DATASHEET

NPH77008Q/H77008MQ/H77008PQ

Automotive Single-Channel Smart High-Side Driver

Revision	Date	Description
Rel 1.0	28 November 2023	Preliminary release.

1. Features

- Compliant with AEC-Q100 Grade 1
- Single-channel high-side driver with integrated current sense feedback
- Operation voltage range: 4V to 28V, AMR 40V
- On resistance (NPH77008(x)QSSOP16P):
  - 6.2mΩ (Typ, T_J = 25°C)
  - 10.5mΩ (Typ, T_J = 150°C)
- Load current: 12A (Typ)
- Maximum overcurrent limit: 70A (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
  - Sensor output linearly related to V_{CC} or junction temperature
  - 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

2. Applications

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

3. Description

The NPH77008(x)Q is an automotive single-channel smart high side driver. It features 3V/5V CMOS compatible input control interface and one high power output channel. It can also provide smart protections and diagnostics. The H77008(x)Q is extensively used in 12V automotive power supply systems.

The NPH77008(x)Q integrates advanced protection functions, including overcurrent protection, dynamic overtemperature protection, and output latch/hiccup function though the $\overline{\text{FaultRST}}$ pin when thermal shutdown or overcurrent event occurs.

The NPH77008(x)Q also integrates multiplexed analog output through the CS pin to provide complex diagnostic functions, including accurate analog output proportional to loading current, overload, and output short to ground alarms, output short to V_{CC}, and open load detection in OFF state.

The SEL1/SEL0 pins of the H77008MQASSOP16P can also provide sensor output linearly related to V_{CC} or junction temperature to provide the application with real-time monitoring of the power supply voltage and junction temperature of the power FET.

The NPH77008(x)Q 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 NPH77008(x)Q 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 NPH77008(x)Q devices, which greatly reduces system cost.

The NPH77008(x)Q supports the SSOP16PP and SSOP14PP packages. See **Table 1** for the order information.

Note: NPH77008(x)Q refers to H77008Q/H77008MQ/H77008PQ in this document.

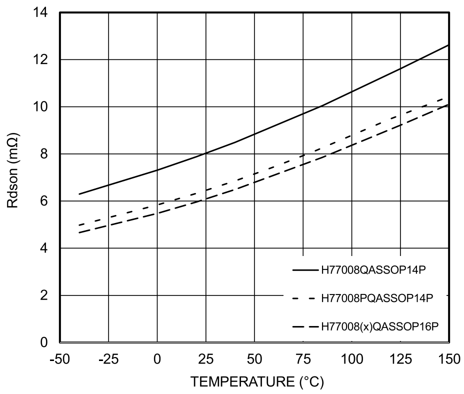

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Table 1. Order Information

Order Number	Package	Mark	V_{CC} / T_J Sense Output	Rdson (mΩ)	I_{Limit} (A)	K_2	Rating	Pkg. Option
NPH77008QASSOP16P	SSOP16PP	H77008Q	No	6.2	70	5950	Auto	T/R-3000
NPH77008MQASSOP16P	SSOP16PP	H77008MQ	Yes	6.2	70	5950	Auto	T/R-3000
NPH77008PQASSOP14P	SSOP14PP	H77008PQ	No	6.5	70	5400	Auto	T/R-3000
NPH77008QASSOP14P	SSOP14PP	H77008Q	No	8.1	60	5400	Auto	T/R-3000

4. Pin Configuration and Functions

4.1 SSOP16PP package

Figure 1 illustrates the pin configuration (SSOP16PP package).

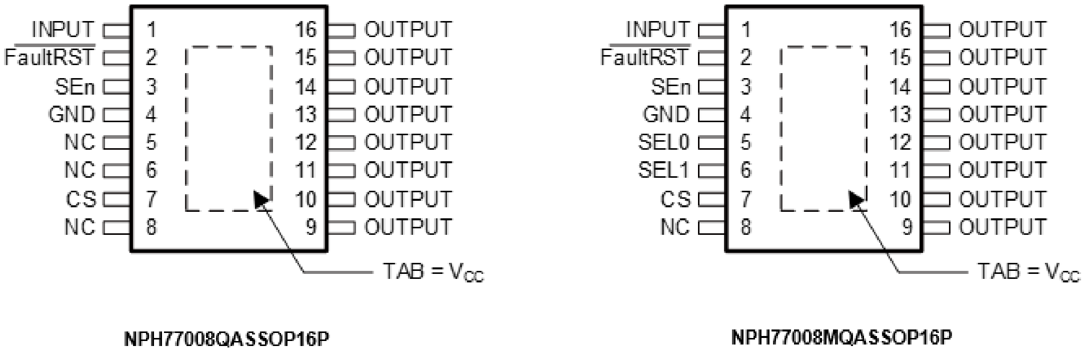

Figure 1. Pin Configuration (SSOP16PP Package)

Table 2 lists the pin functions (SSOP16PP package).

Table 2. Pin Functions (SSOP16PP Package)

Position	Name	Type	Description
1	INPUT	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.
5-6	NC or SEL0/SEL1	---	**NC for H77008QASSOP16P** Not connect for this pin. **SEL0/SEL1 for H77008MQASSOP16P** Active high compatible with 3V and 5V CMOS outputs pin; addressing the CS output multiplexer.
7	CS	Output	Analog current sense output pin. It delivers a current proportional to the load current, fault indication, or V_{CC} / T_J sense depending on the configuration of pins 5 and 6.
8	NC	---	Not connect for this pin.
9-16	OUTPUT	Output	Power outputs. All the pins must be connected together.
---	V_{CC}	Power	Battery connection

4.2 SSOP14PP package

Figure 2 illustrates the pin configuration (SSOP14PP package).

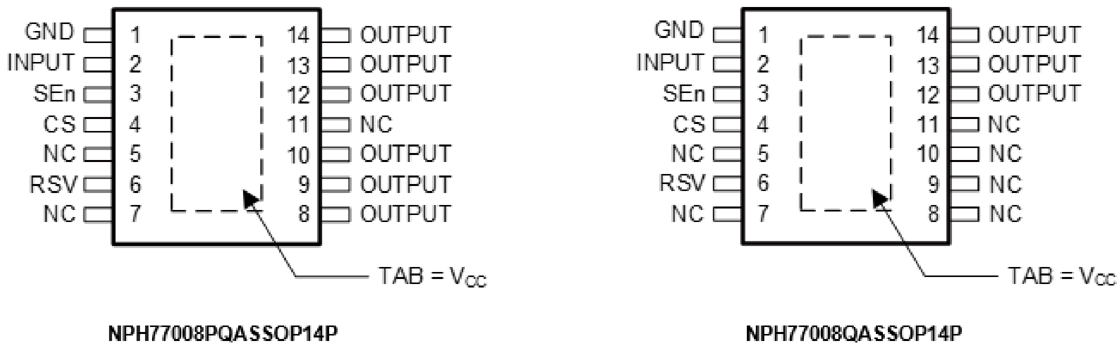

Figure 2. Pin Configuration (SSOP14PP Package)

Table 3 lists the pin functions (SSOP14PP package).

Table 3. Pin Functions (SSOP14PP Package)

Position	Name	Type	Description
1	GND	Ground	Ground connection. Must be reverse battery protected by an external diode / resistor network.
2	INPUT	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	Ground	Analog current sense output pin. It delivers a current proportional to the load current or fault indication.
5, 7, 11	NC	Input	Not connect for this pin.
6	RSV	---	Reserved for internal use. Pulled down to GND internally. Please leave this pin floating in application.
8-10	OUTPUT or NC	---	**OUTPUT for H77008PQASSOP14P** Power outputs. All the pins must be connected together. **NC for H77008QASSOP14P** Not connected for this pin.
12-14	OUTPUT	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 NPH77008(x)Q.

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 NPH77008(x)Q.

Table 5. ESD Ratings

Parameter	Symbol	Description	Value	Units
Electrostatic Discharge	$V_{(ESD)}$	Human-body model (HBM), per AEC Q100-002, all pins	±2000	V
		Human-body model (HBM), per AEC Q100-002, V_{CC} and output	±8000	
		Charged-device model (CDM), per AEC Q100-011	±1000	

5.3 Recommended Operating Conditions

Table 6 lists the recommended operating conditions for the NPH77008(x)Q.

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 NPH77008(x)Q.

Table 7. Thermal Information

Parameter	Symbol	NPH77008(x)QSSOP16P	NPH77008(x)QSSOP14P	Units
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	28.3	28.2	°C/W
Junction-to-Top Characterization Parameter	ψ_{JT}	2.8	2.8	°C/W
Junction-to-Case (Bottom) Thermal Resistance	$R_{\theta JC(bot)}$	0.6	0.6	°C/W

5.5 Electrical Characteristics

Table 8 lists the electrical characteristics of the NPH77008(x)Q. 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
Shutdown Temperature (V_{CC} Decreasing)(2)		T_{TSD}	V_{CC} = 2.85V; V_{CC} decreasing	140			°C
Power							
Operating Supply Voltage		V_{CC}		4	13	28	V
Undervoltage Shutdown		V_{USD}				2.85	V
Undervoltage Shutdown Reset		$V_{USDReset}$				5	V
On-State Resistance(1)	H77008QASSOP16P, H77008MQASSOP16P	R_{ON}	I_{OUT} = 5A; T_J = 25°C		6.2		mΩ
			I_{OUT} = 5A; T_J = 150°C			TBD	
			I_{OUT} = 5A; V_{CC} = 4V; T_J = 25°C(3)			TBD	
	H77008PQASSOP14P	R_{ON}	I_{OUT} = 5A; T_J = 25°C		6.5		mΩ
			I_{OUT} = 5A; T_J = 150°C			TBD	
			I_{OUT} = 5A; V_{CC} = 4V; T_J = 25°C(3)			TBD	
	H77008QASSOP14P	R_{ON}	I_{OUT} = 5A; T_J = 25°C		8.1		mΩ
			I_{OUT} = 5A; T_J = 150°C			TBD	
			I_{OUT} = 5A; V_{CC} = 4V; T_J = 25°C(3)			TBD	
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)			TBD	
			V_{CC} = 13V; V_{IN} = V_{OUT} = V_{FR} = V_{SEn} = 0V; V_{SEL0} = 0V; T_J = 125°C		0.8		
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		3.3		mA
Control Stage Current Consumption in ON State. Output ON.		$I_{GND(ON)}$	V_{CC} = 13V; V_{SEn} = 5V; V_{FR} = V_{SEL0} = 0V; V_{IN0} = 5V; V_{IN1} = 5V; I_{OUT0} = 5A		3.9		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		µA
			V_{IN} = V_{OUT} = 0V; V_{SEn} = 0V; V_{CC} = 13V; T_J = 125°C		1.2		
Output - V_{CC} Diode Voltage at T_J = 150°C		V_F	I_{OUT} = −3A; T_J = 150°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 = 2.6Ω		40		µs

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Turn-Off Delay Time at T_J = 25°C[6]	$t_{d(off)}$			92		
Turn-On Voltage Slope at T_J = 25°C[6]	$(dV_{OUT}/dt)_{on}$	R_L = 2.6Ω		0.2		V/µs
Turn-Off Voltage Slope at T_J = 25°C[6]	$(dV_{OUT}/dt)_{off}$			0.2		
Switching Energy Losses at Turn-On (t_{won})	W_{ON}	R_L = 2.6Ω	---	0.4	TBD[2]	mJ
Switching Energy Losses at Turn-Off (t_{woff})	W_{OFF}	R_L = 2.6Ω	---	0.5	TBD[2]	mJ
Differential Pulse Skew (t_{PHL} − t_{PLH})[6]	t_{SKEW}	R_L = 2.6Ω		62		µs
Logic Inputs (7V < V_{CC} < 28V; −40°C < T_J < 150°C)						
INPUT 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
$\overline{\text{FaultRST}}$ Characteristics						
Input Low Level Voltage	V_{FRL}				0.9	V
Low Level Input Current	I_{FRL}	V_{IN} = 0.9V	TBD	0.6		µA
Input High Level Voltage	V_{FRH}		2.1			V
High Level Input Current	I_{FRH}	V_{IN} = 2.1V		2.3	TBD	µA
Input Hysteresis Voltage	$V_{FR(hyst)}$		0.15			V
SEn 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
SEL1/SEL0 Characteristics						
Input Low Level Voltage	V_{SEnL}				0.9	V
Low Level Input Current	I_{SEnL}	V_{IN} = 0.9V	TBD	0.6		µA
Input High Level Voltage	V_{SEnH}		2.1			V
High Level Input Current	I_{SEnH}	V_{IN} = 2.1V		2.3	TBD	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: NPH77008(x)QSSOP16P, H77008PQSSOP14	I_{LIMH}	V_{CC} = 13V		70	TBD	A
DC Short-Circuit Current: H77008QSSOP14				60		
Short-Circuit Current, During Thermal Cycling	I_{LIML}	V_{CC} = 13V; T_R < T_J < T_{TSD}		0.5 × I_{LIMH}		
Shutdown Temperature	T_{TSD}		155	175	200	°C

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Reset Temperature[2]	T_R			T_{TSD} − 10		
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}	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		
		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		V_{CC} − 44		V
		I_{OUT} = 100mA; T_J = 25°C to 150°C		V_{CC} − 44		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		−9.3		V
		V_{SEn} = 0V; I_{SENSE} = −1mA		5.1		
Current Sense Characteristics						
I_{OUT}/I_{SENSE} NPH77008(x)QSSOP16P	K_0	I_{OUT} = 0.9A; V_{SENSE} = 0.5V; V_{SEn} = 5V	5600	5920	6300	
NPH77008(x)QSSOP14P			5100	5420	5750	
Current Sense Ratio Drift[5][7]	dK_0/K_0	I_{OUT} = 0.9A; V_{SENSE} = 0.5V; V_{SEn} = 5V	TBD		TBD	%
I_{OUT}/I_{SENSE} NPH77008(x)QSSOP16P	K_1	I_{OUT} = 1.5A; V_{SENSE} = 0.5V; V_{SEn} = 5V	5700	5930	6200	
NPH77008(x)QSSOP14P			5150	5430	5700	
Current Sense Ratio Drift[5][7]	dK_1/K_1	I_{OUT} = 1.5A; V_{SENSE} = 0.5V; V_{SEn} = 5V	TBD		TBD	%
I_{OUT}/I_{SENSE} NPH77008(x)QSSOP16P	K_2	I_{OUT} = 6A; V_{SENSE} = 4V; V_{SEn} = 5V	5750	5950	6150	
NPH77008(x)QSSOP14P			5250	5450	5650	
Current Sense Ratio Drift[5][7]	dK_2/K_2	I_{OUT} = 6A; V_{SENSE} = 4V; V_{SEn} = 5V	TBD		TBD	%
I_{OUT}/I_{SENSE} NPH77008(x)QSSOP16P	K_3	I_{OUT} = 18A; V_{SENSE} = 4V; V_{SEn} = 5V	5750	5950	6150	
NPH77008(x)QSSOP14P			5250	5450	5650	
Current Sense Ratio Drift[5][7]	dK_3/K_3	I_{OUT} = 18A; 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		2		µA
Current Sense Leakage Current	I_{SENSE0}	Current sense disabled: V_{SEn} = 0V			0.5	nA
		Current sense disabled: −1V < V_{SENSE} < 5V[5]	−0.5		0.5	nA
		Current sense enabled: V_{SEn} = 5V; Channel ON; I_{OUT} = 0A; Diagnostic selected; V_{IN} = 5V; V_{SEL0} = V_{SEL1} = 0V; I_{OUT0} = 0A		0.1		µA
		Current sense enabled: V_{SEn} = 5V; Channel OFF; Diagnostic selected: V_{IN0} = 0V; V_{SEL0} = V_{SEL1} = 0V; I_{OUT1} = 3A		0.1		µA

Parameter	Symbol	Conditions	Min	Typ	Max	Units
CS Saturation Voltage	V_{SENSE_SAT}	V_{CC} = 7V; R_{SENSE} = 2.7kΩ; V_{SEn} = 5V; V_{IN} = 5V; V_{SEL0} = 0V; I_{OUT} = 18A; T_J = −40°C		5.15		V
CS Saturation Current[5]	I_{SENSE_SAT}	V_{CC} = 7V; V_{SENSE} = 4V; V_{IN} = 5V; V_{SEn} = 5V; V_{SEL0} = 0V; I_{OUT} = 24A; T_A = 25°C		4.0		mA
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		2.9		V
OFF-State Output Sink Current[8]	$I_{L(off2)}$	V_{IN} = 0V; V_{OUT} = V_{OL}; V_{SEn} = 5V; T_J = −40°C to 125°C		10		µA
OFF-State Diagnostic Delay Time from Falling Edge of Input (See **Figure 7)**	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		370		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		55		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		µs
Device Temperature Analog Feedback						
MultiSense Output Voltage Proportional to T_J[10]	V_{SENSE_TC}	V_{SEn} = 5V; V_{SEL0} = 0V; V_{SEL1} = 5V; V_{IN} = 0V; R_{SENSE} = 1kΩ; T_J = −40°C		2.39		V
MultiSense Output Voltage Proportional to T_J[10]	V_{SENSE_TC}	V_{SEn} = 5V; V_{SEL0} = 0V; V_{SEL1} = 5V; V_{IN} = 0V; R_{SENSE} = 1kΩ; T_J = 25°C		2.06		V
		V_{SEn} = 5V; V_{SEL0} = 0V; V_{SEL1} = 5V; V_{IN} = 0V; R_{SENSE} = 1kΩ; T_J = 125°C		1.48		V
Temperature Coefficient	dV_{SENSE_TC}/dT	T_J = −40°C to 150°C		−5.5		mV/°C
Transfer Function		V_{SENSE_TC} (T) = V_{SENSE_TC} (T0) + dV_{SENSE_TC} / dT − (T − T0)				
V_{CC} Supply Voltage Analog Feedback						
CS Output Voltage Proportional to V_{CC}	V_{SENSE_VCC}	V_{CC} = 13V; V_{SEn} = 5V; V_{SEL0} = 5V; V_{SEL1} = 5V; V_{IN} = 0V; R_{SENSE} = 1kΩ		3.3		V
Transfer Function		V_{SENSE_VCC} = V_{CC} / 4				
Fault Diagnostic Feedback						
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		5.1		V
Current Sense Output Current in Fault Condition	I_{SENSEH}	V_{CC} = 13V; V_{SENSE} = 5V		6.7		mA
Current Sense Timings (Current Sense Mode—See Figure 6)[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 = 2.6Ω		16		µs

Parameter	Symbol	Conditions	Min	Typ	Max	Units
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 = 2.6Ω		12		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 = 2.6Ω		110		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 = 2.6Ω			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		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: Subject to change in mass production.

TBD

Figure 3. I_{OUT}/I_{SENSE} vs. I_{OUT}

TBD

Figure 4. Current Sense Accuracy vs. I_{OUT}

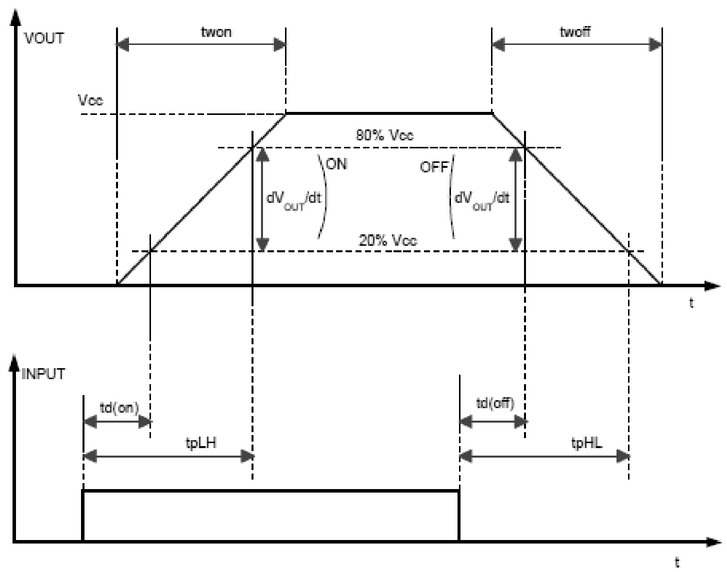

Figure 5. Switching Time and Pulse Skew

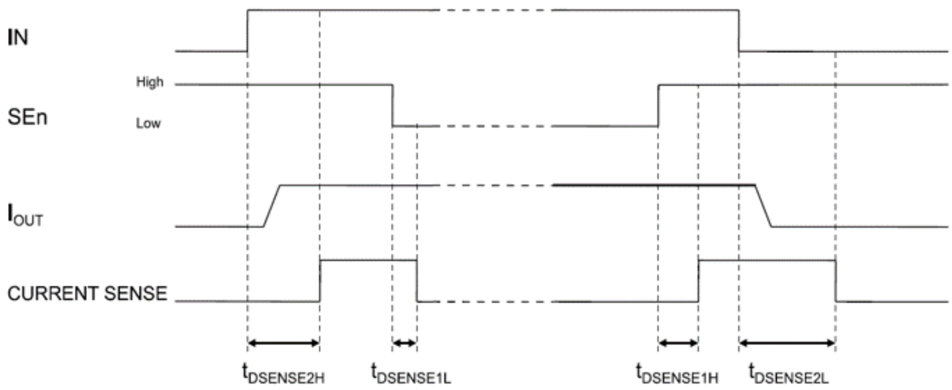

Figure 6. Current Sense Timings (Current Sense Mode)

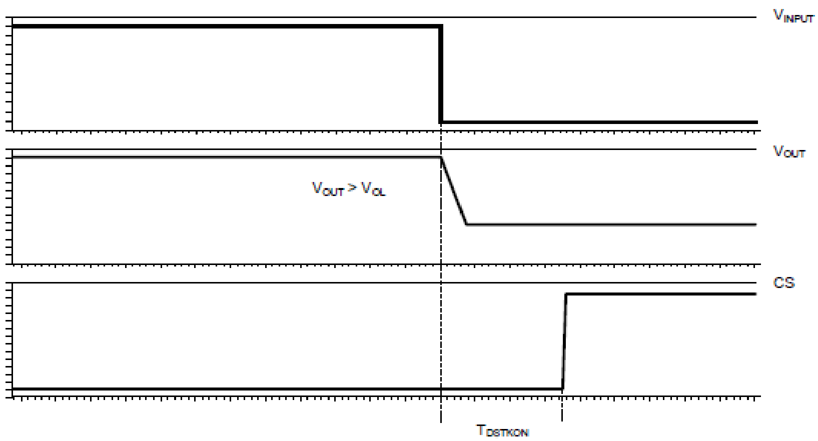

Figure 7. T_{DSTKON}

6. Typical Characteristics

TBD

Figure 8. On-State Resistance vs. T_{case}

TBD

Figure 9. On-State Resistance vs. V_{CC}

7. Package Information

The NPH77008(x)Q is available in the SSOP16PP and SSOP14PP packages.

7.1 SSOP16PP Package

Figure 10 shows the SSOP16PP package view.

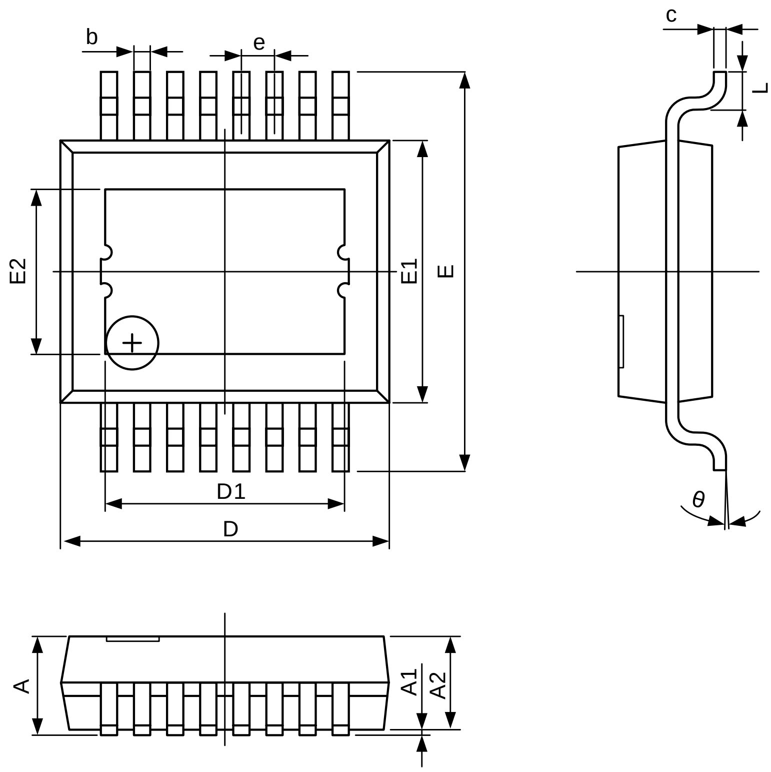

Figure 10. SSOP16PP Package View

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 SSOP14PP Package

Figure 11 shows the SSOP14PP package view.

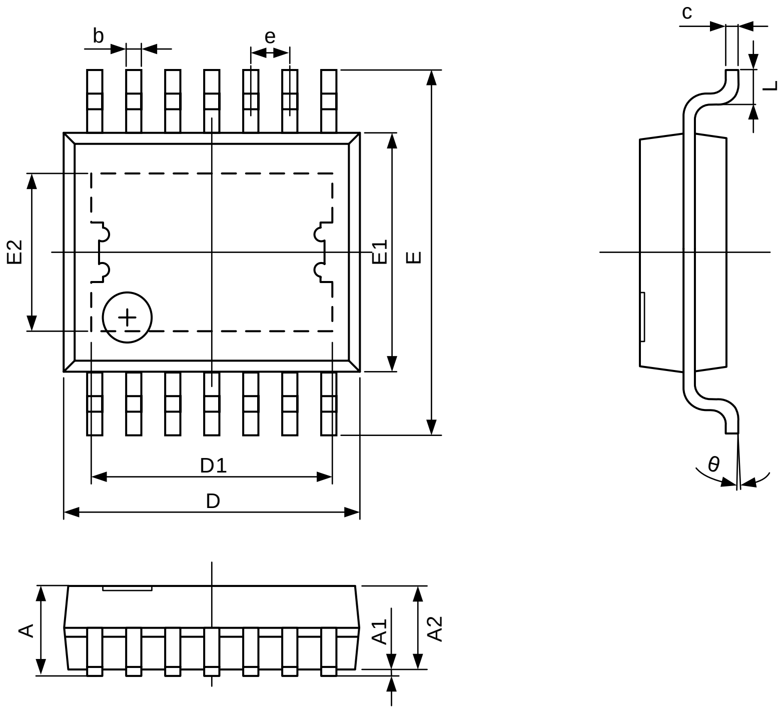

Figure 11. SSOP14PP Package View

Table 10 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