUT} = 1A; T_J = 25°C		40.0	44.2	mΩ
		I_{OUT} = 1A; T_J = 150°C			75.2	
		I_{OUT} = 1A; V_{CC} = 4V; T_J = 25°C(3)		41.1		
On-State Resistance(1) – NPH770280QASSOP14P	R_{ON}	I_{OUT} = 1A; T_J = 25°C		40.2	44.4	mΩ
		I_{OUT} = 1A; T_J = 150°C			75.4	
		I_{OUT} = 1A; V_{CC} = 4V; T_J = 25°C(3)		41.3		
Nominal Load Current Per Channel (2 Channels Active)	$I_{L(NOM)}$	T_J < 150°C(10)		1.5		A
Supply Current in Standby at V_{CC} = 13V(4)	I_{STBY}	V_{CC} = 13V; V_{IN} = V_{OUT} = V_{FR} = V_{SEn} = 0V; V_{SEL0} = 0V; T_J = 25°C		0.01	0.1	µA
		V_{CC} = 13V; V_{IN} = V_{OUT} = V_{FR} = V_{SEn} = 0V; V_{SEL0} = 0V; T_J = 85°C(5)			0.1	
		V_{CC} = 13V; V_{IN} = V_{OUT} = V_{FR} = V_{SEn} = 0V; V_{SEL0} = 0V; T_J = 125°C			3	
Standby Mode Blanking Time	t_{D_STBY}	V_{CC} = 13V; V_{IN} = V_{OUT} = V_{FR} = V_{SEL0} = 0V; V_{SEn} = 5V to 0V		650		µs
Supply Current	$I_{S(ON)}$	V_{CC} = 13V; V_{SEn} = V_{FR} = V_{SEL0} = 0V; V_{IN0} = 5V; V_{IN1} = 5V; I_{OUT0} = 0A; I_{OUT1} = 0A		3.7	5.0	mA
Control Stage Current Consumption in ON State. All Channels Active.	$I_{GND(ON)}$	V_{CC} = 13V; V_{SEn} = 5V; V_{FR} = V_{SEL0} = 0V; V_{IN0} = 5V; V_{IN1} = 5V; I_{OUT0} = 2A; I_{OUT1} = 2A			6.0	mA
Off-State Output Current at V_{CC} = 13V(4)	$I_{L(off)}$	V_{IN} = V_{OUT} = 0V; V_{SEn} = 0V; V_{CC} = 13V; T_J = 25°C		0.15	0.5	µA
		V_{IN} = V_{OUT} = 0V; V_{SEn} = 0V; V_{CC} = 13V; T_J = 125°C			3	
Output - V_{CC} Diode Voltage at T_J = 150°C	V_F	I_{OUT} = −3A; T_A = 125°C		0.7		V
Switching (V_{CC} = 13V; −40°C < T_J < 150°C, Unless Otherwise Specified)						
Turn-On Delay Time at T_J = 25°C(6)	$t_{d(on)}$	R_L = 4.3Ω	35	65	95	µs
Turn-Off Delay Time at T_J = 25°C(6)	$t_{d(off)}$		20	60	100	
Turn-On Voltage Slope at T_J = 25°C(6)	$(dV_{OUT}/dt)_{on}$	R_L = 4.3Ω	0.06	0.2	0.4	V/µs

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Turn-Off Voltage Slope at T_J = 25°C(6)	$(dV_{OUT}/dt)_{off}$		0.15	0.38	0.6	
Switching Energy Losses at Turn-On (t_{won})	W_{ON}	R_L = 4.3Ω		TBD		mJ
Switching Energy Losses at Turn-Off (t_{woff})	W_{OFF}	R_L = 4.3Ω		TBD		mJ
Differential Pulse Skew (t_{PHL} − t_{PLH})(6)	t_{SKEW}	R_L = 4.3Ω	−100	−32	40	µs
Logic Inputs (7V < V_{CC} < 28V; −40°C < T_J < 150°C)						
INPUT0/1 Characteristics						
Input Low Level Voltage	V_{IL}				0.9	V
Low Level Input Current	I_{IL}	V_{IN} = 0.9V	0.8			µA
Input High Level Voltage	V_{IH}		2.1			V
High Level Input Current	I_{IH}	V_{IN} = 2.1V			10	µA
Input Hysteresis Voltage	$V_{I(hyst)}$		0.15			V
$\overline{FaultRST}$ Characteristics						
Input Low Level Voltage	V_{FRL}				0.9	V
Low Level Input Current	I_{FRL}	V_{IN} = 0.9V	0.8			µA
Input High Level Voltage	V_{FRH}		2.1			V
High Level Input Current	I_{FRH}	V_{IN} = 2.1V			10	µA
Input Hysteresis Voltage	$V_{FR(hyst)}$		0.15			V
SEL0 Characteristics (7V < V_{CC} < 18V)						
Input Low Level Voltage	V_{SELL}				0.9	V
Low Level Input Current	I_{SELL}	V_{IN} = 0.9V	0.8			µA
Input High Level Voltage	V_{SELH}		2.1			V
High Level Input Current	I_{SELH}	V_{IN} = 2.1V			10	µA
Input Hysteresis Voltage	$V_{SEL(hyst)}$		0.15			V
SEn Characteristics (7V < V_{CC} < 18V)						
Input Low Level Voltage	V_{SEnL}				0.9	V
Low Level Input Current	I_{SEnL}	V_{IN} = 0.9V	0.8			µA
Input High Level Voltage	V_{SEnH}		2.1			V
High Level Input Current	I_{SEnH}	V_{IN} = 2.1V			10	µA
Input Hysteresis Voltage	$V_{SEn(hyst)}$		0.15			V
Protections (7V < V_{CC} < 18V; −40°C < T_J < 150°C)						
DC Short-Circuit Current	I_{LIMH}	V_{CC} = 13V; T_A = 25°C, with 10µH shorted to GND	TBD	15	TBD	A
		V_{CC} = 13V; T_A = 150°C, with 10µH shorted to GND	TBD		TBD	
		4V < V_{CC} < 18V(2)			TBD	
Short-Circuit Current During Thermal Cycling	I_{LIML}	V_{CC} = 13V; T_R < T_J < T_{TSD}		7.5		
Shutdown Temperature	T_{TSD}		TBD	175	TBD	°C
Reset Temperature(2)	T_R			T_{TSD} − 10		

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Thermal Reset of Fault Diagnostic Indication	T_{RS}	V_{FR} = 0V; V_{SEn} = 5V		135		
Thermal Hysteresis ($T_{TSD} - T_R$)(2)	T_{HYST}			10		
Dynamic Temperature	ΔT_{J_SD}	T_J = −40°C; V_{CC} = 13V		60		°C
Fault Reset Time for Output Unlatch(2)	t_{LATCH_RST}	V_{FR} = 5V to 0V within 2ms after fault occurs; V_{SEn} = 5V; V_{IN} = 5V; V_{SEL0} = 0V		2		ms
		V_{FR} = 5V to 0V longer than 2ms after fault occurs; V_{SEn} = 5V; V_{IN} = 5V; V_{SEL0} = 0V		50		µs
Turn-Off Output Voltage Clamp	V_{DEMAG}	I_{OUT} = 100mA; T_J = −40°C	TBD			V
		I_{OUT} = 100mA; T_J = 25°C to 150°C		V_{CC} − 45		V
Current Sense (7V < V_{CC} < 18V; −40°C < T_J < 150°C)						
Current Sense Clamp Voltage	V_{SENSE_CL}	V_{SEn} = 0V; I_{SENSE} = 1mA	−10.0	−9.3		V
		V_{SEn} = 0V; I_{SENSE} = −1mA		5.1		
Current Sense Characteristics						
I_{OUT}/I_{SENSE}	K_0	I_{OUT} = 0.25A; V_{SENSE} = 0.5V; V_{SEn} = 5V; T_A = 25°C	1100	1190	1280	
Current Sense Ratio Drift(5)(7)	dK_0/K_0	I_{OUT} = 0.25A; V_{SENSE} = 0.5V; V_{SEn} = 5V; T_A = −40°C to 150°C	TBD		TBD	%
I_{OUT}/I_{SENSE}	K_1	I_{OUT} = 0.5A; V_{SENSE} = 0.5V; V_{SEn} = 5V; T_A = 25°C	1150	1200	1250	
Current Sense Ratio Drift(5)(7)	dK_1/K_1	I_{OUT} = 0.5A; V_{SENSE} = 0.5V; V_{SEn} = 5V; T_A = −40°C to 150°C	TBD		TBD	%
I_{OUT}/I_{SENSE}	K_2	I_{OUT} = 15A; V_{SENSE} = 4V; V_{SEn} = 5V; T_A = 25°C	1160	1200	1240	
Current Sense Ratio Drift(5)(7)	dK_2/K_2	I_{OUT} = 15A; V_{SENSE} = 4V; V_{SEn} = 5V; T_A = −40°C to 150°C	TBD		TBD	%
I_{OUT}/I_{SENSE}	K_3	I_{OUT} = 3A; V_{SENSE} = 4V; V_{SEn} = 5V; T_A = 25°C		1200		
Current Sense Ratio Drift(5)(7)	dK_3/K_3	I_{OUT} = 3A; V_{SENSE} = 4V; V_{SEn} = 5V	TBD		TBD	%
CS Current for OL Detection	I_{SENSE_OL}	I_{OUT} = 0.01A; V_{SENSE} = 0.5V; V_{SEn} = 5V		8.9	12	µA
Current Sense Leakage Current	I_{SENSE0}	Current sense disabled: V_{SEn} = 0V			0.5	µA
		Current sense disabled: −1V < V_{SENSE} < 4V(5)	−0.5		0.5	µA
		Current sense enabled: V_{SEn} = 5V; Channel ON; I_{OUT} = 0A; Diagnostic selected; V_{IN0} = 5V; V_{IN1} = 5V; V_{SEL0} = 0V; I_{OUT0} = 0A; I_{OUT1} = 3A		4.6		µA
		Current sense enabled: V_{SEn} = 5V; Channel OFF; Diagnostic selected: V_{IN0} = 0V; V_{IN1} = 5V; V_{SEL0} = 0V; I_{OUT1} = 3A			1	µA
CS Saturation Voltage	V_{SENSE_SAT}	V_{CC} = 7V; R_{SENSE} = 2.7kΩ; V_{SEn} = 5V; V_{IN} = 5V; V_{SEL0} = 0V; I_{OUT} = 6A; T_J = −40°C		5.1	5.5	V
CS Saturation Current(5)	I_{SENSE_SAT}	V_{CC} = 7V; V_{SENSE} = 4V; V_{IN} = 5V; V_{SEn} = 5V; V_{SEL0} = 0V; IOUT = 6A; T_A = 25°C		TBD		mA

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Saturation Current(5)	I_{OUT_SAT}	V_{CC} = 7V; V_{SENSE} = 4V; V_{IN} = 5V; V_{SEn} = 5V; V_{SEL0} = 0V; T_A = 25°C		TBD		A
OFF-State Diagnostic						
OFF-State Open-Load Voltage Detection Threshold	V_{OL}	V_{SEn} = 5V; Chx OFF; Chx diagnostic selected; V_{IN0} = 0V; V_{SEL0} = 0V	2.0	2.9	4.0	V
OFF-State Output Current During Open Load Detection(8)	$I_{L(off2)}$	V_{IN} = 0V; V_{OUT} = V_{OL}; V_{SEn} = 5V; T_J = −40°C to 125°C	0.5	10	50	µA
OFF-State Diagnostic Delay Time from Falling Edge of Input (See **Figure 6**)	t_{DSTKON}	V_{SEn} = 5V; Chx ON to OFF transition; Chx diagnostic selected; e.g. Ch0: V_{IN0} = 5V to 0V; V_{SEL0} = 0V; I_{OUT0} = 0A; V_{OUT} = 4V	200	370	600	µs
Settling Time for Valid OFF-State Open Load Diagnostic Indication from Rising Edge of SEn	$t_{D\_OL\_V}$	V_{IN0} = 0V; V_{IN1} = 0V; V_{FR} = 0V; V_{SEL0} = 0V; V_{OUT} = 4V; V_{SEn} = 0V to 5V		30	60	µs
OFF-State Diagnostic Delay Time from Rising Edge of V_{OUT}	t_{D_VOL}	V_{SEn} = 5V; Chx OFF; Chx diagnostic selected; e.g. Ch0; V_{IN0} = 0V; V_{SEL0} = 0V; V_{OUT} = 0V to 4V		10	30	µs
Fault Diagnostic Feedback (See Table 8)						
Current Sense Output Voltage in Fault Condition	V_{SENSEH}	V_{CC} = 13V; R_{SENSE} = 1kΩ; e.g. Ch0 in open load: V_{IN0} = 0V; V_{SEn} = 5V; V_{SEL0} = 0V; I_{OUT0} = 0A; V_{OUT} = 4V	4.7	5.1	5.5	V
Current Sense Output Current in Fault Condition	I_{SENSEH}	V_{CC} = 13V; V_{SENSE} = 5V	5.4	6.5	7.6	mA
Current Sense Timings (Current Sense Mode—See Figure 5)(9)						
Current Sense Settling Time from Rising Edge of SEn	$t_{DSENSE1H}$	V_{IN} = 5V; V_{SEn} = 0V to 5V; R_{SENSE} = 1kΩ; R_L = 4.3Ω		20	60	µs
Current Sense Disable Delay Time from Falling Edge of SEn	$t_{DSENSE1L}$	V_{IN} = 5V; V_{SEn} = 5V to 0V; R_{SENSE} = 1kΩ; R_L = 4.3Ω		12	20	µs
Current Sense Settling Time from Rising Edge of INPUT	$t_{DSENSE2H}$	V_{IN} = 0V to 5V; V_{SEn} = 5V; R_{SENSE} = 1kΩ; R_L = 4.3Ω		160	400	µs
Current Sense Settling Time from Rising Edge of I_{OUT} (Dynamic Response to a Step Change of I_{OUT})	$\Delta t_{DSENSE2H}$	V_{IN} = 5V; V_{SEn} = 5V; R_{SENSE} = 1kΩ; I_{SENSE} = 90% of $I_{SENSEMAX}$; R_L = 4.3Ω			30	µs
Current Sense Turn-Off Delay Time From Falling Edge of INPUT	$t_{DSENSE2L}$	V_{IN} = 5V to 0V; V_{SEn} = 5V; R_{SENSE} = 1kΩ; R_L = 4.3Ω		8	30	µs
Current Sense Timings (Multiplexer Transition Times)(9)						
Current Sense Transition Delay from ChX to ChY	t_{D_XtoY}	V_{IN0} = 5V; V_{IN1} = 5V; V_{SEn} = 5V; V_{SEL0} = 0V to 5V; I_{OUT0} = 0A; I_{OUT1} = 3A; R_{SENSE} = 1kΩ		10	20	µs
Current Sense Transition Delay from Stable Current Sense on ChX to V_{SENSEH} on ChY	$t_{D\_CStoVSENSEH}$	V_{IN0} = 5V; V_{IN1} = 5V; V_{SEn} = 5V; V_{SEL0} = 0V to 5V; I_{OUT0} = 0A; I_{OUT1} = 3A; R_{SENSE} = 1kΩ		14	20	µs

Note 1: For each channel

Note 2: Parameter guaranteed by design and characterization; not subject to production test.

Note 3: Parameter guaranteed only at V_{CC} = 4V and T_J = 25°C

Note 4: PowerMOS leakage included

Note 5: Parameter specified by design; not subject to production test.

Note 6: See **Figure 4**.

Note 7: All values refer to V_{CC} = 13V; T_J = 25°C, unless otherwise specified.

Note 8: Parameter granted at −40°C < T_J < 125°C

Note 9: Transition delays are measured up to ±10% of final conditions.

Note 10: Not subject to production test and specified by design.

TBD

Figure 2. I_{OUT}/I_{SENSE} vs. I_{OUT}

TBD

Figure 3. Current Sense Accuracy vs. I_{OUT}

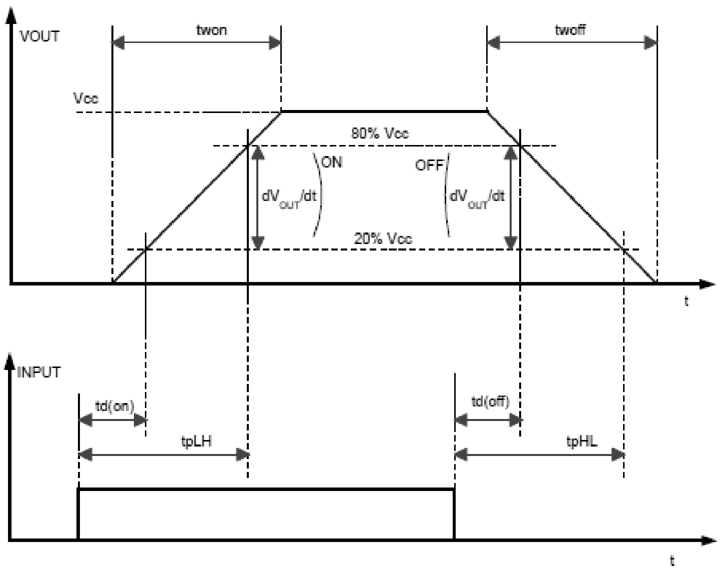


Figure 4. Switching Time and Pulse Skew

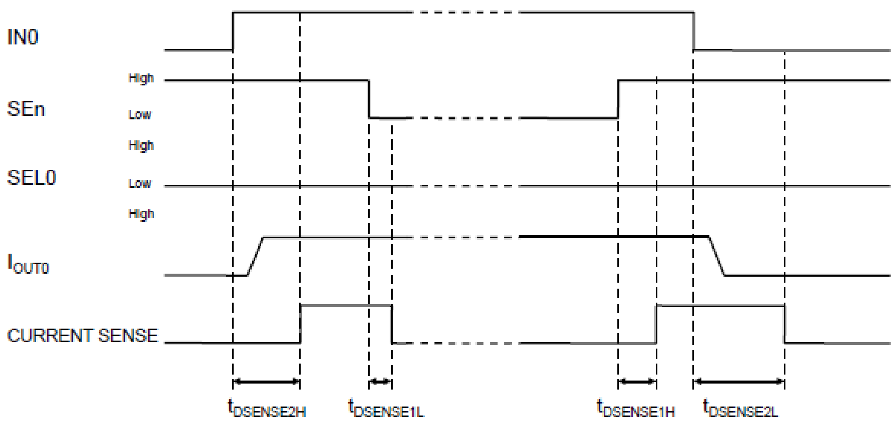


Figure 5. Current Sense Timings (Current Sense Mode)

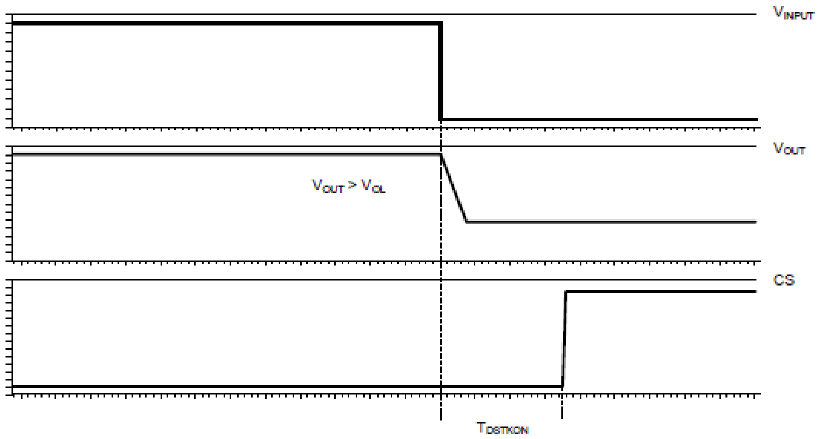


Figure 6. T_{DSTKON}

6. Typical Characteristics

TBD

Figure 7. On-State Resistance vs. T_{case}

TBD

Figure 8. On-State Resistance vs. V_{CC}

7. Package Information

The NPH770280Q is available in the SSOP16PP and SSOP14PP packages.

7.1 SSOP16PP Package

Figure 9 shows the SSOP16PP package view.

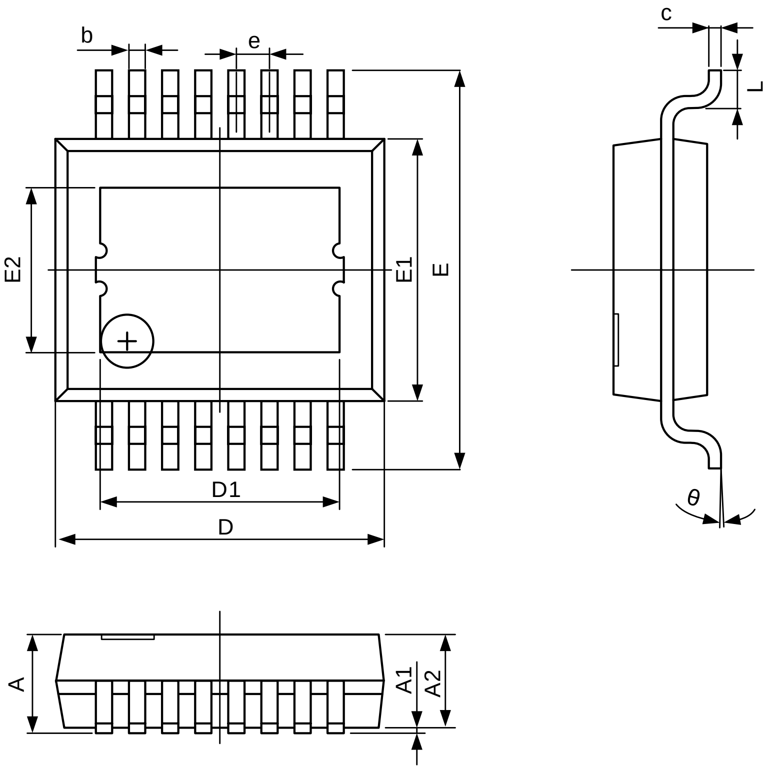


Figure 9. SSOP16PP Package View

Table 9 provides detailed information about the dimensions of the SSOP16PP package.

Table 9. Dimensions of the SSOP16PP Package

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.350	1.650	0.053	0.065
A1	0.000	0.100	0.000	0.004
A2	1.350	1.550	0.053	0.061
b	0.200	0.300	0.008	0.012
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
D1	3.510	3.710	0.138	0.146
E	6.050	6.200	0.238	0.244
E1	3.800	4.000	0.150	0.157
E2	2.400	2.600	0.094	0.102
e	0.500 (BSC)		0.020 (BSC)	
L	0.400	0.900	0.016	0.035
θ	0°	8°	0°	8°

7.2

7.3 SSOP14PP Package

Figure 9 shows the SSOP14PP package view.

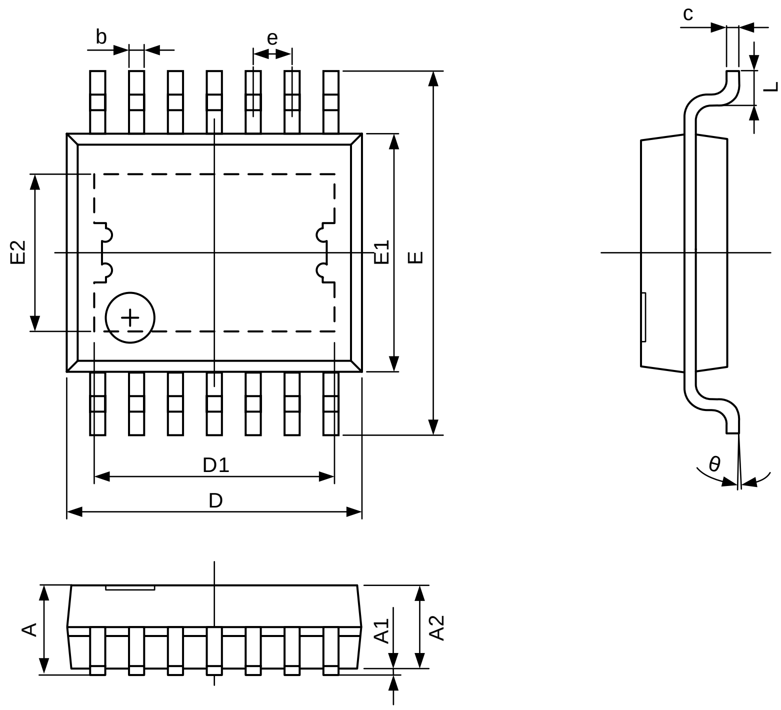


Figure 10. SSOP14PP Package View

Table 9 provides detailed information about the dimensions of the SSOP14PP package.

Table 10. Dimensions of the SSOP14PP Package

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	**Max**	**Min**	**Max**
A	1.350	1.650	0.053	0.065
A1	0.000	0.100	0.000	0.004
A2	1.350	1.550	0.053	0.061
b	0.200	0.300	0.008	0.012
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
D1	3.900	4.100	0.154	0.161
E	6.050	6.200	0.238	0.244
E1	3.800	4.000	0.150	0.157
E2	2.440	2.640	0.096	0.104
e	0.6500 (BSC)		0.026 (BSC)	
L	0.400	0.900	0.016	0.035
θ	0°	8°	0°	8°

8. Tape and Reel Information

TBD