

Thirty billion power conversion ICs enable power management applications, says Petrov Group

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The analog power conversion IC segment dominates the power management market; it accounts for about 30 billion units and US\$11 billion revenues with a forecast average growth rate of 8% from 2010 to 2015. The power conversion IC market is highly fragmented, however, with growth rates for its various segments ranging from 4% to more than 15% in the 2010 to 2015 period, according to the Petrov Group.

The Petrov Group based its findings on a detailed bottom-up analysis of thirty vendors which account for more than two-thirds of the total market. Vendors analyzed include Texas Instruments, National, Linear, Maxim, Intersil, ADI, AnalogicTech, MPS, ON Semi, Infineon, Rohm, Diodes, STM, Semtech, Exar, Fujitsu ME, Richtek, Micrel, Sanyo Semi, Vishay, Freescale, Dialog, Wolfson ME, Microchip, Fairchild, IRF, austria-microsystems, Active-Semi, PAM, and Marvell.

The findings are derived from actual vendor data on more than 9,000 products," said Boris Petrov, managing partner of the Petrov Group. The analysis was focused on switching power conversion, which represents the essence of analog power ICs.

Power efficiency requirements are also strongly dependent on end-equipment application requirements. The trend is from converter level topology optimization to system level architecture optimization and load activity based power management. This trend is in favor of emerging digital power technology. Digital power management can optimize performance at the system level, while digital control enables optimization of efficiency at the converter level in the entire load range.

Power distribution architecture trends have primarily been driven by advances in semiconductor technologies as well as the trend toward lower voltages at high currents. Continuously decreasing cost and improving performance of non-isolated DC/DC converters has enabled the proliferation of the intermediate bus architecture (IBA). In this architecture a number of non-isolated power conversion ICs provide power to a range of specific loads (point-of-load converters). New power architecture trends drive the proliferation of non-isolated point-of-load power conversion ICs, especially of switching synchronous buck (step-down) DC/DC conversion ICs, according to the Petrov Group.

Switching DC/DC conversion ICs offer a significant size and weight reduction; power efficiency and size (i.e., power density) is based on finding a switching frequency that optimizes the trade-off between conduction and switching losses. Power MOSFET devices have not only enabled significant increases in the switching frequency (in the megahertz range), but also in the size reduction of magnetic components.

Growth of switching DC/DC conversion ICs is the highest among non-isolated power conversion ICs. By 2013, switching type products will reach or exceed the unit level of linear/LDO regulators (about 17 billion units) for the first time. Integration of power MOSFETs (typically DMOS based devices) is an increasing trend for non-isolated DC/DC conversion ICs (both converters and controllers).

General-purpose oriented single-function products dominate power conversion ICs and represent the basic building-blocks of power systems. Therefore, these products emphasize performance and are implemented in a range of process technologies including Bipolar, BICMOS, BCD, and analog CMOS. Application oriented multi-function products emphasize integration and are implemented in CMOS-based process technologies typically specialized for a specific high-volume end-equipment type, such as mobile phones.

From an integration viewpoint, non-isolated DC/DC conversion ICs could be segmented into four distinct integration domains: 1) Single and multi-function products dominate power conversion ICs, 2) Multi-function products integrate DC/DC conversion functions with application power functions (typically battery charging), 3) Multi-function products integrate DC/DC conversion functions with application power functions (typically battery charging and LED drivers) and system functions (typically audio), 4) Multi-function products integrate DC/DC conversion functions and system functions.

Implications

The first integration domain contains the majority of DC/DC conversion ICs dominated by single-function products featuring one or two channels, i.e., building-block functions of power systems. Integration domains 2 and 3 follow in terms of unit volume and are dominated by products integrating battery charging and/or audio functions with integration domain 1 functions.

Power conversion ICs cover a large application space ranging in currents from milliamperes to 100+ amperes and in voltages from less than 1V to 800+V. Applications include end-equipment types powered from a single-cell battery to 1000+V batteries to single phase AC power lines. This large application space enables IC vendors to target process technologies at specific power conversion IC market segments.

The power conversion ICs market represents about 30 billion units (US\$11 billion) in 2010. The number of power conversion ICs increases along the power distribution chain from AC supply to point-of-load. As a result, non-isolated DC/DC conversion ICs dominate power conversion products.

Power factor correction (PFC) controllers feature the highest growth rate driven by the increasing need for higher power efficiency in AC/DC power conversion front-ends. Worldwide regulation led by Europe, Japan, and China drives the growth of PFC ICs.

High growth areas in the non-isolated DC/DC conversion ICs market include switching DC/DC conversion ICs – 12% and switching DC/DC converters (internal power switches) – 14%.

Various segments of switching DC/DC converters have different growth rates, for example: DMOS/MOS power switches – 14%, buck (step-down) topology – 15%, boost (step-up) topology – 12%, one or two channel products – more than 12%, equal or less than 2A load current – more than 12%, equal or less than 40V input/output voltage – more than 12%.

Switching DC/DC converters with integrated DMOS/MOS power switches represent the highest growth segment among non-isolated power conversion ICs. Key product attributes include (1) one or two channels, (2) 2A or less load current, and (3) 40V or less input/output voltage. Higher current and voltage levels represent the high-end part of the market.

General-purpose standard products represent 79% of total non-isolated DC/DC conversion ICs and are dominated by single-function products (75% of total). Practically all products feature one or two channels, i.e., building-block functions broadly used in power systems. Application-specific standard products are about equally represented by single and multi-function products. Multi-function ICs growth rates are mainly driven by specific end-equipment types.

Petrov Group: Non-isolated point-of-load DC/DC conversion ICs (internal and external power switches)

Vendor	Single-function ICs							Multi-function ICs		Grand total # of Products
	Inductor based		Charge pump		Linear/LDO		Total generic products	# of Products	% Grand total	
	# of Products	% Total	# of Products	% Total	# of Products	% Total				
TI	460	32%	72	5%	908	63%	1,440	52	3%	1,492
National	209	53%	24	6%	162	41%	395	13	3%	408
Linear	567	84%	39	6%	68	10%	674	34	5%	708
Maxim	375	66%	51	9%	145	25%	571	53	8%	624
Intersil	227	88%	2	1%	30	12%	259	0	0%	259
Analog Devices	23	32%	11	15%	37	52%	71	2	3%	73
AnalogicTech	63	79%	0	0%	17	21%	80	25	24%	105
MPS	99	86%	1	1%	15	13%	115	4	3%	119
PAM	7	50%	0	0%	7	50%	14	0	0%	14
ON Semiconductor	125	8%	7	0%	1,410	91%	1,542	0	0%	1,542
Infineon	13	32%	0	0%	28	68%	41	8	16%	49
Rohm	89	24%	0	0%	275	76%	364	11	3%	375
Diodes	37	38%	0	0%	60	62%	97	0	0%	97
STMicroelectronics	99	22%	1	0%	352	78%	452	6	1%	458
Semtech	115	58%	26	13%	56	28%	197	9	4%	206
Exar	33	47%	2	3%	35	50%	70	0	0%	70
Fujitsu ME	40	100%	0	0%	0	0%	40	2	5%	42
Richtek	103	61%	0	0%	66	39%	169	3	2%	172
Micrel	83	39%	0	0%	132	61%	215	0	0%	215
Sanyo	58	62%	9	10%	27	29%	94	2	2%	96
Vishay	39	62%	1	2%	23	37%	63	1	2%	64
Freescale	7	39%	0	0%	11	61%	18	5	22%	23
Dialog	0	0%	0	0%	0	0%	0	5	100%	5
Wolfson ME	0	0%	0	0%	0	0%	0	8	100%	8
Marvell	8	100%	0	0%	0	0%	8	6	43%	14
Microchip	13	13%	26	25%	63	62%	102	5	5%	107
Fairchild	43	21%	4	2%	155	77%	202	0	0%	202
IRF	55	23%	0	0%	181	77%	236	0	0%	236
AMS	17	50%	2	6%	15	44%	34	7	17%	41
Active-Semi	17	100%	0	0%	0	0%	17	24	59%	41
Total	3,024	40%	278	4%	4,278	56%	7,580	285	4%	7,865

Source: The Petrov Group, compiled by Digitimes, August 2010

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Power conversion ICs of 30 analyzed vendors account for 9,024 generic products revealing the following major trends: 87% are non-isolated DC/DC conversion ICs; DC/DC conversion ICs increasingly integrate on-chip power switches, 84% of internal power switches are implemented with DMOS/MOS devices; one and two channel products represent practically all single-function power conversion ICs; buck (step-down) and boost (step-up) topologies represent 89% of all topologies; products featuring 40V or less input/output voltage represent more than 90% of buck and boost DC/DC conversion ICs; products featuring 2A or less load current represent about 75% of buck and boost DC/DC conversion ICs; multi-function DC/DC conversion ICs that integrate switching and linear/LDO regulator functions represent 78% of all multi-function products; 87% of single-function power conversion ICs are of the general-purpose type; 69% of multi-function power conversion ICs are of the application-specific type.

The product portfolios of the 30 analyzed vendors represent the overall market attributes of power conversion ICs that can be mapped into 16 comparative data maps with vendor-specific details. Vendor focus and positions in multi-function and multi-channel power conversion ICs reveal how likely is their expansion into other power ICs, including highly integrated "companion" PMUs for application processors, said the Petrov Group.

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