8 Channel Half-Bridge Driver

NCV7724B

Features

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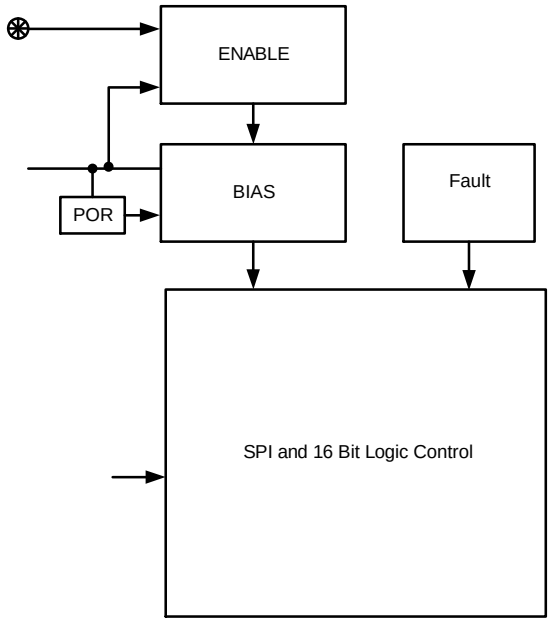
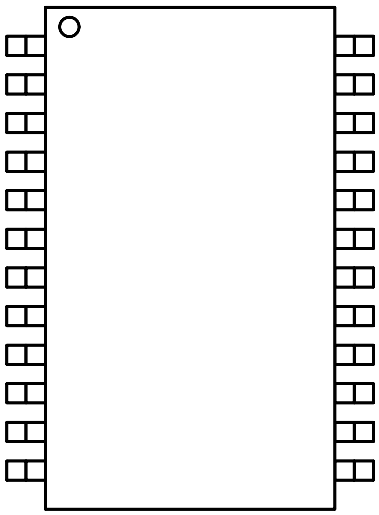


Figure 2. Block Diagram



MAXIMUM RATINGS (Voltages are with respect to GND)

Rating		Symbol	Value	Unit
VSx Pin Voltage	(VS1, VS2) (DC) (AC), t < 500 ms, Ivsx > 2 A	 VsxdcMax VSxac	 0.3 to 45 1.0	V
Pin Voltage	(Vcc, SI, SCLK, CSB, SO, EN, PWM1, PWM2)	VioMax	0.3 to 5.5	V
OUTx Pin Voltage	 (DC) (AC) (AC), t < 500 ms, IOUTx > 1.1 A (AC), t < 500 ms, IOUTx < 1 A	 VoutxDc VoutxAc	 0.3 to 45 0.3 to 45 1.0 1.0	V
OUTx Pin Current (OUT1, ..., OUT8)		IoutxImax	2.0 to 2.0	A
Junction Temperature Range		T_J	40 to 150	°C
Storage Temperature Range		Tstr	55 to 150	°C
Peak Reflow Soldering Temperature: Pb free 60 to 150 seconds at 217°C		(Note 1)	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. See or download **onsemi**'s Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ATTRIBUTES

Characteristic	Symbol	Value	Unit
Short Circuit Reliability Characterization	AECQ10x	Grade A	

ESD Capability

Human Body Model per AEC Q100per AEC1 4002 .9071 14.7T 40Sxac

ELECTRICAL CHARACTERISTICS

($40°C \le T_J \le 150°C$, $5.5\ V \le VSx \le 40\ V$, $3.15\ V \le V_{CC} \le 5.25\ V$, $EN = V_{CC}$, unless otherwise specified.)

Characteristic	Symbol	Conditions	Min	Typ	Max	Unit
POWER SUPPLIES						
Supply Current (VS1 + VS2) Sleep Mode	IqVSx85	VS1 = VS2 = 13.2 V, V_{CC} = 0 V 40°C to 85°C		1.0	2.5	A
Supply Current (VS1 + VS2) Active Mode	IvsOp	EN = V_{CC}, 5.5V < VSx < 32 V No Load,All Outputs Off		0.5	1.0	mA
Supply Current (Vcc) Sleep Mode Active Mode	IqV_{CC} $IV_{CC}Op$	CSB = V_{CC}, EN = SI = SCLK = 0 V 40°C to 85°C EN = CSB = V_{CC}, SI = SCLK = 0 V No Load, All Outputs Off		1.0 1.5	2.5 3.0	A mA
Total Sleep Mode Current I(VS1) + I(VS2) + I(VCC)	IqTot	Sleep Mode, 40°C to 85°C VS1 = VS2 = 13.2 V, No Load		2.0	5.0	A
VCC Power on Reset Threshold	V_{CC}por	V_{CC} increasing		2.70	2.90	V
VSx Undervoltage Detection Threshold	VSxuv	VSx increasing	3.7	4.3	4.7	V
		VSx decreasing	3.5	4.1	4.5	
VSx Undervoltage Detection Hysteresis	VSxuHys			200		mV
VSx Overvoltage Detection Threshold	VsXov	VSx increasing				

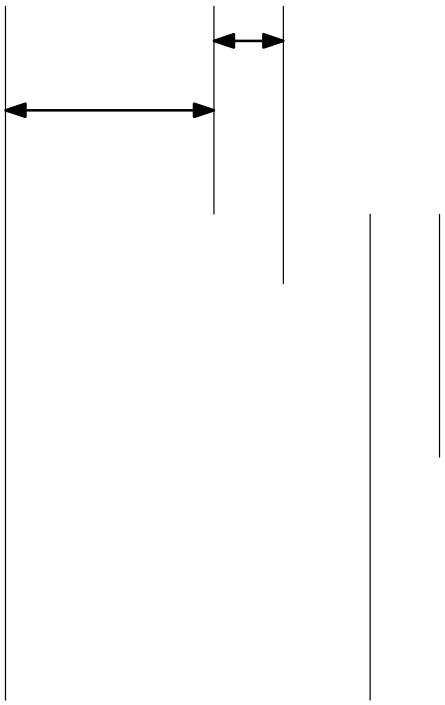
ELECTRICAL CHARACTERISTICS
(40°C ≤ T_J ≤ 150°C, 5.5 V ≤ VSx ≤ 40 V, 3.15 V ≤ V_{CC} ≤ 5.25 V, EN = V_{CC}, unless otherwise specified.) (continued)

Characteristic	Symbol	Conditions	Min	Typ	Max	Unit
DRIVER OUTPUT SWITCHING CHARACTERISTICS						
Low Side Off to High Side On Non Overlap Time	TlsOffHsOn	Vs = 13.2 V, R_{load} = 70 Ω	5			s
PWM High to High Side On Time	ThsOnPWM	Vs = 13.2 V, R_{load} = 70 Ω		120	165	s
PWM Low to High Side Off Time	ThsOffPWM	Vs = 13.2 V, R_{load} = 70 Ω		20	45	s
PWM High to Low Side On Time	TlsOnPWM	Vs = 13.2 V, R_{load} = 70 Ω		120	165	s
PWM Low to Low Side Off Time	TlsOffPWM	Vs = 13.2 V, R_{load} = 70 Ω		35	75	s
THERMAL RESPONSE						
Thermal Warning	Twr	(Note 3)	120	140	170	°C
Thermal Warning Hysteresis	TwHy	(Note 3)		20		°C
Thermal Shutdown	Tsd	(Note 3)	150	175	200	°C
Thermal Shutdown Hysteresis	TsdHy	(Note 3)		20		°C

ELECTRICAL CHARACTERISTICS
($-40°C \le T_J \le 150°C$, $5.5\ V \le VSx \le 40\ V$, $3.15\ V \le V_{CC} \le 5.25\ V$, $EN = V_{CC}$, unless otherwise specified.) (continued)

Characteristic	Symbol	Conditions	Timing Charts #	Min	Typ	Max	Unit
SERIAL PERIPHERAL INTERFACE							
SCLK Frequency	Fclk					5.0	MHz
SCLK Clock Period	TpClk	V_{CC} = 5 V V_{CC} = 3.3 V		200 500			ns
SCLK High Time	TclkH		1	85			ns
SCLK Low Time	TclkL		2	85			ns
SCLK Setup Time	TclkSup		3, 4	85			ns
SI Setup Time	TsiSup		11				

CHARACTERISTIC TIMING DIAGRAMS



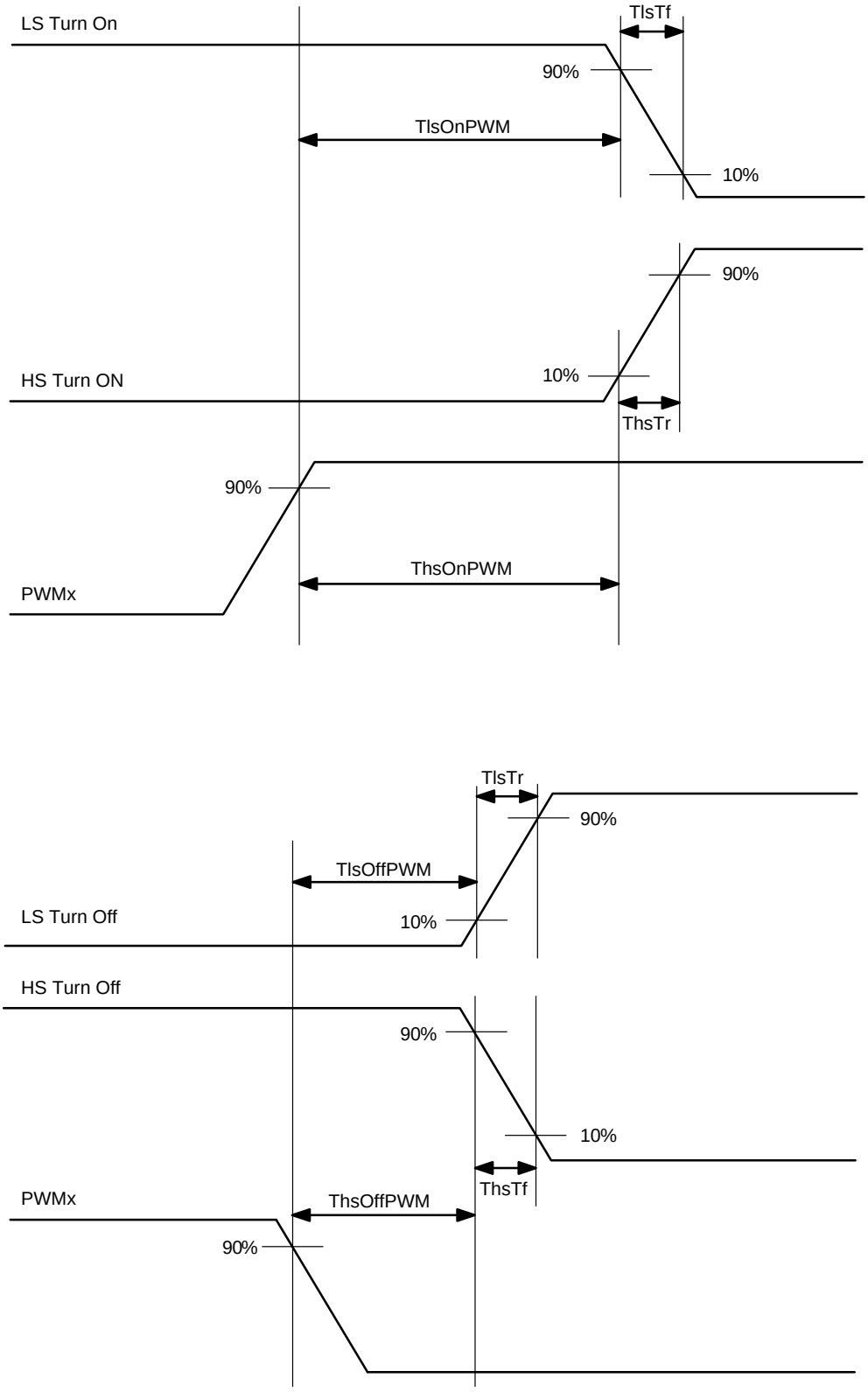


Figure 5. Detailed Driver Timing (OUT1 / OUT2 PWM)

TYPICAL CHARACTERISTICS

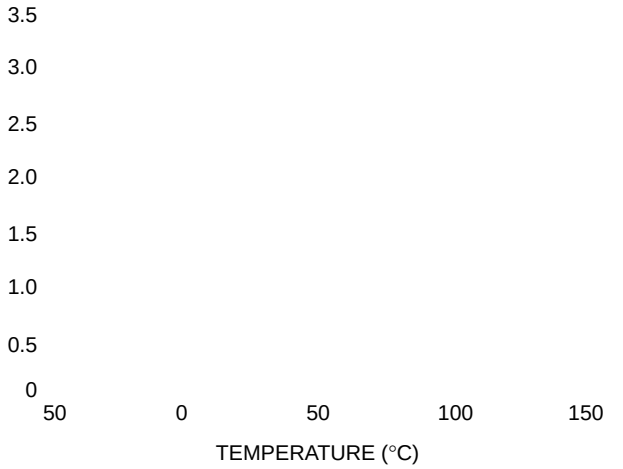


Figure 7. $I_{Q(tot)}$ vs. Temperature

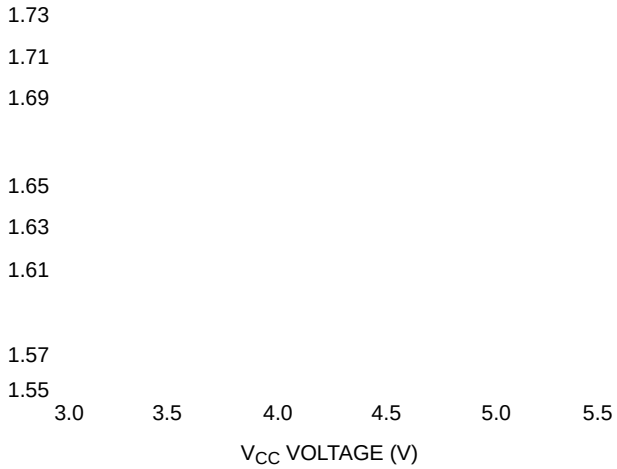


Figure 8. $I_{(Vcc)}$ Active Mode vs. $V_{(Vcc)}$

Figure 9. $R_{DS(on)}$ vs. Temperature

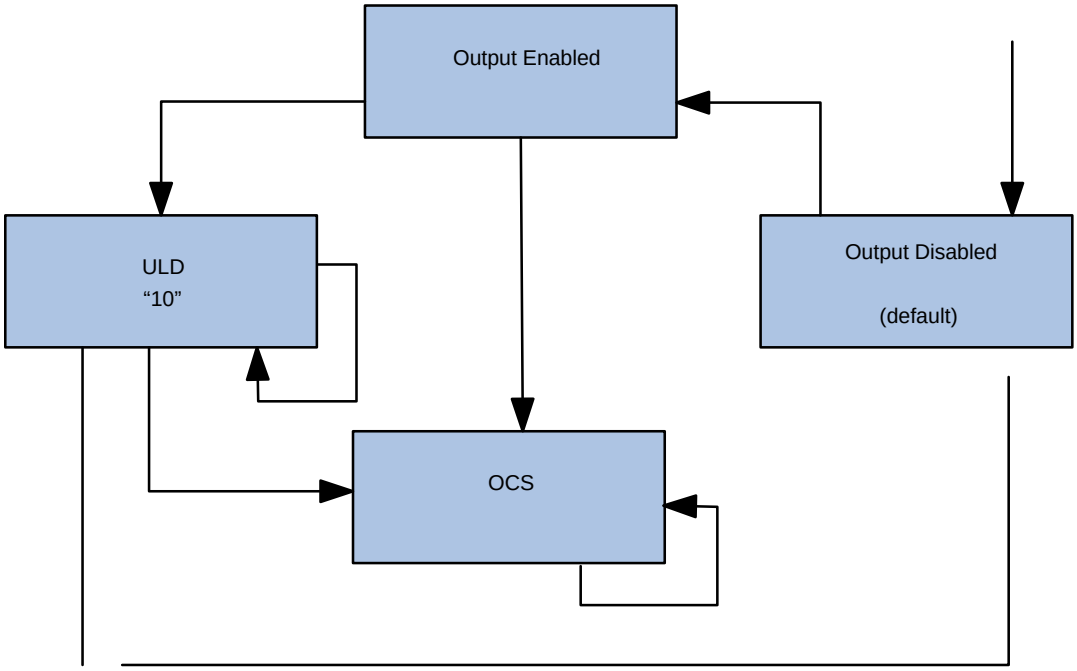
Figure 10. Body Diode Voltage vs. Temperature

Table 1. SPI COMMAND INPUT DEFINITIONS

Channels 8 – 7 (Input Bit # 14 = 1)				
Bit#	**Name**	**Function**	**Status***	**Scope**
15	SRR			

Table 2. SPI STATUS OUTPUT DEFINITIONS

Channels 8 – 7 (If Previous Input Bit # 14 = 1)				
Bit#	**Name**	**Function**	**Status***	**Scope**
PRE_15	TSD	Latched Thermal Shutdown	1 = Fault	Global Notification; Per Half Bridge Operation
15	OCS	Latched Overcurrent Shutdown	1 = Fault	Notification per **HBSEL**; Per Half Bridge Operation
14	PSF	VS1 and/or VS2 Undervoltage or Overvoltage	1 = Fault	Global Notification and Global Operation
13	ULD	Underload Detect	1 = Fault	Notification per **HBSEL**; Per Half Bridge Operation
12	X	Not Used		
11				
10				
9				
8				
7				
6				
5				
4	HBST8 [1:0]	Half Bridge 8 Output Status	0x00b – Output Disabled 0x01b – OCS 0x10b – ULD 0x11b – Output Enabled	Per Half Bridge
3				
2	HBST7 [1:0]	Half Bridge 7 Output Status		
1				
0	TW	Thermal Warning	1 = Fault	Global Notification; Per Half Bridge Operation


Output Enabled
ULD
“10”
Output Disabled
(default)
OCS

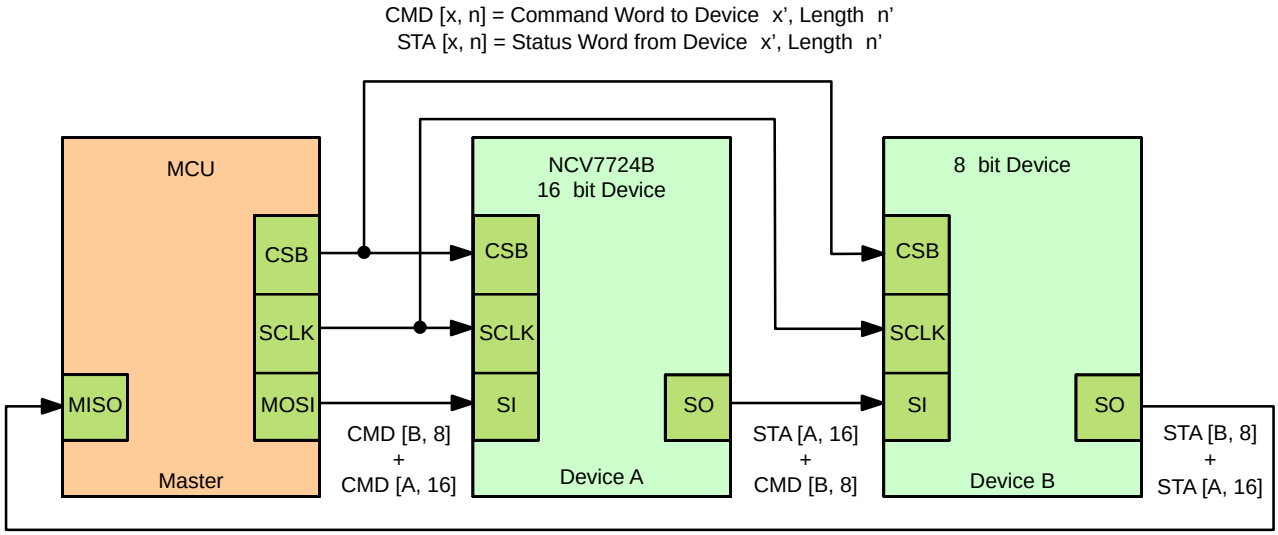


Figure 15. Daisy Chain Configuration

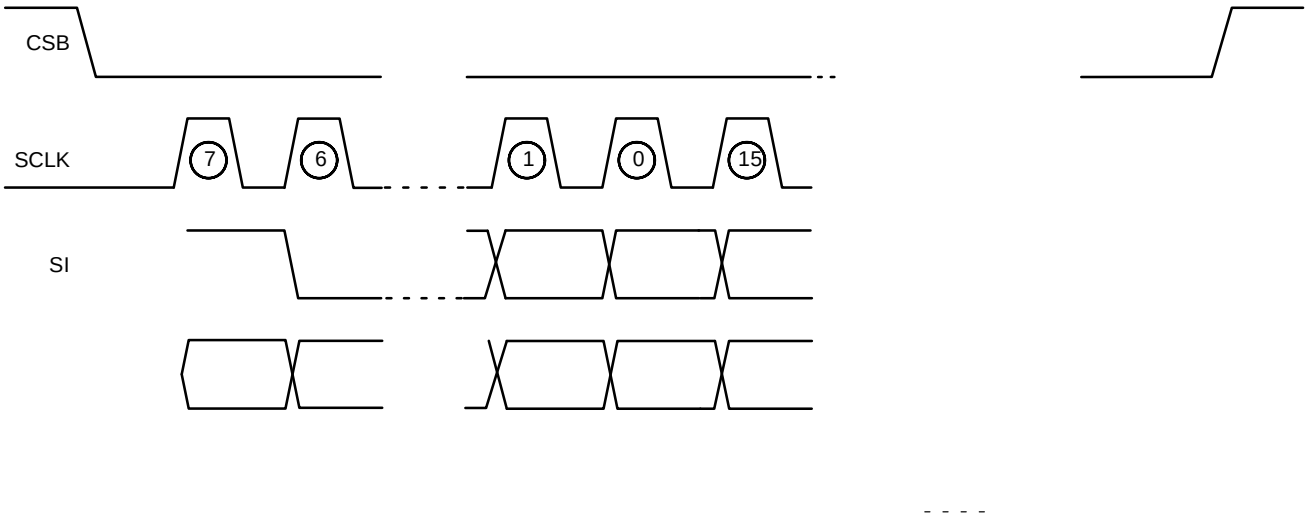
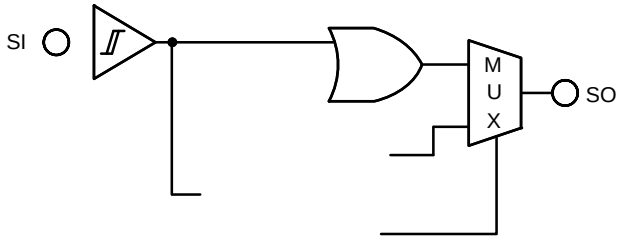


Figure 16. Daisy Chain – 24 bit Frame Format


SI
M
U
X
SO

Power Up/Down Control

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DIAGNOSTICS, PROTECTIONS, STATUS REPORTING AND RESET

Overview

Table 3. DIAGNOSTIC CL01 ions can be chang62 9 310INTUS REmem

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Diagnostics Details

Undervoltage Lockout

Global Notification, Global Operation

OUTx

Underload Shutdown

Global and per Channel Notification per HBSEL
Shutdown Control per HBSEL,
Per Half−Bridge Operation

Thermal Warning and Thermal Shutdown

Global Notification, Per Half−Bridge Operation

THERMAL PERFORMANCE ESTIMATES

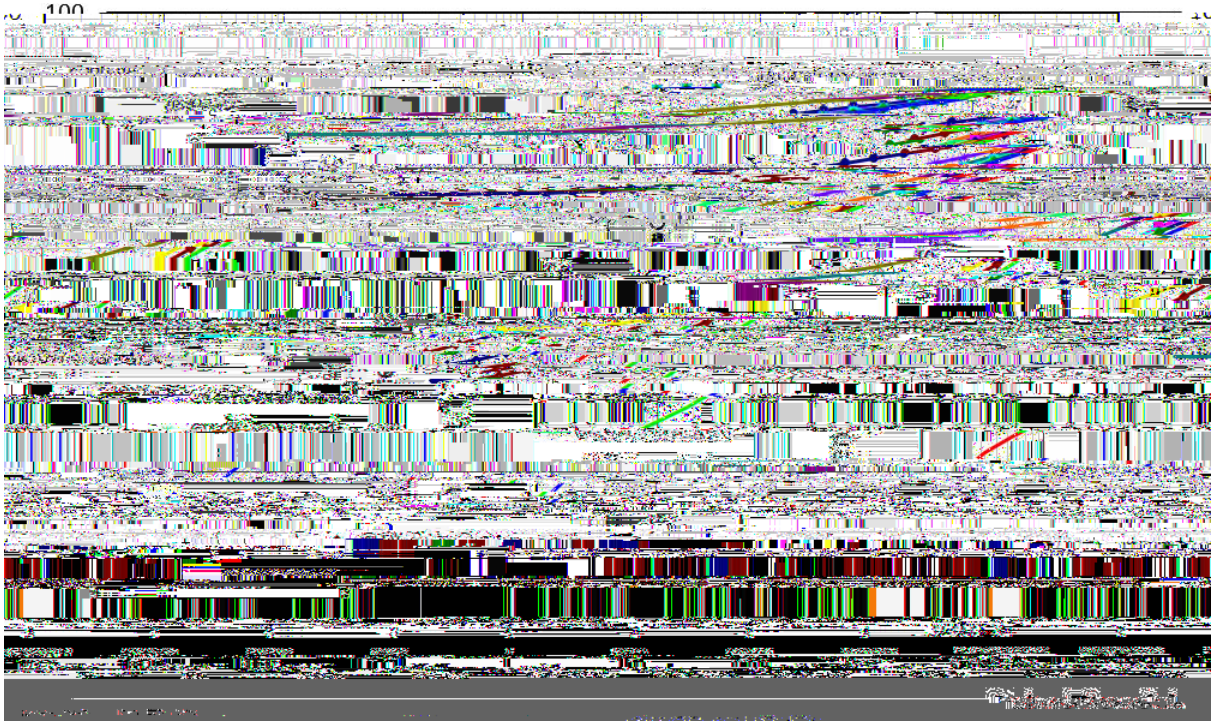


Figure 26. Transient R(t) vs. Pulse Time for 2 oz Spreader

ORDERING INFORMATION

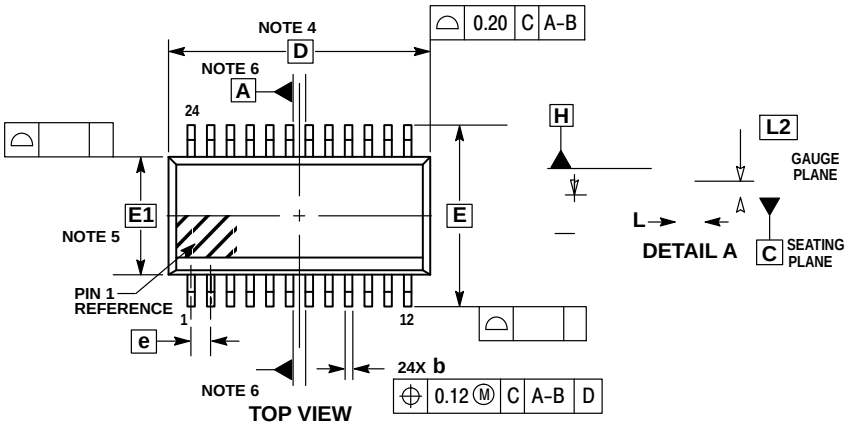
Device	Package	Shipping†
NCV7724DQBR2G	SSOP24 NB EP (Pb Free)	2500 / Tape & Reel

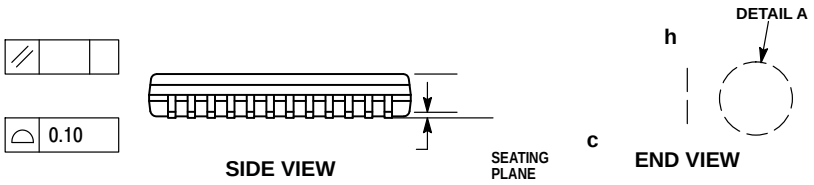
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

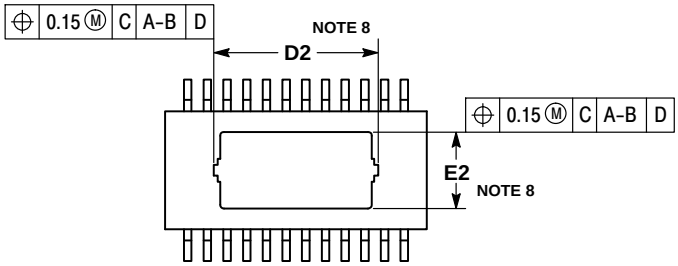
SSOP24 NB EP
CASE 940AK
ISSUE O

SCALE 1:1

DATE 24 APR 2012





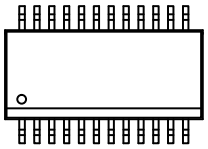


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL BE 0.10 MAX. AT MMC. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT. DIMENSION b APPLIES TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10 TO 0.25 FROM THE LEAD TIP.
4. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSION D IS DETERMINED AT DATUM PLANE H.
5. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 PER SIDE. DIMENSION E1 IS DETERMINED AT DATUM PLANE H.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
8. CONTOURS OF THE THERMAL PAD ARE UNCONTROLLED WITHIN THE REGION DEFINED BY DIMENSIONS D2 AND E2.

	MILLIMETERS	
DIM	MIN	MAX
A	---	1.70
A1	0.00	0.10
b	0.19	0.30
c	0.09	0.20

D2	5.28	5.58

E1	3.90 BSC	
E2	2.44	2.64
e	0.65 BSC	
h	0.25	0.50
L	0.40	0.85
L1	1.00 REF	
L2	0.25 BSC	
M	0°	8°



SOLDERING FOOTPRINT