A Leading Logic NVM Company

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Outline

Business Model

- Review of Operations
- Growth Opportunity and Future Outlook
- Q & A



Nonvolatile Memory Classifications



SOC Block Diagram



Source : tsmc



Embedded NVM Technologies

	ROM	eFuse (OTP)	Antifuse (OTP)	CMOS Floating Gate (OTP)	CMOS Floating Gate (MTP)	Embedded Flash
Cell Structure	Transistor	Poly Fuse	Antifuse	Floating Gate	Floating Gate	Floating Gate
Standard CMOS Compatible	Yes	Yes	Yes	Yes	Yes	Νο
Bitcell Area	< 1	50	1	2	4	1
Endurance	Νο	No	< 10	< 10	10K-100K	100-1000K
Density	4Kb-1Mb	256bit-4Kb	16bit-1Mb	16Kb-1Mb	1Kb-2M	64Kb-4Mb
Security	Low	Low	High	High	High	High
Additional Steps	None	None	None	None	None	+10 Mask

ROM not programmable, eFuse cannot scale beyond 16Kb, embedded flash expensive and cannot scale after 40 nm

• eMemory's IPs: OTP (antifuse, floating gate) and MTP (floating gate)

Considerations for IP Adoption



Inside Nonvolatile Memory IP



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Crossing the Chasm



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Business Model

- Founded in 2000. First customer engaged in 2002. Achieved profitability in 2005 and IPO in 2011. The largest logic non-volatile memory IP company, 228 employees (159 R&D)*.
- Since its IPO, the company initiated no new fund raising or bank debt, and has distributed in excess of 100% of earnings in cash dividends.
- Growth Indices: 1) No. of on-going technology platforms

2) No. of design licenses

3) Royalty



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Worldwide Customers





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Patent Portfolio

	Q1 16	Q2 16	Diff.
Pending	185	193	+ 8
Issued	345	355	+ 10
Total	530	548	+ 18



Note*: As of Jun. 30th, 2016

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Quarterly Revenue Pattern

 The quarterly royalty from most of foundries are collected at first month of each quarter and from some other foundries are collected at second month, and none at third month.

Unit : NTD Thousands



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Q2 Revenue Breakdown

Unit: NTD thousands

	Q2 2016	Q1 2016	QoQ	Q2 2015	YoY	H1 2016	H1 2015	ΥοΥ
Licensing	77,715	85,976	-9.61%	95,982	-19.03%	163,691	160,038	2.28%
Royalty	202,304	233,870	-13.50%	184,343	9.74%	436,174	378,889	15.12%
Total	280,019	319,846	-12.45%	280,325	-0.11%	599,865	538,927	11.31%

Unit: Number of contracts

		Q2 2016	Q1 2016	2015	2014
Technolog	y Licenses	14	13	28	21
Design	NRE	14	13	57	82
Licenses	Usage	96	69	349	363





Financial Income Statement

(Unit: NTD thousands)	Q2 2016	Q1 2016	% change	Q2 2015	% change
Revenue	280,019	319,846	-12.5%	280,325	-0.1%
Gross Margin	100%	100%	-	100%	-
Operating Expenses	163,276	177,088	-7.8%	141,435	15.4%
Operating Margin	41.7%	44.6%	-2.9ppts	49.5%	-7.8ppts
Net Income	106,245	166,012	-36.0%	130,297	-18.5%
Net Margin	37.9%	51.9%	-14.0ppts	46.5%	-8.6ppts
EPS (Unit: NTD)	1.40	2.19	-36.1%	1.72	-18.6%
ROE	24.5%	34.9%	-10.4ppts	30.9%	-6.4ppts

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Technology License

Unit: Number of contract

Year	2013	2014	2015	H1 2016
License number	19	21	28	27

Note: The terms (including number of process platforms and licensing fees) for each technology license are set contractually. Payments are made according to set milestones, and there are no particular seasonal factors involved.



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Current Technology Development Platforms

- Total (As of June) : 108
- 20 for NeoBit, 46 for NeoFuse, 21 for NeoEE, and 21 for NeoMTP.

	7/10nm	14/16nm	28nm	40nm	55/65nm	80/90nm	0.11~ 0.13um	0.15~ 0.18um	>0.25 um
NeoBit	-	-	-	-	-	-	6	13	1
NeoFuse	2	3	9	6	11	5	7	3	-
NeoFlash	-	-	-	-	-	-	-	-	-
NeoEE	-	-	-	-	-	1	5	15	-
NeoMTP	-	-	-	-	2	2	6	11	-

Current Technology Development Platforms

12" Fabs	Production	Development	NVM Type	Process Type
7/10nm	0	2	ОТР	FF
14/16nm	1	3	ОТР	FF+
28nm	5	9	ОТР	LP/HPM, HLP/HPM, LPS
40nm	4	6	OTP, MTP	HV-DDI, LP
55/65nm	11	13	OTP, MTP, Flash	LP, HV-DDI, HV-OLED, DRAM, CIS
80/90nm	5	8	OTP, MTP	HV-DDI, HV-OLED, LP
0.13/0.11um	6	4	OTP, Flash	HV-DDI, BCD, Generic
0.18um	1	0	ОТР	BCD

8" Fabs	Development	NVM Type	Process Type
0.13/0.11um	20	OTP, MTP, Flash	HV-DDI, BCD, LP, RF, CIS, LL
0.18/0.16/0.152um	42	OTP, MTP	Generic, LP, LL, MR, HV, Green, BCD
0.25um	1	OTP, MTP	BCD
0.35um	0	ОТР	UHV

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Quarterly Design Licensing (New Tape Out)

- Total 192 NTO as of H1 2016(406@2015,445@2014, 393@2013, 303@2012)



Note*: As the applications of MCU at several foundries have gradually entered mass production, and the business model of the main foundry partner which provides green process has shifted to — eMemroy licenses IP cell to the foundry for it to provide direct design service to customers — as the result, the new tape out number of MCU has been affected, but the royalty coming from IP cell usage continues to roll in.

In summary, even the new tape out number of MCU is lower than before; the corresponding wafer output and royalty continue to grow.



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Cumulative Licenses Drive Future Royalties



causing a drop of 6.3% in the following year, 2011.

note 3: CAGR for 2009-2013 was 30%.

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Wafer Production Volume



embedded eMemory IP in T Company (\$revenue); * % of Process node in T company total revenue in Q2 2016

	Process node	*% of T	Q2 16	Q1 16	2015	2014
8"	0.25/0.35	3%	* 18.44%	40.91%	33.49%	30.5%
	0.15/0.18	11%	12.32%	13.41%	8.73%	11.9%
	0.11/0.13	2%	43.90%	27.53%	29%	20.8%
12"	90nm	5%	* 11.33%	20.04%	19.85%	16.3%
	65nm	12%	3.76%	2.91%	0.55%	0%
	40/45nm	15%	0%	0%	0%	0%
	28nm	28%	0.41%	0.46%	0.05%	0%
	16/20nm	23%	0	0%	0%	0%
8"		17%	16.39%	20.33%	16.64%	15.6%
12"		83%	1.36%	1.97%	1.87%	1.4%
Total		100%	3.92%	5.09%	4.76%	4.5%

* Due to Inventory correction of iOS related customers in Q2.

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eMemory's NVM Technologies

Logic NVM portfolio offers one-stop-shop solution.

- Compatible to any process
- > Robust structure
- > Low process cost

- > Competitive macro sizes
- > Easy integration
- > Easy porting

eMemory's NVM	07	ГР	МТР			
Technology	NeoBit	NeoFuse	NeoFlash	NeoEE	NeoMTP	
Product Type	OTP	OTP	Flash	EEPROM	MTP	
Endurance (Cycles)	10	10	1K~10K	10K~100K	1K~10K	
Additional Mask Steps	0	0	2-3	0	0	
Technology	Floating gate	Anti-Fuse	SONOS	Floating gate	Floating gate	
Scalability	Simple	Simple	Simple	Simple	Simple	
Memory Density	HD < 512Kb GHD < 16Mb	< 4Mb	< 2Mb	< 4Kb	< 512Kb	



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Opportunity at all Price Points





eMemory IP in Smart Phone



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Benefits from Using eMemory IPs

Package/FT level



4. Encryption : Security algorithm or key storage

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Invisibility for Security

- Provide "Invisible Hardware Key" for invisible storage
- Prevent reverse-engineering to detect content of security key
- Protect firmware and hardware of ICs from pirating
- Extend & protect customer's business



Invisible Hardware Key : Data is hard to be detected

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eFuse Key: Data is easily observed

Security & Protection

Authorized Product

Fake Product



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OTP for security storage



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Security with eMemory IPs



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NVM IP Demand in IoT



Autotronics with eMemory IPs



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Imager Module with eMemory IPs



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Advanced LCD Driver ICs

Process Technology : 0.11um HV/80nm HV/55nm HV



Code	2 Timing Control Pattorn
Storage	2. Thing Control Fattern
U	3. Color Engine Enhancemen

Power Management ICs for Baseband and Application Processor

Process Technology : Advanced 0.25um BCD/ 0.18um BCD/ 0.13um BCD Mature 0.18um/0.16um/0.152um Logic

	Density	NVM Type	Purpose	NVM Usage
Application Processor	2Kb~4Kb	ОТР	Trimming	DC/DC, Bandgap
			Parameter Setting	Design flexibility & Performance optimization
			Code Storage	Start-up behavior & smart power saving algorithm
Base Band IC	PMIC	Neo Bit		

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Touch Panel Controller ICs

Process Technology : 0.16um HV/0.11um G



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In-Cell Touch Panel Controllers ICs

Process Technology : 0.11um HV/80nm HV/55nm HV



Density	Endurance	NVM Type	Purpose	NVM Usage
2K8~4K8	1	ОТР	Trimming	Accuracy
			Code Storage	Gamma Table
16K8~32K8	<1000	МТР	Code Storage	Touch F/W Code
			Parameter setting	Performance Optimization

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CMOS Image Sensor

Process Technology : 0.11um CIS/90nm CIS/65nm CIS



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MEMS 180/160/15x nm HV/Logic for MEMS Controller



Density	NVM Type	Purpose	NVM Usage
2Kb~4Kb OTP	Trimming	Factory trimming	
		Parameter Setting	Signal filtering
		Code Storage	Geometric computation

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Replacement of Embedded Flash for Competitiveness Improvement

product design & manufacturing by embedded Flash Logic Process + 10 Masks

30% more cost reduction

wafer cost & testing time

product design & manufacturing by Embedded Logic NVM (OTP/MTP) Logic Process

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MCU

MCU

MCU Applications with EEPROM



storage for ID, trimming, encryption...

One-time



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NeoBit + NeoEE

Hybrid NVM solution (NeoBit + NeoEE) with customized SPEC & optimized size



One single IP by integration of NeoBit & NeoEE Help for system size reduction

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Wafer Demand by IC Type

ІС Туре	Equa to 8-inch wafer (K)	
AP	5740	
PMU	5255	
Base Band controller	2945	
Smart card controller	2683	
Fingerprint	2500	
CIS sensor	2215	
LCD driver (int with TCON)	1955	
Gauge IC	708	
TV controller	619	
Touch panel controller (C)	602	
Connectivity	463	
STB controller	348	
DC-DC/AC-DC	239	
Wifi controller	231	
Accelator sensor controller	166	
LED driver	140	
Light snesor	126	
Gyroscope sensor controller	120	
BT controller	107	
TAG IC	104	
MCU (8bits, LV/3.3V)	90	
MCU (8bits, pure 5V)	88	
ISP	82	
DVD controller	67	
P-Gamma	47	
NB CAM controller	38	
Pressure sensor controller	23	
Touch pad controller	16	
PC CAM controller	14	
Touch panel controller (R)	3	
TCON (w/o driver)	3	
Speech controller	0	

2015 Q3 updated

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Outlook for Q3 and Beyond

- iOS related applications will increase wafer production in Q3 after experiencing an inventory correction in previous quarters, and are expected to see a substantial increase in royalty contribution in Q4.
- With more customers ramping up production and expanding into new applications, PMIC related products will maintain strong growth momentum in the coming quarters.
- 55nm TDDI continues volume production.
- Fingerprint customer started wafer production in Q2 and contributed 4% of total July royalty. We expect more fingerprint customers to ramp up production in Q3, resulting in further contribution to royalties in the following quarters.

Outlook for Q3 and Beyond

- 28nm DTV applications will increase volume production in 2H of 2016. 2 more STB customers have taped-out in the 1H of 2016.
- 7 process platforms for OLED are under qualification at different foundries. There were 2 tape-outs for OLED drivers in second quarter and more tape-outs expected in 2H.
- We expect 2 NRE designs and tape outs in 16nm FFC in 2H of 2016.
- NeoPUF, our new technology for security applications is expected to tape-out IP in September.
- Automotive applications continue platform build with further tape outs for European and Japan customers.

Key Growth Drivers





Q & A



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