

## Features

- Any frequency between 10 MHz and 220 MHz accurate to 6 decimal places
- Widest pull range options:  $\pm 25$ ,  $\pm 50$ ,  $\pm 80$ ,  $\pm 100$ ,  $\pm 150$ ,  $\pm 200$ ,  $\pm 400$ ,  $\pm 800$ ,  $\pm 1600$ ,  $\pm 3200$ ppm
- 0.23 ps RMS phase jitter (Typ) over 12 kHz to 20 MHz bandwidth
- Wide temperature range support from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$   
Contact SiTime for other temperature range options
- Industry-standard packages: 3.2x2.5, 7.0x5.0 mm  
Contact SiTime for 5.0 x 3.2 mm package
- For frequencies 220 MHz to 720 MHz, refer to SiT3373 datasheet

## Applications

- Remote Radio Head (RRH), Cable Modem Termination System (CMTS), Video, Broadcasting System, Audio, Industrial Sensors
- SATA, SAS, 10GB Ethernet, Fibre Channel, PCI-Express



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## Electrical Characteristics

All Min and Max limits in the Electrical Characteristics tables are specified over temperature and rated operating voltage with 15 pF output load unless otherwise stated. Typical values are at  $25^{\circ}\text{C}$  and nominal supply voltage

**Table 1. Electrical Characteristics - Common to LVPECL, LVDS and HCSL**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
<b>Frequency Range</b>						
Output Frequency Range	f	10	–	220	MHz	Accurate to 6 decimal places
<b>Frequency Stability</b>						
Frequency Stability	F_stab	-15	–	+15	ppm	Inclusive of initial tolerance, operating temperature, rated power supply voltage, load variations, and first year aging at $25^{\circ}\text{C}$ condition
		-25	–	+25	ppm	
		-30	–	+30	ppm	
		-50	–	+50	ppm	
<b>Temperature Range</b>						
Operating Temperature Range	T_use	-20	–	+70	$^{\circ}\text{C}$	Extended Commercial
		-40	–	+85	$^{\circ}\text{C}$	Industrial. Contact SiTime for other temperature range options.
<b>Supply Voltage</b>						
Supply Voltage	Vdd	2.97	3.3	3.63	V	
		2.7	3.0	3.3	V	
		2.52	2.8	3.08	V	
		2.25	2.5	2.75	V	
<b>Voltage Control Characteristics</b>						
Pull Range	PR	$\pm 25$ , $\pm 50$ , $\pm 80$ , $\pm 100$ , $\pm 150$ , $\pm 200$ , $\pm 400$ , $\pm 800$ , $\pm 1600$ , $\pm 3200$ ppm			ppm	See the last page for Absolute Pull Range, APR Table. Contact SiTime for custom pull range options.
Upper Control Voltage	VC_U	90%	–	–	Vdd	Voltage at which maximum frequency deviation is guaranteed
Lower Control Voltage	VC_L	–	–	10%	Vdd	Voltage at which minimum frequency deviation is guaranteed
Control Voltage Input Impedance	VC_z	–	10	–	M $\Omega$	
Control Voltage Input Bandwidth	V_c	–	10	–	kHz	Contact SiTime for other input bandwidth options
Pull Range Linearity	Lin	–	1	TBD	%	
Frequency Change Polarity	–	Positive Slope			–	
<b>Input Characteristics</b>						
Input Voltage High	VIH	70%	–	–	Vdd	Pin 2, OE
Input Voltage Low	VIL	–	–	30%	Vdd	Pin 2, OE
Input Pull-up Impedance	Z_in	–	100	–	k $\Omega$	Pin 2, OE logic high or logic low

**Table 2. Electrical Characteristics - Common to LVPECL, LVDS and HCSL (Cont'd)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
<b>Output Characteristics</b>						
Duty Cycle	DC	45	–	55	%	
<b>Startup and OE Timing</b>						
Start-up Time	T_start	–	–	5	ms	Measured from the time Vdd reaches its rated minimum value.
OE Enable/Disable Time	T_oe	–	–	515	ns	f = 212.5 MHz - For other frequencies, T_oe = 500ns + 3 period

**Table 3. Electrical Characteristics - LVPECL Specific**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
<b>Current Consumption</b>						
Current Consumption	I <sub>dd</sub>	–	–	84	mA	Excluding Load Termination Current, V <sub>dd</sub> = 3.3V or 2.5V
OE Disable Supply Current	I <sub>OE</sub>	–	–	55	mA	OE = Low
Output Disable Leakage Current	I <sub>leak</sub>	–	0.15	–	μA	OE = Low
Maximum Output Current	I <sub>driver</sub>	–	–	30	mA	Maximum average current drawn from OUT+ or OUT-
<b>Output Characteristics</b>						
Output High Voltage	VOH	V <sub>dd</sub> -1.1	–	V <sub>dd</sub> -0.7	V	See Figure 2
Output Low Voltage	VOL	V <sub>dd</sub> -1.9	–	V <sub>dd</sub> -1.5	V	See Figure 2
Output Differential Voltage Swing	V <sub>Swing</sub>	1.2	1.6	2.0	V	See Figure 3
Rise/Fall Time	Tr, Tf	–	250	–	ps	20% to 80%, see Figure 2
<b>Jitter</b>						
RMS Period Jitter <sup>[1]</sup>	T <sub>jitt</sub>	–	1	2	ps	f = 156.25 MHz, V <sub>DD</sub> = 3.3V or 2.5V
RMS Phase Jitter (random)	T <sub>phj</sub>	–	0.23	–	ps	f = 156.25 MHz, Integration bandwidth = 12 kHz to 20 MHz, all V <sub>dds</sub>
		–	0.1	–	ps	f = 156.25 MHz, IEEE802.3-2005 10GbE jitter mask integration bandwidth = 1.875 MHz to 20 MHz, all V <sub>dds</sub>

**Notes:**

1. Measured according to JESD65B

**Table 4. Electrical Characteristics – LVDS Specific**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
<b>Current Consumption</b>						
Current Consumption	I <sub>dd</sub>	–	–	76	mA	Excluding Load Termination Current, V <sub>dd</sub> = 3.3V or 2.5V
OE Disable Supply Current	I <sub>OE</sub>	–	–	55	mA	OE = Low
Output Disable Leakage Current	I <sub>leak</sub>	–	0.15	–	μA	OE = Low
<b>Output Characteristics</b>						
Differential Output Voltage	VOD	250	–	450	mV	See Figure 4
VOD Magnitude Change	ΔVOD	–	–	50	mV	See Figure 4
Offset Voltage	VOS	1.125	–	1.375	V	See Figure 4
VOS Magnitude Change	ΔVOS	–	–	50	mV	See Figure 4
Rise/Fall Time	Tr, Tf	–	340	–	ps	Measured with 2 pF capacitive loading to GND, 20% to 80%, see Figure 4
<b>Jitter</b>						
RMS Period Jitter <sup>[2]</sup>	T <sub>jitt</sub>	–	1	2	ps	f = 156.25 MHz, V <sub>DD</sub> = 3.3V or 2.5V
RMS Phase Jitter (random)	T <sub>phj</sub>	–	0.23	–	ps	f = 156.25 MHz, Integration bandwidth = 12 kHz to 20 MHz, all V <sub>dds</sub>
		–	0.1	–	ps	f = 156.25 MHz, IEEE802.3-2005 10GbE jitter mask integration bandwidth = 1.875 MHz to 20 MHz, all V <sub>dds</sub>

**Notes:**

2. Measured according to JESD65B

**Table 5. Electrical Characteristics – HCSL Specific**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
<b>Current Consumption</b>						
Current Consumption	I <sub>dd</sub>	–	–	84	mA	Excluding Load Termination Current, V <sub>dd</sub> = 3.3V or 2.5V
OE Disable Supply Current	I <sub>OE</sub>	–	–	55	mA	OE = Low
Output Disable Leakage Current	I <sub>leak</sub>	–	0.15	–	μA	OE = Low
<b>Output Characteristics</b>						
Output High Voltage	VOH	0.6	–	0.8	V	See Figure 2
Output Low Voltage	VOL	-0.05	–	0.05	V	See Figure 2
Output Differential Voltage Swing	V <sub>Swing</sub>	1	1.4	1.8	V	See Figure 3
Rise/Fall Time	Tr, Tf	–	350	–	ps	Measured with 2 pF capacitive loading to GND, 20% to 80%, see Figure 2
<b>Jitter</b>						
RMS Period Jitter <sup>[3]</sup>	T <sub>jitt</sub>	–	1	2	ps	f = 156.25 MHz, VDD = 3.3V or 2.5V
RMS Phase Jitter (random)	T <sub>phj</sub>	–	0.23	–	ps	f = 156.25 MHz, Integration bandwidth = 12 kHz to 20 MHz, all Vdds
		–	0.1	–	ps	f = 156.25 MHz, IEEE802.3-2005 10GbE jitter mask integration bandwidth = 1.875 MHz to 20 MHz, all Vdds

**Notes:**

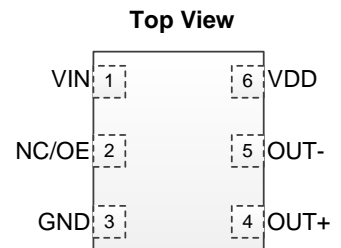
3. Measured according to JESD65B

**Table 6. Pin Description**

Pin	Symbol	Functionality	
1	VIN	Input	Control Voltage
2	NC/OE	No Connect (NC)	No Connect: Leave it floating or connect to GND for better heat dissipation
		Output Enable (OE)	H <sup>[4]</sup> : specified frequency output L: output is high impedance. Only output driver is disabled
3	GND	Power	VDD Power Supply Ground
4	OUT+	Output	Oscillator output
5	OUT-	Output	Complementary oscillator output
6	VDD	Power	Power supply voltage <sup>[5]</sup>

**Notes:**

- 4. In OE mode, a pull-up resistor of 10 kΩ or less is recommended if pin 1 is not externally driven.
- 5. A capacitor of value 0.1 μF or higher between Vdd and GND is required. An Additional 10 pF between Vdd and GND is required for the best phase jitter performance



**Figure 1. Pin Assignments**

**Table 7. Absolute Maximum**

Attempted operation outside the absolute maximum ratings may cause permanent damage to the part. Actual performance of the IC is only guaranteed within the operational specifications, not at absolute maximum ratings.

Parameter	Min.	Max.	Unit
Storage Temperature	-65	150	°C
VDD	-0.5	4	V
Electrostatic Discharge (HBM)	–	2000	V
Soldering Temperature (follow standard Pb free soldering guidelines)	–	260	°C

**Table 8. Thermal Consideration<sup>[6]</sup>**

Package	$\theta_{JA}$ , 4 Layer Board (°C/W)	$\theta_{JC}$ , Bottom (°C/W)
3225, 6-pin	TBD	TBD
7050, 6-pin	TBD	TBD

**Notes:**

6. Refer to JESD51 for  $\theta_{JA}$  and  $\theta_{JC}$  definitions, and reference layout used to determine the  $\theta_{JA}$  and  $\theta_{JC}$  values in the above table.

**Table 9. Maximum Operating Junction Temperature<sup>[7]</sup>**

Max Operating Temperature (ambient)	Maximum Operating Junction Temperature
70°C	80
85°C	95

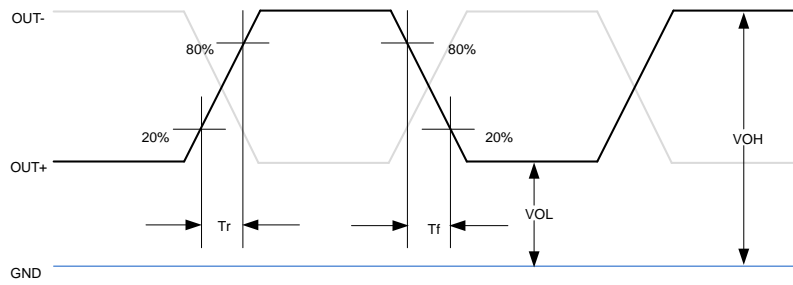
**Notes:**

7. Datasheet specifications are not guaranteed if junction temperature exceeds the maximum operating junction temperature.

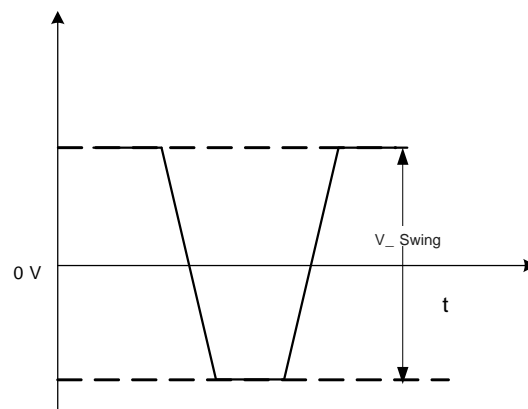
**Table 10. Environmental Compliance**

Parameter	Condition/Test Method
Mechanical Shock	MIL-STD-883F, Method 2002
Mechanical Vibration	MIL-STD-883F, Method 2007
Temperature Cycle	JESD22, Method A104
Solderability	MIL-STD-883F, Method 2003
Moisture Sensitivity Level	MSL1 @ 260°C

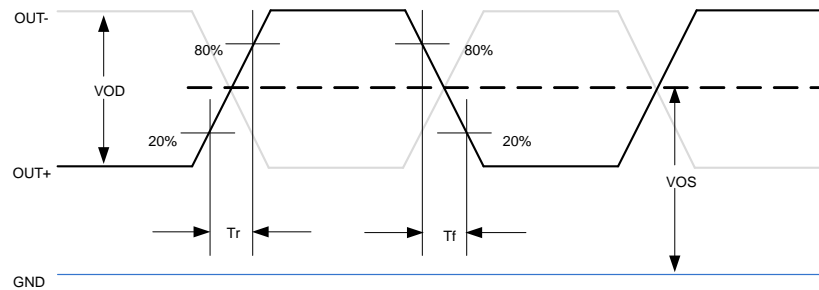
**Waveform Diagrams**



**Figure 2. LVPECL/HCSL Voltage Levels per Differential Pin (OUT+/OUT-)**



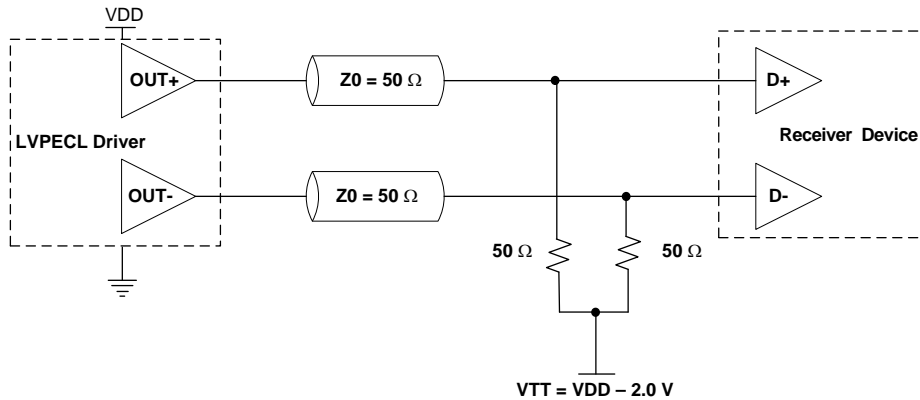
**Figure 3. LVPECL/HCSL Voltage Levels across Differential Pair**



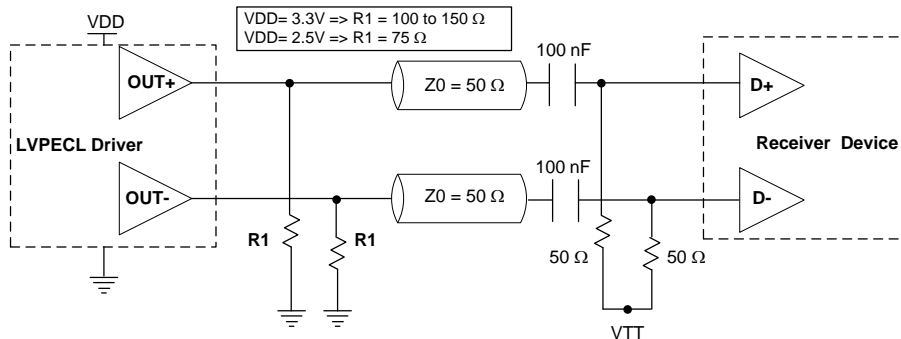
**Figure 4. LVDS Voltage Levels per Differential Pin (OUT+/OUT-)**

**Termination Diagrams**

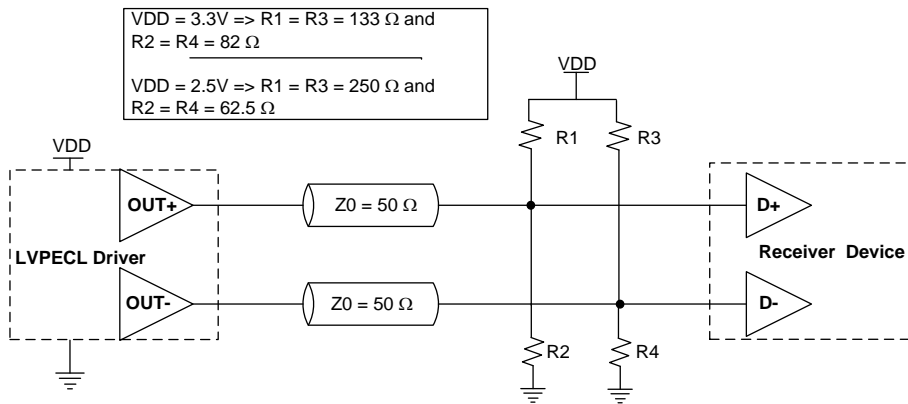
LVPECL:



**Figure 5. LVPECL Typical Termination**



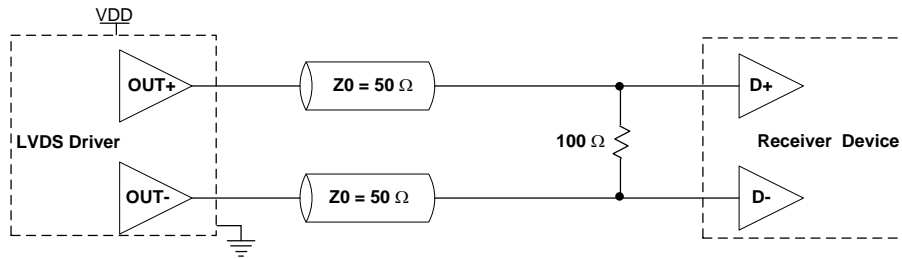
**Figure 6. LVPECL AC Coupled Termination**



**Figure 7. LVPECL with Thevenin Typical Termination**

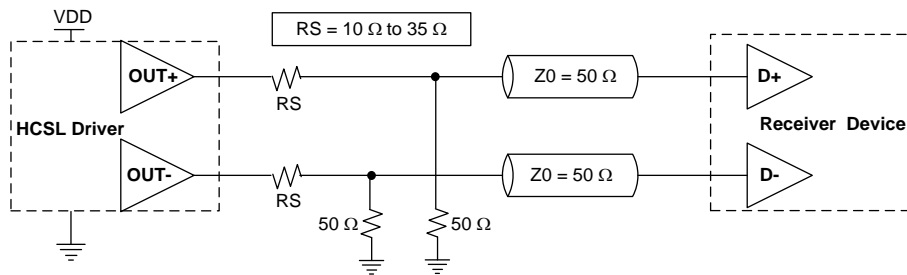
**Termination Diagrams (Continued)**

**LVDS:**



**Figure 8. LVDS Single Termination (Load Terminated)**

**HCSL:**



**Figure 9. HCSL Typical Termination**

#### Dimensions and Patterns

Package Size – Dimensions (Unit: mm) <sup>[8]</sup>	Recommended Land Pattern (Unit: mm) <sup>[9]</sup>
<p><b>3.2 x 2.5x 0.75 mm</b></p>	
<p><b>7.0 x 5.0x 0.90 mm<sup>[10]</sup></b></p>	

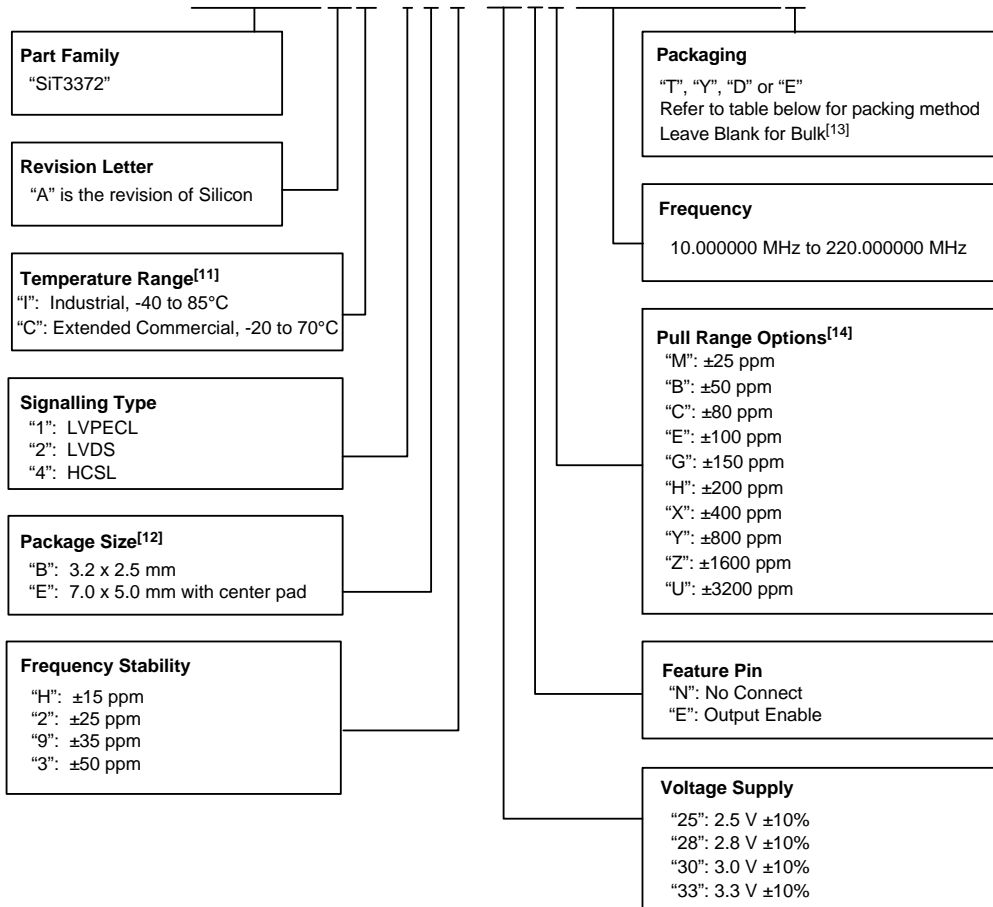
**Notes:**

- 8. Top Marking: Y denotes manufacturing origin and XXXX denotes manufacturing lot number. The value of “Y” will depend on the assembly location of the device.
- 9. A capacitor of value 0.1 μF or higher between Vdd and GND is required.
- 10. The center pad has no electrical function. Soldering down the center pad to the GND is recommended for best thermal dissipation, but is optional.



**Ordering Information**

SiT3372AC-1B2-33-H122.123456T



**Notes:**

11. Contact SiTime for higher temperature options
12. Contact SiTime for 5.0 x 3.2 package
13. Bulk is available for sampling only
14. Contact SiTime for custom pull range options

**Table 11. Ordering Codes for Supported Tape & Reel Packing Method**

Device Size (mm x mm)	8 mm T&R (3ku)	8 mm T&R (1ku)	12 mm T&R (3ku)	12 mm T&R (1ku)	16 mm T&R (3ku)	16 mm T&R (1ku)
7.0 x 5.0	—	—	—	—	T	Y
3.2 x 2.5	D	E	T	Y	—	—

**Table 12. APR Table**

Absolute pull range (APR) = Nominal pull range (PR) - frequency stability (F\_stab)

Nominal Pull Range	Frequency Stability			
	± 15	± 25	± 35	± 50
	APR (ppm)			
± 25	± 5	—	—	—
± 50	± 30	± 20	± 10	—
± 80	± 60	± 50	± 40	± 25
± 100	± 80	± 70	± 60	± 45
± 150	± 130	± 120	± 110	± 95
± 200	± 180	± 170	± 160	± 145
± 400	± 380	± 370	± 360	± 345
± 800	± 780	± 770	± 760	± 745
± 1600	± 1580	± 1570	± 1560	± 1545
± 3200	± 3180	± 3170	± 3160	± 3145