REVISION HISTORY

Revision	Description	Issue Date
Rev. 1.0	Initial Issue	Sep.5.2006
Rev. 1.1	Revised **PACKAGE OUTLINE DIMENSION** (TSOP II)	Apr.12.2007
Rev. 2.0	Revised I_{CC} and I_{SB1} Revised **TEST CONDITION** of I_{SB1}/I_{DR} Added E and I grade Revised **ABSOLUTE MAXIMUN RATINGS**	Jun.23.2007
Rev. 2.1	Adding PKG type : 36-ball 6mm x 8mm TFBGA Revised **TEST CONDITION** of I_{CC}	Mar.31.2008
Rev. 2.2	Revised **FEATURES** & **ORDERING INFORMATION** **Lead free and green package available** to **Green package available** Deleted T_{SOLDER} in **ABSOLUTE MAXIMUN RATINGS** Added packing type in **ORDERING INFORMATION**	Apr.17.2009
Rev. 2.3	Revised **PACKAGE OUTLINE DIMENSION** in page 9/10/12	May.7.2010
Rev. 2.4	Revised **ORDERING INFORMATION** in page 14/15/16/17/18/19	Aug.30.2010
Rev. 2.5	Correct **ORDERING INFORMATION** Typo.	May.20.2015
Rev. 2.6	Added "*Not recommended for new design." in **ORDERING INFORMATION**. Revised I_{SB1} & I_{CC} Revised I_{DR} in **DATA RETENTION CHARACTERISTICS** Deleted -15/25ns Spec. Deleted E grade Deleted PKG type : 32-pin TSOP I & 32-pin sTSOP & 36-ball TFBGA Deleted **WRITE CYCLE** Notes : 1. WE#,CE# must be high during all address transitions. In page 8.	Dec.27.2016
Rev. 2.7	Deleted -10/12ns Spec.	Apr.19.2017

Lyontek Inc.

LY61L5128

Rev. 2.7

512K X 8 BIT HIGH SPEED CMOS SRAM

FEATURES

- Fast access time : 20ns
- **Very low power consumption:**
  Operating current (Normal version):
  50mA (TYP.)
  Standby current:
  0.5mA (TYP. for 20ns)
  20μA (TYP. for LL version)
- Single 3.3V power supply
- All inputs and outputs TTL compatible
- Fully static operation
- Tri-state output
- Data retention voltage : 2.0V (MIN.)
- **Green package available**
- Package : 44-pin 400 mil TSOP II

GENERAL DESCRIPTION

The LY61L5128 is a 4,194,304-bit low power CMOS static random access memory organized as 524,288 words by 8 bits. It is fabricated using very high performance, high reliability CMOS technology. Its standby current is stable within the range of operating temperature.

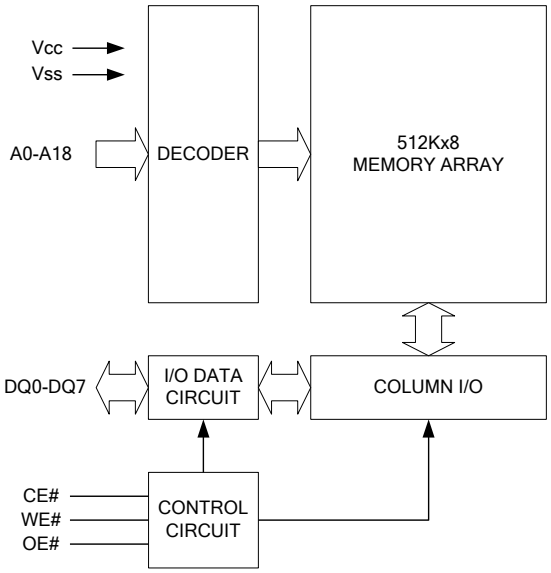
The LY61L5128 is well designed for very low power system applications, and particularly well suited for battery back-up nonvolatile memory application.

The LY61L5128 operates from a single power supply of 3.3V and all inputs and outputs are fully TTL compatible

PRODUCT FAMILY

Product Family	Operating Temperature	V_{CC} Range	Speed	Power Dissipation	
				Standby(I_{SB1},TYP.)	Operating(I_{CC},TYP.)
LY61L5128	0 ~ 70℃	3.0 ~ 3.6V	20ns	0.5mA	50mA
LY61L5128(I)	-40 ~ 85℃	3.0 ~ 3.6V	20ns	0.5mA	50mA
LY61L5128(LL)	0 ~ 70℃	3.0 ~ 3.6V	20ns	20μA	50mA
LY61L5128(LLI)	-40 ~ 85℃	3.0 ~ 3.6V	20ns	20μA	50mA

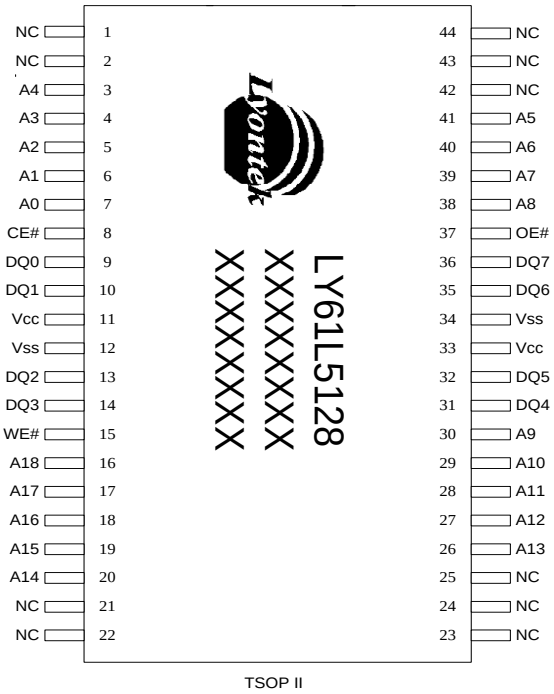
FUNCTIONAL BLOCK DIAGRAM



PIN DESCRIPTION

SYMBOL	DESCRIPTION
A0 - A18	Address Inputs
DQ0 - DQ7	Data Inputs/Outputs
CE#	Chip Enable Inputs
WE#	Write Enable Input
OE#	Output Enable Input
V_{CC}	Power Supply
V_{SS}	Ground
NC	No Connection

PIN CONFIGURATION



TSOP II

ABSOLUTE MAXIMUN RATINGS*

PARAMETER	SYMBOL	RATING	UNIT
Voltage on V_{CC} relative to V_{SS}	V_{T1}	-0.5 to 4.6	V
Voltage on any other pin relative to V_{SS}	V_{T2}	-0.5 to V_{CC}+0.5	V
Operating Temperature	T_A	0 to 70(C grade) -40 to 85(I grade)	℃
Storage Temperature	T_{STG}	-65 to 150	℃
Power Dissipation	P_D	1	W
DC Output Current	I_{OUT}	50	mA

*Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to the absolute maximum rating conditions for extended period may affect device reliability.

TRUTH TABLE

MODE	CE#	OE#	WE#	I/O OPERATION	SUPPLY CURRENT
Standby	H	X	X	High-Z	I_{SB1}
Output Disable	L	H	H	High-Z	I_{CC}
Read	L	L	H	D_{OUT}	I_{CC}
Write	L	X	L	D_{IN}	I_{CC}

Note: H = V_{IH}, L = V_{IL}, X = Don't care.

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP. *4	MAX.	UNIT
Supply Voltage	V_{CC}			3.0	3.3	3.6	V
Input High Voltage	V_{IH} *1			2.2	-	V_{CC}+0.3	V
Input Low Voltage	V_{IL} *2			- 0.3	-	0.6	V
Input Leakage Current	I_{LI}	$V_{CC} \geqq V_{IN} \geqq V_{SS}$		- 1	-	1	µA
Output Leakage Current	I_{LO}	$V_{CC} \geqq V_{OUT} \geqq V_{SS}$, Output Disabled		- 1	-	1	µA
Output High Voltage	V_{OH}	I_{OH} = -4mA		2.4	-	-	V
Output Low Voltage	V_{OL}	I_{OL} = 8mA		-	-	0.4	V
Average Operating Power supply Current	I_{CC}	Cycle time = MIN. CE# = V_{IL} , $I_{I/O}$ = 0mA, others at V_{IH} or V_{IL}		-	50	80	mA
Standby Power Supply Current	I_{SB1}	CE# $\geqq V_{CC}$ - 0.2V, others at 0.2V or V_{CC} - 0.2V	20	-	0.5	5*5	mA
			20LL	-	20	100*6	µA

Notes:
1. V_{IH}(max) = V_{CC} + 3.0V for pulse width less than 10ns.
2. V_{IL}(min) = V_{SS} - 3.0V for pulse width less than 10ns.
3. Over/Undershoot specifications are characterized, not 100% tested.
4. Typical values are included for reference only and are not guaranteed or tested.
   Typical valued are measured at V_{CC} = $V_{CC(TYP.)}$ and T_A = 25℃
5. 1mA for special request
6. 50µA for special request

CAPACITANCE (T_A = 25℃, f = 1.0MHz)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Input Capacitance	C_{IN}	-	8	pF
Input/Output Capacitance	$C_{I/O}$	-	10	pF

Note : These parameters are guaranteed by device characterization, but not production tested.

AC TEST CONDITIONS

Input Pulse Levels	0.2V to V_{CC} - 0.2V
Input Rise and Fall Times	3ns
Input and Output Timing Reference Levels	1.5V
Output Load	C_L = 30pF + 1TTL, I_{OH}/I_{OL} = -8mA/16mA

AC ELECTRICAL CHARACTERISTICS

(1) READ CYCLE

PARAMETER	SYM.	LY61L5128-20		UNIT
		MIN.	MAX.	
Read Cycle Time	t_{RC}	20	-	ns
Address Access Time	t_{AA}	-	20	ns
Chip Enable Access Time	t_{ACE}	-	20	ns
Output Enable Access Time	t_{OE}	-	8	ns
Chip Enable to Output in Low-Z	t_{CLZ}*	4	-	ns
Output Enable to Output in Low-Z	t_{OLZ}*	0	-	ns
Chip Disable to Output in High-Z	t_{CHZ}*	-	8	ns
Output Disable to Output in High-Z	t_{OHZ}*	-	8	ns
Output Hold from Address Change	t_{OH}	3	-	ns

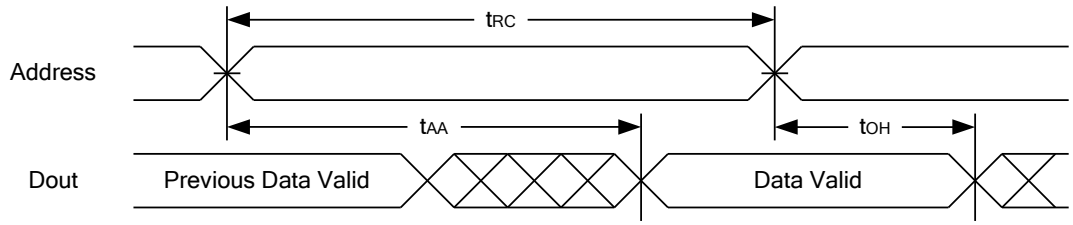
(2) WRITE CYCLE

PARAMETER	SYM.	LY61L5128-20		UNIT
		MIN.	MAX.	
Write Cycle Time	t_{WC}	20	-	ns
Address Valid to End of Write	t_{AW}	16	-	ns
Chip Enable to End of Write	t_{CW}	16	-	ns
Address Set-up Time	t_{AS}	0	-	ns
Write Pulse Width	t_{WP}	11	-	ns
Write Recovery Time	t_{WR}	0	-	ns
Data to Write Time Overlap	t_{DW}	9	-	ns
Data Hold from End of Write Time	t_{DH}	0	-	ns
Output Active from End of Write	t_{OW}*	5	-	ns
Write to Output in High-Z	t_{WHZ}*	-	9	ns

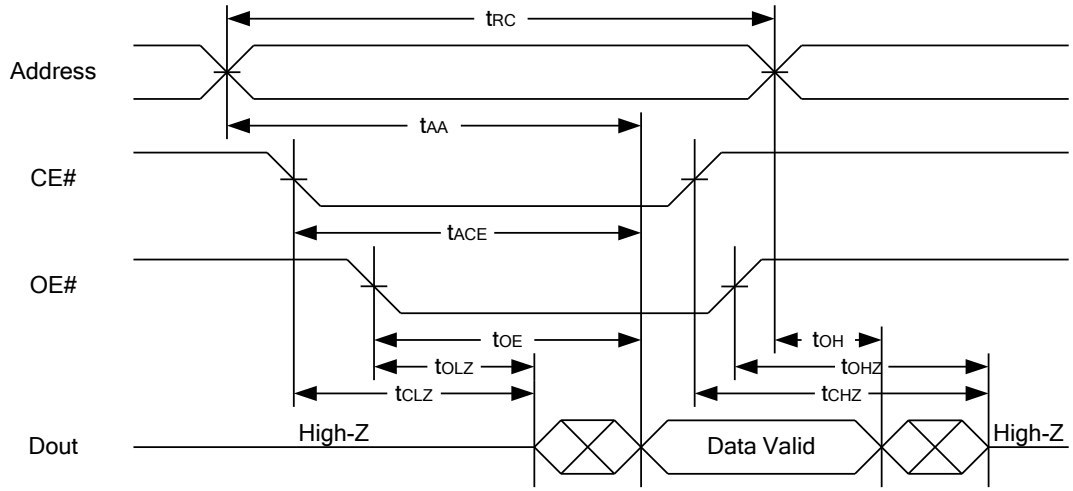
*These parameters are guaranteed by device characterization, but not production tested.

TIMING WAVEFORMS

READ CYCLE 1 (Address Controlled) (1,2)

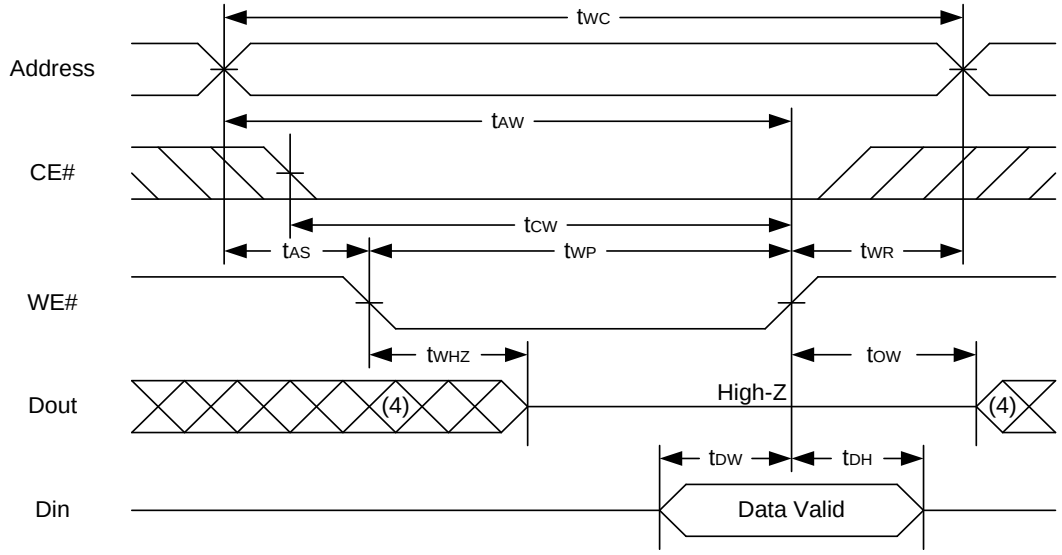


READ CYCLE 2 (CE# and OE# Controlled) (1,3,4,5)

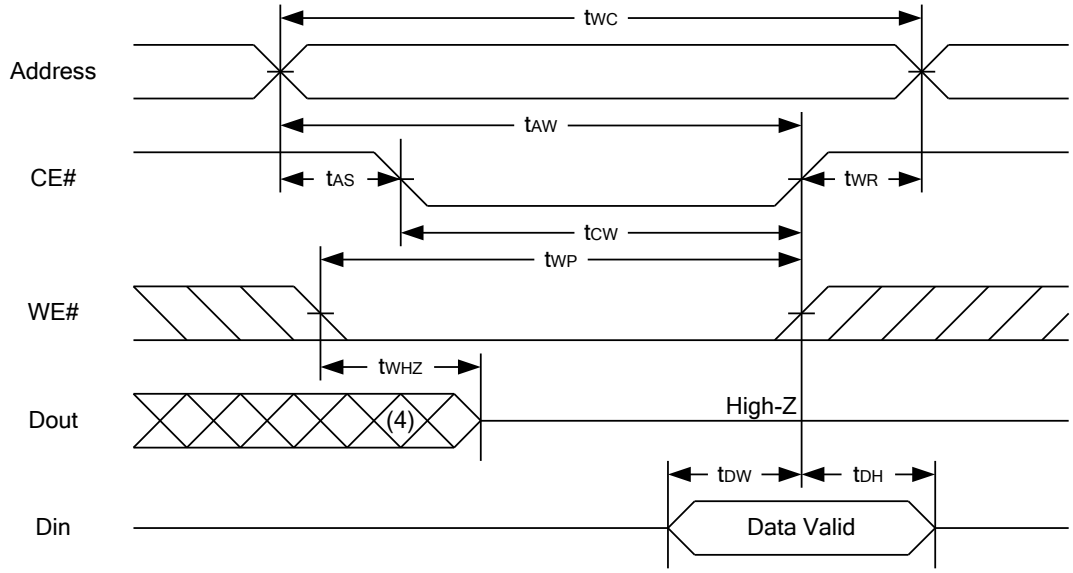


Notes :
1.WE# is high for read cycle.
2.Device is continuously selected OE# = low, CE# = low.
3.Address must be valid prior to or coincident with CE# = low,; otherwise t_{AA} is the limiting parameter.
4.t_{CLZ}, t_{OLZ}, t_{CHZ} and t_{OHZ} are specified with C_L = 5pF. Transition is measured ±500mV from steady state.
5.At any given temperature and voltage condition, t_{CHZ} is less than t_{CLZ} , t_{OHZ} is less than t_{OLZ}.

WRITE CYCLE 1 (WE# Controlled) (1,2,4,5)



WRITE CYCLE 2 (CE# Controlled) (1,4,5)



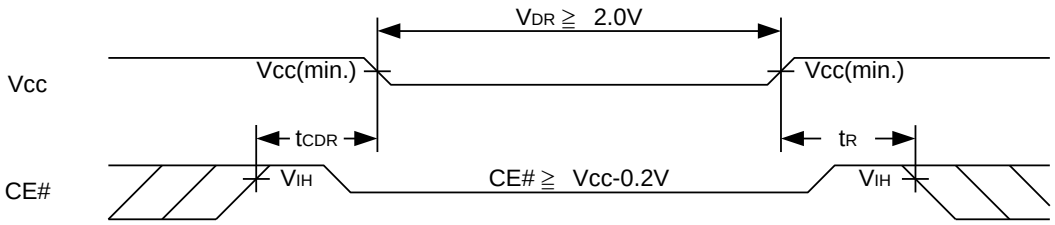
Notes :
1.A write occurs during the overlap of a low CE#, low WE#.
2.During a WE# controlled write cycle with OE# low, t_{WP} must be greater than $t_{WHZ} + t_{DW}$ to allow the drivers to turn off and data to be placed on the bus.
3.During this period, I/O pins are in the output state, and input signals must not be applied.
4.If the CE# low transition occurs simultaneously with or after WE# low transition, the outputs remain in a high impedance state.
5.t_{OW} and t_{WHZ} are specified with C_L = 5pF. Transition is measured ±500mV from steady state.

DATA RETENTION CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
V_{CC} for Data Retention	V_{DR}	CE# ≧ V_{CC} - 0.2V		2.0	-	3.6	V
Data Retention Current	I_{DR}	V_{CC} = 2.0V, CE# ≧ V_{CC} - 0.2V Others at 0.2V or V_{CC} - 0.2V	20	-	0.5	1	mA
			20LL	-	10	50	µA
Chip Disable to Data Retention Time	t_{CDR}	See Data Retention Waveforms (below)		0	-	-	ns
Recovery Time	t_R			t_{RC*}	-	-	ns

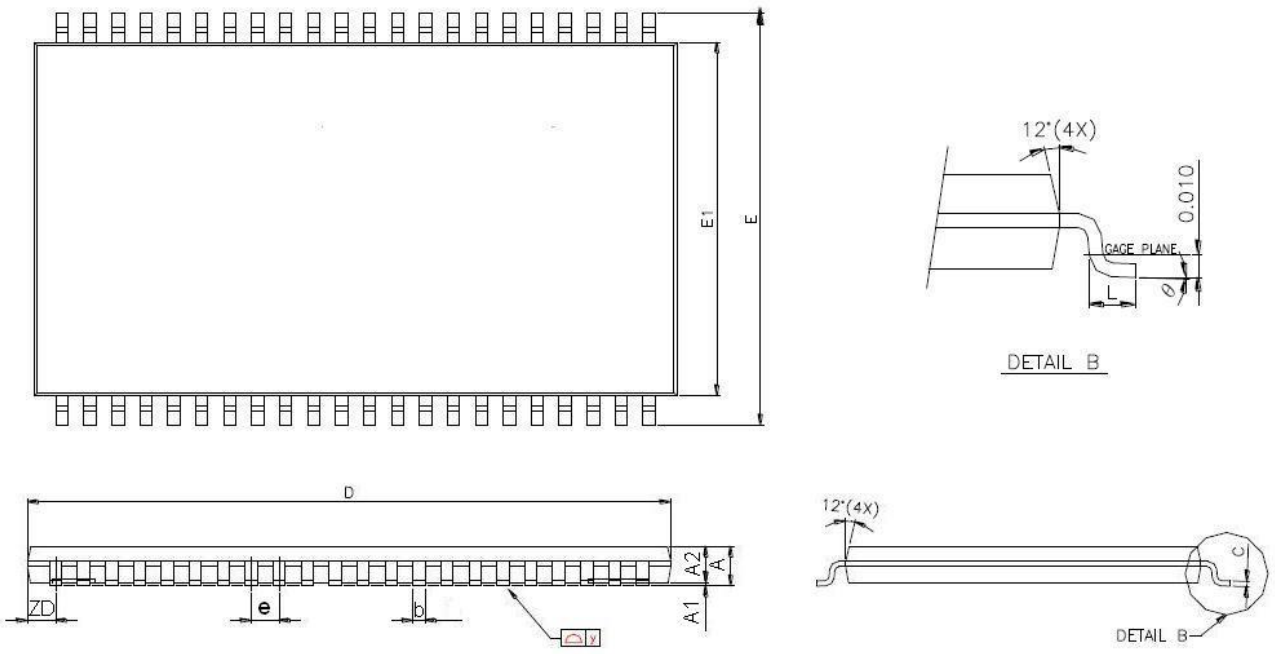
t_{RC*} = Read Cycle Time

DATA RETENTION WAVEFORM



PACKAGE OUTLINE DIMENSION

44-pin 400mil TSOP Ⅱ Package Outline Dimension



SYMBOLS	DIMENSIONS IN MILLMETERS			DIMENSIONS IN MILS		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	-	-	1.20	-	-	47.2
A1	0.05	0.10	0.15	2.0	3.9	5.9
A2	0.95	1.00	1.05	37.4	39.4	41.3
b	0.30	-	0.45	11.8	-	17.7
c	0.12	-	0.21	4.7	-	8.3
D	18.212	18.415	18.618	717	725	733
E	11.506	11.760	12.014	453	463	473
E1	9.957	10.160	10.363	392	400	408
e	-	0.800	-	-	31.5	-
L	0.40	0.50	0.60	15.7	19.7	23.6
ZD	-	0.805	-	-	31.7	-
y	-	-	0.076	-	-	3
θ	0°	3°	6°	0°	3°	6°

ORDERING INFORMATION

Package Type	Access Time (Speed)(ns)	Power Type	Temperature Range(℃)	Packing Type	Lyontek Item No.
44-pin (400mil) TSOP II	20	Normal Power	0℃~70℃	Tray	LY61L5128ML-20
				Tape Reel	LY61L5128ML-20T
			-40℃~85℃	Tray	LY61L5128ML-20I
				Tape Reel	LY61L5128ML-20IT
	20	Ultra Low Power	0℃~70℃	Tray	LY61L5128ML-20LL
				Tape Reel	LY61L5128ML-20LLT
			-40℃~85℃	Tray	LY61L5128ML-20LLI
				Tape Reel	LY61L5128ML-20LLIT

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