

CY7C1041CV33

4-Mbit (256 K × 16) Static RAM

Features

- Temperature ranges
 Industrial: -40 °C to 85 °C
- Pin and function compatible with CY7C1041BV33
- High speed □ t_{AA} = 8 ns
- Low active power □ 360 mW (max)
- 2.0 V data retention
- Automatic power down when deselected
- TTL-compatible inputs and outputs
- Easy memory expansion with CE and OE features
- Available in Pb-free 44-pin TSOP II package

Functional Description

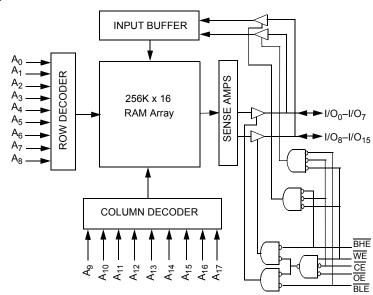
The CY7C1041CV33 is a high performance CMOS static RAM organized as 262,144 words by 16 bits.

<u>To write</u> to the device, take Chip Enable $\overline{(CE)}$ and Write Enable $\overline{(WE)}$ inputs LOW. If Byte Low Enable (BLE) is LOW, then data from I/O pins (/IO₀ through I/O₇), is written into the location specified on the address pins (A₀ through A₁₇). If Byte High Enable (BHE) is LOW, then data from IO pins (I/O₈ through I/O₁₅) is written into the location specified on the address pins (A₀ through A₁₇).

To read <u>from</u> the device, take Chip Enable ($\overline{\text{CE}}$) and Output Enable ($\overline{\text{OE}}$) LOW <u>while</u> forcing the Write Enable (WE) HIGH. If Byte Low Enable (BLE) is LOW, then data from the memory location specified by <u>the</u> address pins appear on I/O₀ to I/O₇. If Byte High Enable (BHE) is LOW, then data from memory appears on I/O₈ to I/O₁₅. For more information, see the Truth Table on page 10 for a complete description of Read and Write modes.

The input and output pins (I/O₀ through I/O₁₅) are placed in a high impedance state when <u>the</u> device is des<u>elected</u> (\overline{CE} HIGH), the outputs are disabled (\overline{OE} HIGH), the BHE and BLE are disabled (BHE, BLE HIGH), or during a write operation (\overline{CE} LOW and WE LOW).

For a complete list of related documentation, click here.



Logic Block Diagram

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Selection Guide

Description	-8	Unit
Maximum Access Time	8	ns
Maximum Operating Current	100	mA
Maximum CMOS Standby Current	10	mA

Pin Configurations

Figure 1. 44-pin TSOP II pinout (Top View) ^[1]

A ₀ A ₁ CP A ₂ A ₃ A ₄ CP CO ₀ CP CO ₀ CP CO ₂ CP CP CO ₂ CP CP CP CP CP CP CP CP CP CP CP CP CP C	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	44 A ₁₇ 43 A ₁₆ 42 A ₁₅ 41 OE 40 BHE 39 BLE 38 I/O ₁₅ 37 I/O ₁₄ 36 I/O ₁₃ 35 I/O ₁₂ 34 V _{SS} 33 V _{CC} 32 I/O ₁₁ 31 IO ₁₀ 30 IO ₉ 29 IO ₈ 28 NC 27 A ₁₄
	-	29 🗌 IO ₈
		27 🗖 A ₁₄
	20	25 🗖 A ₁₂
∧8 L A9 L	21 22	24 🗆 A ₁₁ 23 🗌 A ₁₀





Pin Definitions

Pin Name	TSOP Pin Number	I/О Туре	Description	
A ₀ -A ₁₇	1–5, 18–27, 42–44	Input	Address Inputs. Used to select one of the address locations.	
I/O ₀ -I/O ₁₅	7–10,13–16, 29–32, 35–38	Input or Output	idirectional Data IO lines. Used as input or output lines depending on peration.	
NC	28	No Connect	No Connects. Not connected to the die.	
WE	17	Input or Control	Write Enable Input, Active LOW. When selected LOW, a write is conducted. When deselected HIGH, a read is conducted.	
CE	6	Input or Control	Chip Enable Input, Active LOW. When LOW, selects the chip. When HIGH, deselects the chip.	
BHE, BLE	40, 39	Input or Control	Byte Write Select Inputs, Active LOW. $\overline{\rm BHE}$ controls I/O ₁₅ –I/O ₈ , $\overline{\rm BLE}$ controls I/O ₇ –I/O ₀ .	
OE	41	Input or Control	Output Enable, Active LOW . Controls the direction of the I/O pins. When LOW, the IO pins are allowed to behave as outputs. When deasserted HIGH, the I/O pins are tri-stated and act as input data pins.	
V _{SS}	12, 34	Ground	Ground for the Device. Connected to ground of the system.	
V _{CC}	11, 33	Power Supply	Power Supply Inputs to the Device.	



Maximum Ratings

Exceeding maximum ratings may impair the useful life of the device. These user guidelines are not tested.

Storage Temperature	–65 °C to +150 °C
Ambient Temperature with Power Applied	–55 °C to +125 °C
Supply Voltage on V_{CC} Relative to GND $^{\left[2\right] }$	–0.5 V to +4.6 V
DC Voltage Applied to Outputs in High Z State ^[2] 0.	.5 V to V _{CC} + 0.5 V

DC Input Voltage [2]	–0.5 V to V _{CC} + 0.5 V
Current into Outputs (LOW)	
Static Discharge Voltage (MIL-STD-883, Method 3015)	> 2001 V
Latch Up Current	> 200 mA

Operating Range

Range	Ambient Temperature (T _A)	V _{cc}
Industrial	–40 °C to +85 °C	$3.3~V\pm10\%$

Electrical Characteristics

Over the Operating Range

Parameter	Description	Test Conditions		-8		
			Min	Max	Unit	
V _{OH}	Output HIGH Voltage	V _{CC} = Min, I _{OH} = -4.0 mA	2.4	-	V	
V _{OL}	Output LOW Voltage	V _{CC} = Min, I _{OL} = 8.0 mA	-	0.4	V	
V _{IH}	Input HIGH Voltage		2.0	V _{CC} + 0.3	V	
V _{IL} ^[2]	Input LOW Voltage		-0.3	0.8	V	
I _{IX}	Input Leakage Current	$GND \leq V_1 \leq V_{CC}$	-1	+1	μA	
I _{OZ}	Output Leakage Current	$GND \leq V_{OUT} \leq V_{CC}$, Output disabled	-1	+1	μA	
I _{CC}	V _{CC} Operating Supply Current	V_{CC} = Max, f = f _{MAX} = 1/t _{RC}	-	100	mA	
I _{SB1}	Automatic CE Power Down Current – TTL Inputs	$ \begin{array}{l} \text{Max } V_{CC}, \ \overline{CE} \geq V_{IH}, \\ V_{IN} \geq V_{IH} \ \text{or} \ V_{IN} \leq V_{IL}, \ f = f_{MAX} \end{array} $	-	40	mA	
I _{SB2}	Automatic CE Power Down Current – CMOS Inputs	$\begin{array}{l} \text{Max V}_{\text{CC}}, \ \overline{\text{CE}} \geq \text{V}_{\text{CC}} - 0.3 \text{ V}, \\ \text{V}_{\text{IN}} \geq \text{V}_{\text{CC}} - 0.3 \text{ V}, \text{ or } \text{V}_{\text{IN}} \leq 0.3 \text{ V}, \text{ f} = 0 \end{array}$	-	10	mA	



Capacitance

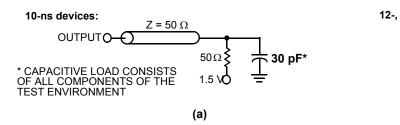
Parameter ^[3]	Description	Test Conditions	Max	Unit
C _{IN}	Input Capacitance	T _A = 25 °C, f = 1 MHz, V _{CC} = 3.3 V	8	pF
C _{OUT}	Output Capacitance		8	pF

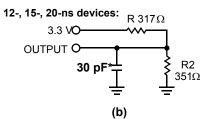
Thermal Resistance

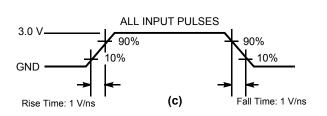
Parameter ^[3]	Description	Test Conditions	TSOP II	Unit
Θ_{JA}	()	Test conditions follow standard test methods and procedures for measuring thermal impedance, per	42.96	°C/W
Θ^{JC}	Thermal Resistance (Junction to Case)	EIA/JESD51	10.75	°C/W

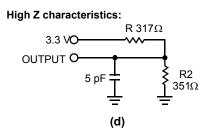
AC Test Loads and Waveforms

Figure 2. AC Test Loads and Waveforms ^[4]









Notes

- 3. Tested initially and after any design or process changes that may affect these parameters.
- AC characteristics (except High Z) for 10-ns parts are tested using the load conditions shown in Figure 2 (a). All other speeds are tested using the Thevenin load shown in Figure 2 (b). High Z characteristics are tested for all speeds using the test load shown in Figure 2 (d).



Switching Characteristics

Over the Operating Range

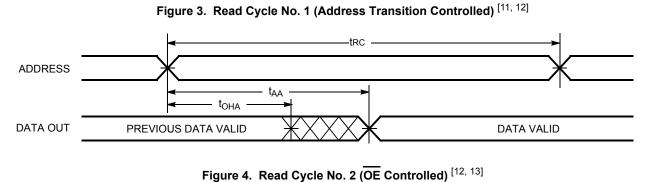
Parameter [5]	Description	-8		Unit
Parameter	Description		Max	Unit
Read Cycle		·		
t _{power} [6]	V _{CC} (Typical) to the First Access	100	-	μS
t _{RC}	Read Cycle Time	8	_	ns
t _{AA}	Address to Data Valid	-	8	ns
t _{OHA}	Data Hold from Address Change	3	-	ns
t _{ACE}	CE LOW to Data Valid	-	8	ns
t _{DOE}	OE LOW to Data Valid	-	5	ns
t _{LZOE}	OE LOW to Low Z ^[7]	0	_	ns
t _{HZOE}	OE HIGH to High Z ^[7, 8]	-	4	ns
t _{LZCE}	CE LOW to Low Z ^[7]	3	_	ns
t _{HZCE}	CE HIGH to High Z ^[7, 8]	-	4	ns
t _{PU}	CE LOW to Power Up	0	_	ns
t _{PD}	CE HIGH to Power Down	-	8	ns
t _{DBE}	Byte Enable to Data Valid	-	5	ns
t _{LZBE}	Byte Enable to Low Z	0	_	ns
t _{HZBE}	Byte Disable to High Z	-	5	ns
Write Cycle ^{[9,}	10]			•
t _{WC}	Write Cycle Time	8	_	ns
t _{SCE}	CE LOW to Write End	6	_	ns
t _{AW}	Address Setup to Write End	6	_	ns
t _{HA}	Address Hold from Write End	0	_	ns
t _{SA}	Address Setup to Write Start	0	_	ns
t _{PWE}	WE Pulse Width	6	_	ns
t _{SD}	Data Setup to Write End	4	-	ns
t _{HD}	Data Hold from Write End	0	_	ns
t _{LZWE}	WE HIGH to Low Z ^[7]	3	_	ns
t _{HZWE}	WE LOW to High Z ^[7, 8]	-	4	ns
t _{BW}	Byte Enable to End of Write	6	-	ns

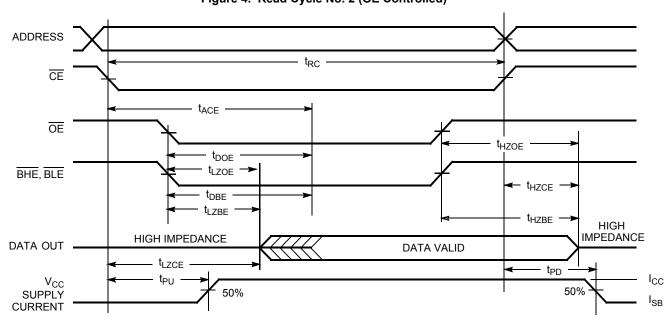
Notes

- 5. Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5 V, and input pulse levels of 0 to 3.0 V.
 6. t_{POWER} gives the minimum amount of time that the power supply is at typical V_{CC} values until the first memory access is performed.
 7. At any temperature and voltage condition, t_{HZCE} is less than t_{LZCE}, t_{HZBE} is less than t_{LZDE}, t_{HZDE} is less than t_{LZDE}, and t_{HZWE} is less than t_{LZWE} for any device.
 8. t_{HZCE}, t_{HZCE}, t_{HZDE}, and t_{HZWE} are specified with a load capacitance of 5 pF as in part (d) of Figure 2 on page 6. Transition is measured ±500 mV from steady state voltage.
 9. The intermed write time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the time of the memory is defined but the number of CE to cut the total or the total or the total or the time of the memory is defined but the total of CE to cut the total or the total or total
- The internal write time of the memory is defined by the overlap of CE LOW, WE LOW, and BHE/BLE LOW. CE, WE, and BHE/BLE must be LOW to initiate a write. The transition of these signals terminate the write. The input data setup and hold timing is referenced to the leading edge of the signal that terminates the write.
 The minimum Write cycle time for Write Cycle No. 3 (WE Controlled, OE LOW) is the sum of tsD and tHZWE.



Switching Waveforms





Notes

- 11. <u>Device</u> is continuously selected. \overline{OE} , \overline{CE} , \overline{BHE} , and/or $\overline{BLE} = V_{IL}$. 12. WE is HIGH for read cycle.
- 13. Address valid prior to or coincident with \overline{CE} transition LOW.



Switching Waveforms (continued)

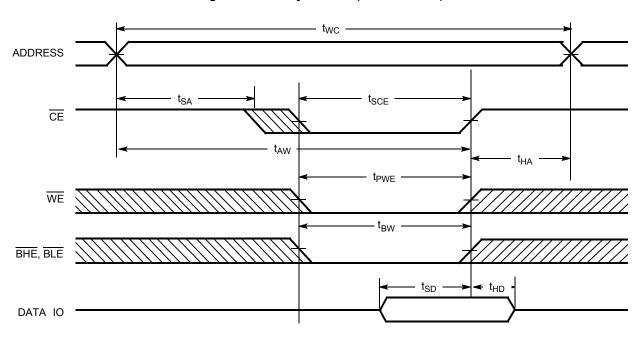
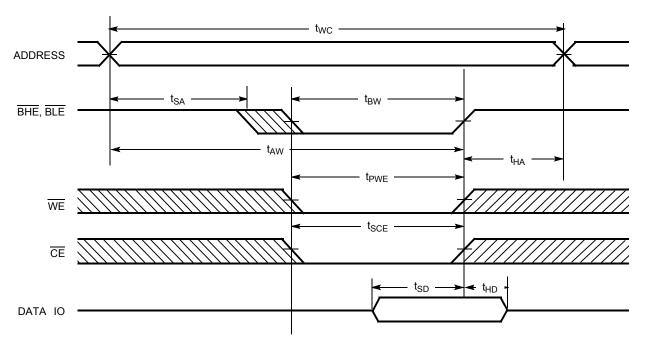


Figure 5. Write Cycle No. 1 (CE Controlled) ^[14, 15]

Figure 6. Write Cycle No. 2 (BLE or BHE Controlled)



Notes

14. Data IO is high impedance if \overline{OE} , \overline{BHE} , and/or $\overline{BLE} = V_{IH}$.

15. If CE goes HIGH simultaneously with WE going HIGH, the output remains in a high impedance state.



Switching Waveforms (continued)

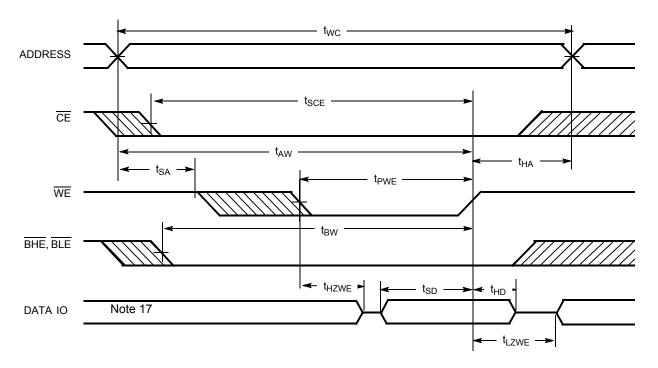


Figure 7. Write Cycle No. 3 ($\overline{\text{WE}}$ Controlled, $\overline{\text{OE}}$ LOW) ^[16]

Notes

16. The minimum write cycle pulse width should be equal to the sum of t_{SD} and t_{HZWE} . 17. During this time I/Os are in output state. Do not apply input signal.



Truth Table

CE	OE	WE	BLE	BHE	I/O ₀ –I/O ₇	I/O ₈ –I/O ₁₅	Mode	Power
н	Х	Х	Х	Х	High Z	High Z	Power Down	Standby (I _{SB})
L	L	Н	L	L	Data Out	Data Out	Read – All Bits	Active (I _{CC})
			L	Н	Data Out	High Z	Read – Lower Bits Only	Active (I _{CC})
			Н	L	High Z	Data Out	Read – Upper Bits Only	Active (I _{CC})
L	Х	L	L	L	Data In	Data In	Write – All Bits	Active (I _{CC})
			L	Н	Data In	High Z	Write – Lower Bits Only	Active (I _{CC})
			Н	L	High Z	Data In	Write – Upper Bits Only	Active (I _{CC})
L	Н	Н	Х	Х	High Z	High Z	Selected, Outputs Disabled	Active (I _{CC})
L	Х	Х	Н	Н	High Z	High Z	Selected, Outputs Disabled	Active (I _{CC})



Ordering Information

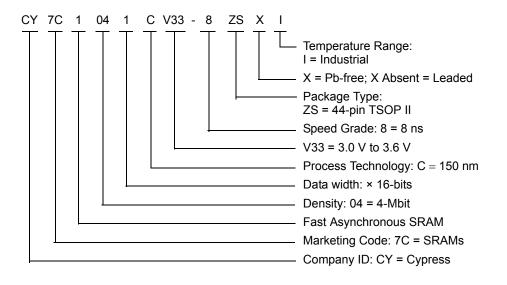
Cypress offers other versions of this type of product in many different configurations and features. The below table contains only the list of parts that are currently available. For a complete listing of all options, visit the Cypress website at www.cypress.com/products or contact your local sales representative.

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Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
8	CY7C1041CV33-8ZSXI	51-85087	44-pin TSOP Type II (Pb-free)	Industrial

Please contact your local Cypress sales representative for availability of these parts

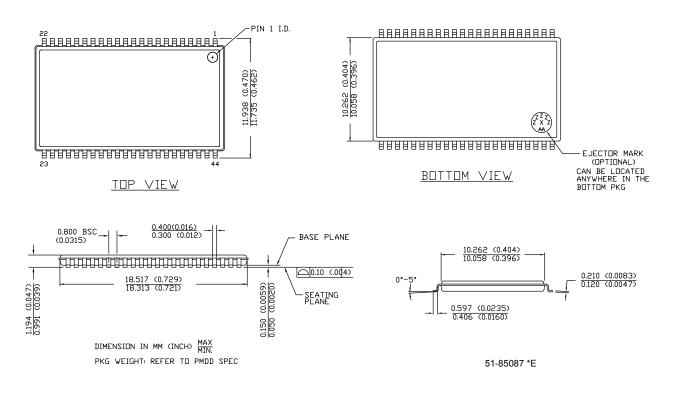
Ordering Code Definitions





Package Diagram

Figure 8. 44-pin TSOP Z44-II Package Outline, 51-85087





Acronyms

Acronym	Description
CE	Chip Enable
CMOS	Complementary Metal Oxide Semiconductor
I/O	Input/Output
OE	Output Enable
SRAM	Static Random Access Memory
TSOP	Thin Small Outline Package
TTL	Transistor-Transistor Logic
WE	Write Enable

Document Conventions

Units of Measure

Symbol	Unit of Measure			
°C	degree Celsius			
MHz	megahertz			
μA	microampere			
μs	microsecond			
mA	milliampere			
mm	millimeter			
ms	millisecond			
mW	milliwatt			
ns	nanosecond			
Ω	ohm			
%	percent			
pF	picofarad			
V	volt			
W	watt			





Document History Page

Rev.	ECN No.	Issue Date	Orig. of Change	Description of Change
**	109513	12/13/01	HGK	New data sheet
*A	112440	12/20/01	BSS	Updated 51-85106 from revision *A to *C
*В	112859	03/25/02	DFP	Added CY7C1042CV33 in BGA package Removed 1042 BGA option pin ACC Final Data Sheet
*C	116477	09/16/02	CEA	Add applications foot note to data sheet
*D	119797	10/21/02	DFP	Added 20-ns speed bin
*E	262949	See ECN	RKF	 Added Lead (Pb)-Free parts in the Ordering info (Page #9) Added Automotive Specs to Datasheet
*F	361795	See ECN	SYT	Added Pb-Free offerings in the Ordering Information
*G	435387	See ECN	NXR	Removed -8 Speed bin from Product offering. Corrected typo in description for BHE/BLE in pin definitions table on Page# corrected their Pin name from OE2 to OE. Included the Maximum Ratings for Static Discharge Voltage and Latch u Current. Changed the description of I _{IX} current from Input Load Current to Input Leakage Current Added note# 4 on page# 4 Updated the Ordering Information table
*H	499153	See ECN	NXR	Added Automotive-A Operating Range Changed t _{power} value from 1 μs to 100 μs Updated Ordering Information table
*	2104110	See ECN	VKN/AESA	Added Automotive-E specs for 12 ns speed Updated Ordering Information table
*J	2897141	03/22/10	AJU/VIVG	Updated Ordering Information (Removed inactive parts). Updated Package Diagram.
*K	3072834	11/12/2010	PRAS	Updated Ordering Information: Removed inactive parts. Added Ordering Code Definitions.
*L	3186840	03/03/2011	PRAS	Updated Features. Updated Selection Guide (Added -8 ns speed grade devices and removed -1 ns, -12 ns, -15 ns and -20 ns speed grade devices). Removed Figure "48-Ball FBGA Pinout (Top View)" and renamed Figur "44-Pin SOJ/TSOP II (Top View)" as "44-pin TSOP II (Top View)" in Pin Config urations. Updated Pin Definitions (Deleted the column "BGA Pin Number" and renamed the column "SOJ, TSOP Pin Number" as "TSOP Pin Number". Updated Operating Range Updated Electrical Characteristics (Added -8 ns speed grade devices ar removed -10 ns, -12 ns, -15 ns and -20 ns speed grade devices). Updated Thermal Resistance (Deleted the columns SOJ and FBGA). Updated Switching Characteristics (Added -8 ns speed grade devices ar removed -10 ns, -12 ns, -15 ns and -20 ns speed grade devices). Updated Ordering Information (Added new speed bin (-8 ns speed grade devices) and removed -10 ns, -12 ns, -15 ns and -20 ns speed grade devices. Updated Ordering Information to new datasheet (001-67307) Removed SOJ and FBGA package related information in all instances in th document. Updated to new template.



Document History Page (continued)

Rev.	ECN No.	Issue Date	Orig. of Change	Description of Change
*M	3199948	03/18/2011	PRAS	Updated Features (Updated Operating Temperature Range from Commercia to Industrial). Updated Operating Range (Updated Operating Temperature Range from Commercial to Industrial). Updated Ordering Information (Updated Operating Temperature Range from Commercial to Industrial).
*N	3266084	05/28/2011	PRAS	Updated Functional Description (Removed "For best practice recommendations, refer to the Cypress application note AN1064, SRAM System Guidelines.").
*0	4315741	03/20/2014	VINI	Updated Package Diagram: spec 51-85087 – Changed revision from *C to *E. Updated to new template. Completing Sunset Review.
*P	4578447	01/16/2015	VINI	Added related documentation hyperlink in page 1. Updated Switching Waveforms: Added Note 16 and referred the same note in Figure 7.
*Q	4702949	03/27/2015	VINI	Updated Switching Waveforms: Added Note 17 and referred the same note in DATA IO in Figure 7. Completing Sunset Review.
*R	5962455	11/09/2017	AESATMP8	Updated logo and Copyright.



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