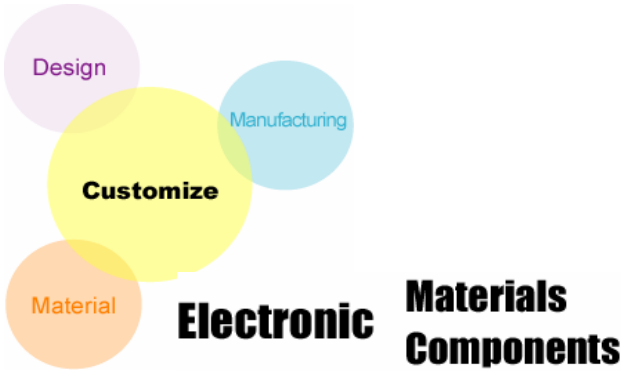




Introduction of Multilayer Power Inductor



Joinset Co., Ltd.

19B-11L, Panwol Industrial Complex, 606-1, Sungkok-Dong, Ansan City, Kyunggi-Do, 425-110, Korea

Tel.) 82-31-495-2601 [Rep.] Fax) 82-31-495-2693 E-mail) joincs@joinset.com

Multilayer Chip Power Inductor?

What

Power Inductor means inductor that can be applied in power line. We developed small size and high performance power inductor that can be used in high current line using by our material, producing and CAE technology. It can be replaced wire wound type power inductor.

Where

Normally it is used in output line of DC-DC Converter with capacitor. It converts switching wave form that output from DC-DC converter to dc form. Multilayer Chip Power Inductor can be used in small mobile set such as mobile phone, PMP, DSC, MP4 so on.

Application

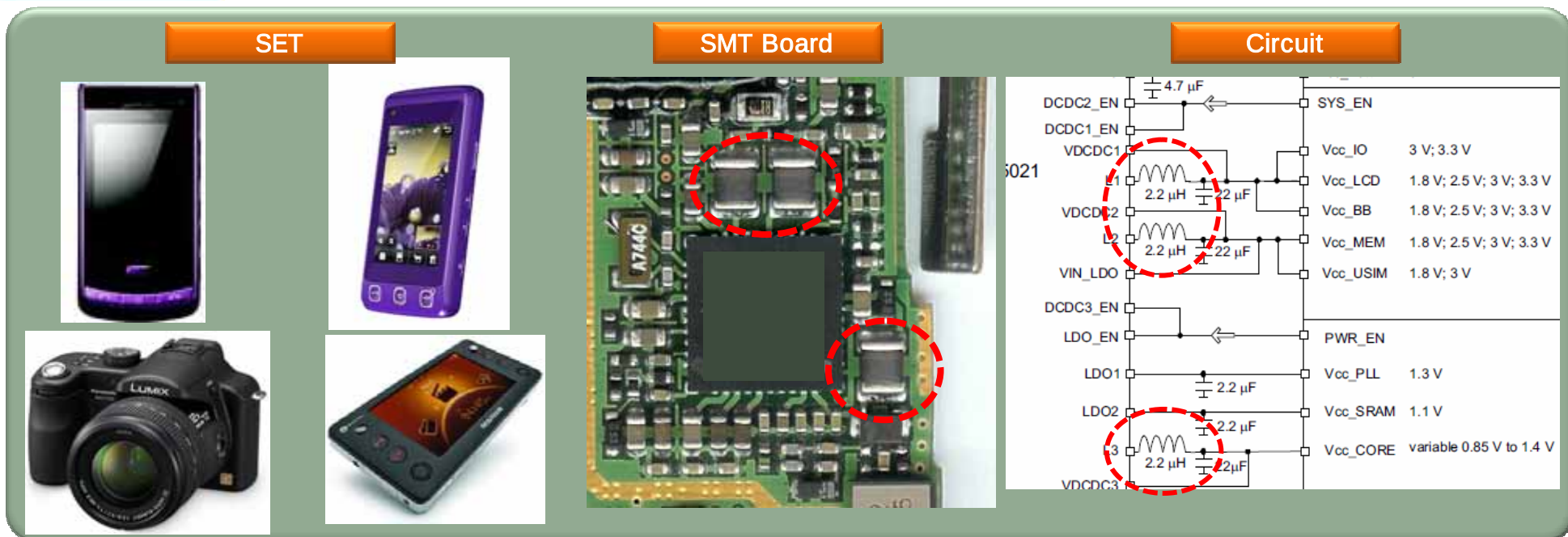


Fig 1. Applications of Multilayer Power Inductor

Special Feature of Joinset Power Inductor

Set Needs

Small & Slim

- High Density PCB
- Highly Integrated SoC
- Slim & Large LCD Panel

High Power Efficiency

- High Speed Processing
- Entertainment & Wireless
- Increasing Multifunction

Low EMI Noise

JCPN Series

Down Sizing

Can decrease 73% of SMT Area and 0.4mm Thickness



3.0X3.0X1.2

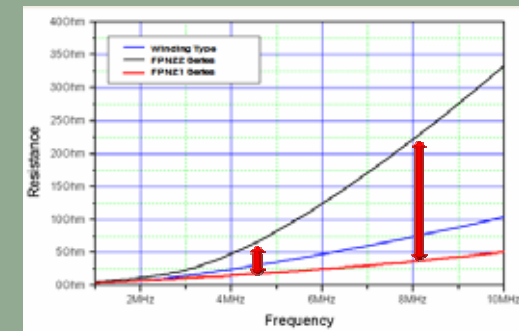


2.0X1.2X0.9

Low Rac

Show Low Rac at high switching frequency.

It can show low loss in power line



Low Radiation

has lower radiation noise than winding type. Cause it is constructed in closed magnetic shield,

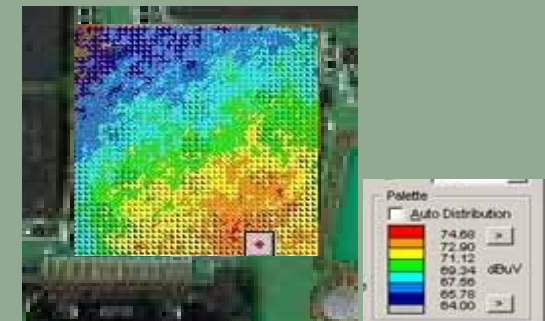


Fig 2. Characteristics of Joinset's Multilayer Chip Power Inductor

Case of using power inductor in mobile phone

- Example of 2016 size multilayer type power inductor in 3G (WCDMA) Mobile Phone
- JCPN 2012 series can be more decrease SMT area than others.

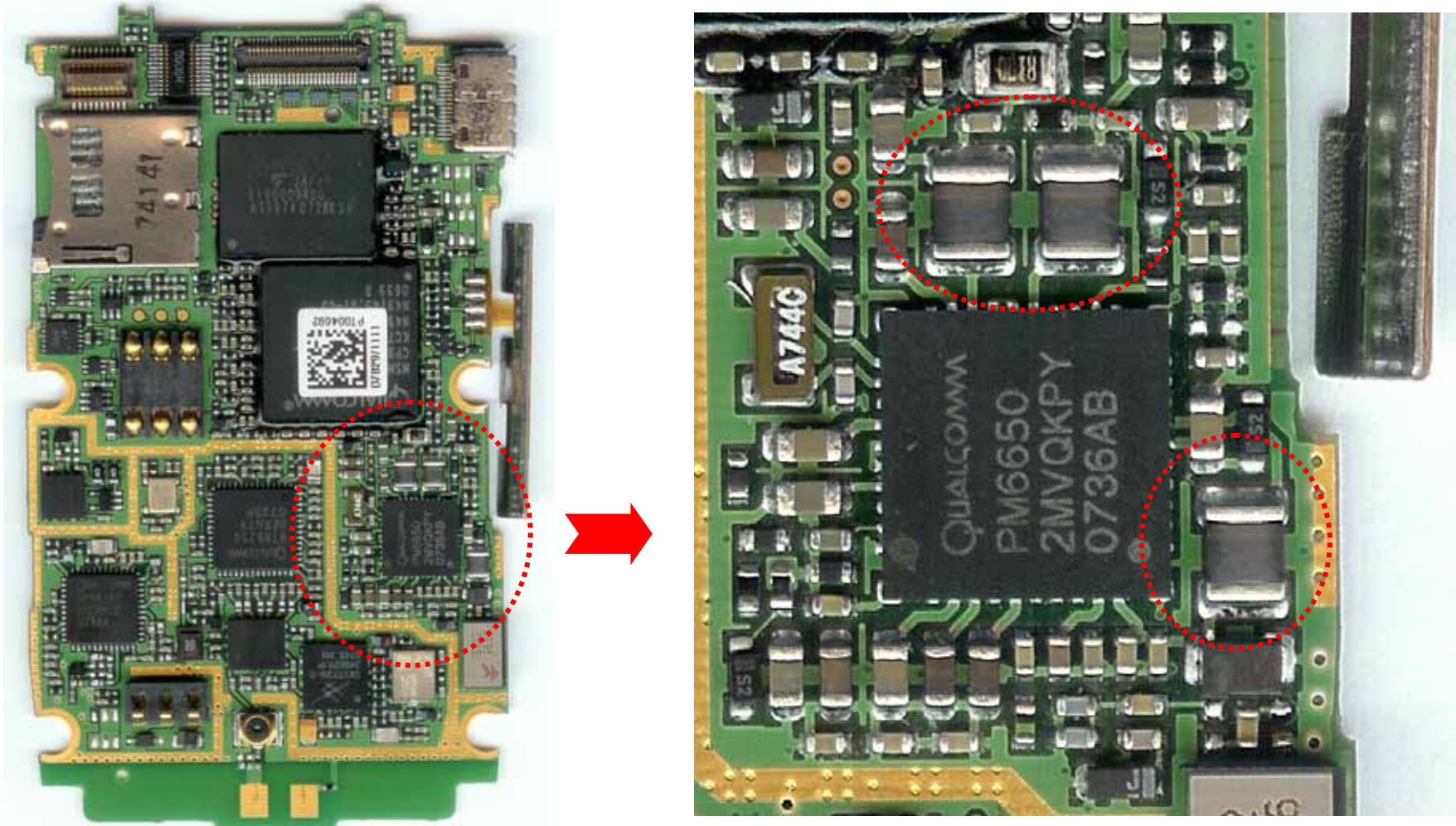


Fig3. Example of Multilayer Chip Power Inductor that is applied in 3G Mobile Phone using Qualcomm, PM6650 PMIC

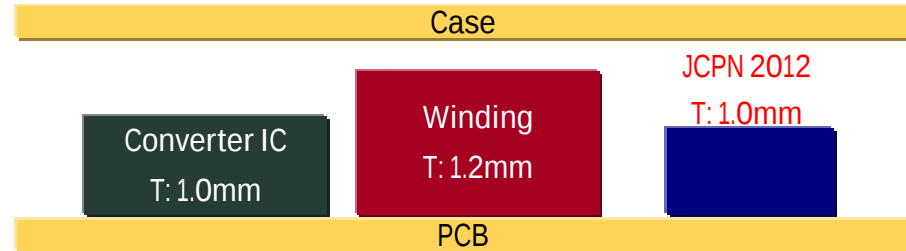
Advantage of JCPN Series (Mechanical Characteristics)

Small & Slim

Small SMT Area

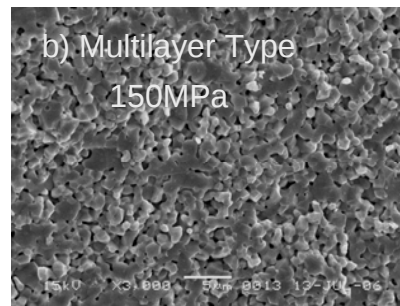
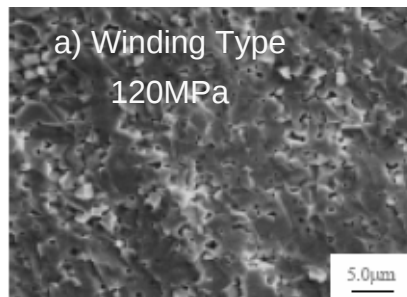
	L	W	Area
Winding	3.0	3.0	9.0
JCPN 2012	2.0	1.2	2.4
Difference	33%	60%	73%

Low Thickness



High Mechanical Strength

Bending Strength



JCPN2012 Series has a smallest size and lowest thickness. So you can save more space in board and can design more slim.

It also has a good strength, so it doesn't make a SMT error like broken failure, miss pick up, crack, so on.

Fig 4. Micro structures of ferrite body a) Winding type, b) Multilayer type

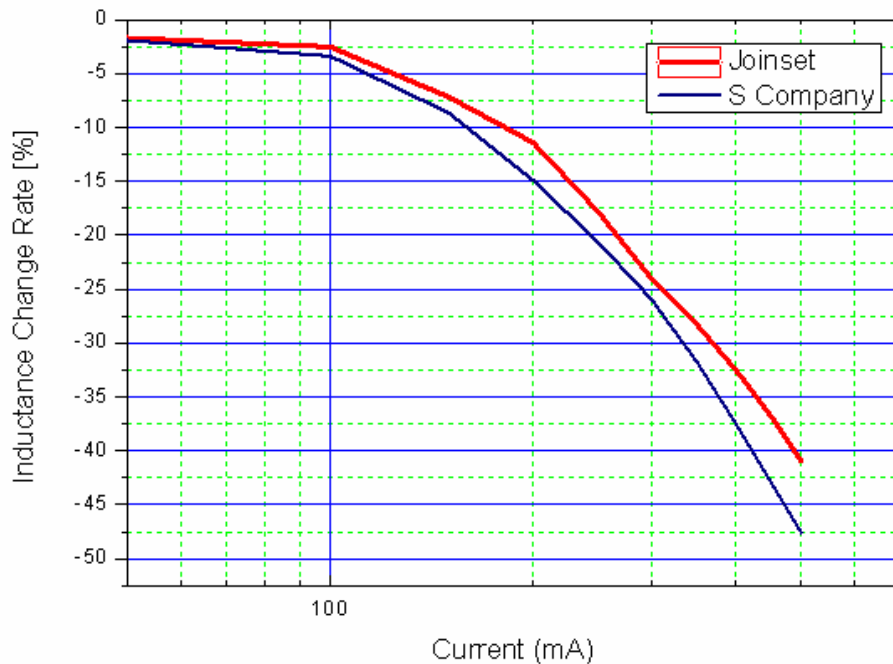
Comparing spec. with others

- Joinset Multilayer Chip Power Inductor has superior characteristics comparing with others.
- JCPN 2012 series has lowest dc resistance, highest rated current in same size.

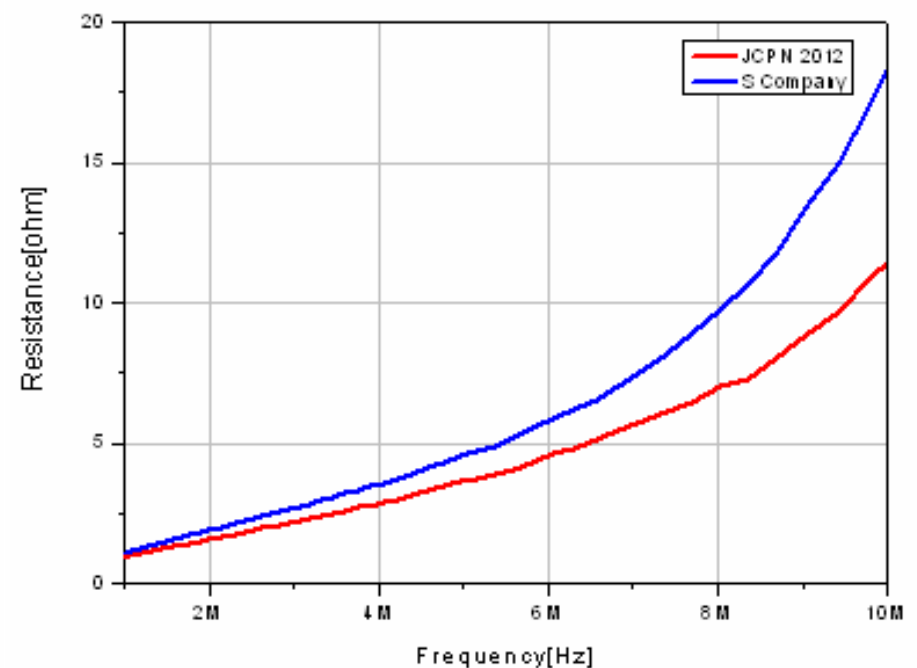
Manu	Type	Size (mm)	Thickness (mm)	Inductance (uH)	Rdc (Ω)	Rated Current (mA)	Remark
Joinset	Multilayer	2.0 x 1.25	Max. 1.0	2.2±20%	0.17±20%	1000	
S Company	Multilayer	2.0 x 1.25	Max. 1.0	2.2±20%	0.20±20%	810	
F Company	Multilayer	2.0 x 1.25	Max. 1.0	2.2±30%	0.23±30%	700	
A Company	Wound	2.0 x 1.4	Max. 1.0	2.2±20%	Max. 0.39	630	
		2.0 x 2.0	Max. 1.0	2.2±20%	Max. 0.25	1160	
		2.0 x 2.0	Max. 1.4	2.2±20%	Max. 0.13	1330	
M Company	Wound	2.0 x 1.6	Max. 1.0	2.2±20%	0.48±30%	425	
	Multilayer	2.0 x 1.25	Max. 0.5	2.2±20%	0.34±30%	600	

Advantage of JCPN Series (Electrical Characteristics)

- JCPN 2012 Series has smaller inductance changing rate than others, so it can supply stable power at working current range of IC.
- JCPN 2012 Series has small AC resistance, so it shows high power efficiency at switching frequency of DC/DC Converter.



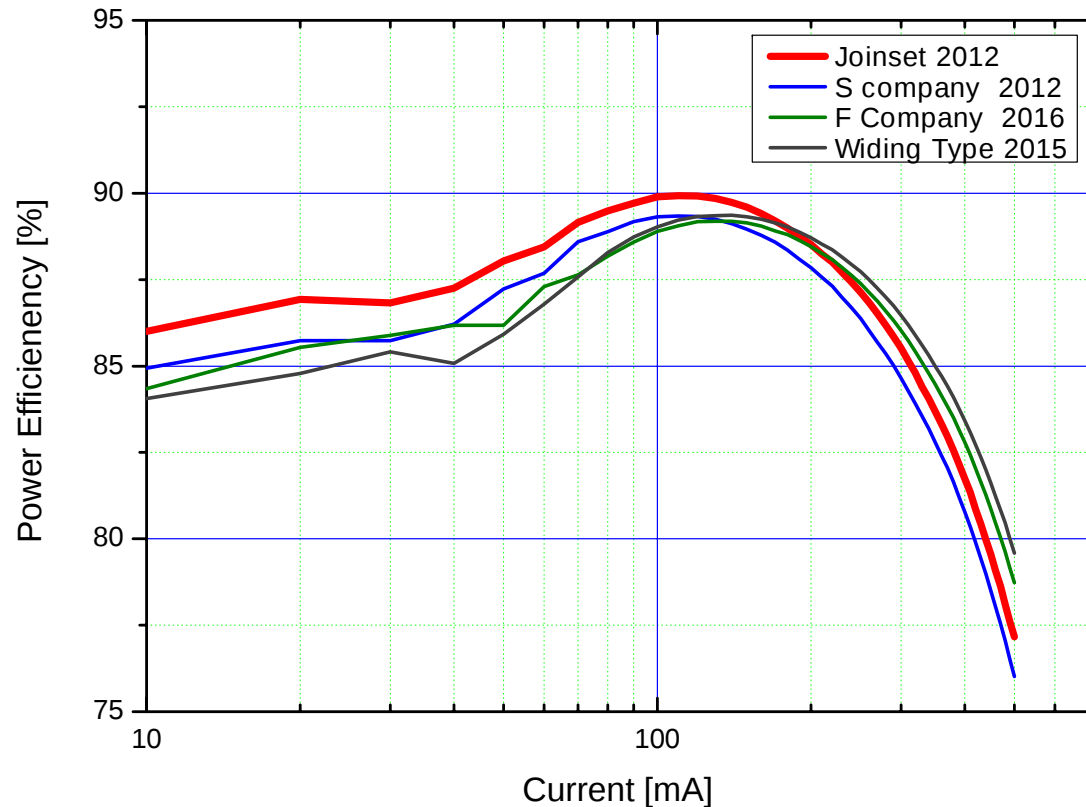
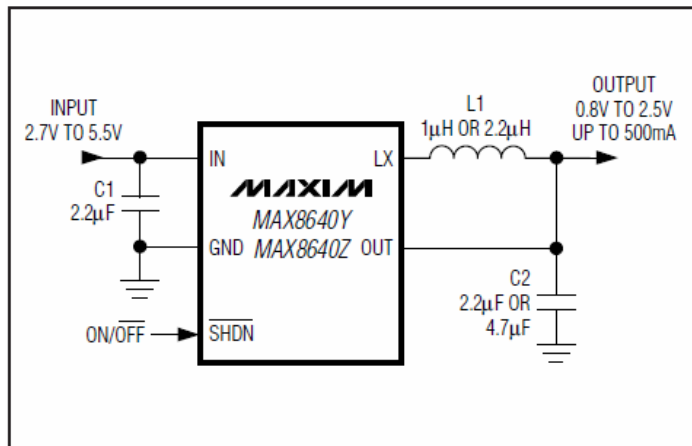
Graph 1. Inductance Change Rate for rated current
(Multilayer Type 2012 Size, 2.2uH)



Graph 2. Resistance for various switching frequency
(Multilayer Type 2012 Size, 2.2uH)

Evaluation result of power Inductor

- JCPN 2012 Series shows higher power efficiency than others when it is used in Max8640, step down dc-dc converter that is applied in Mobile Set.

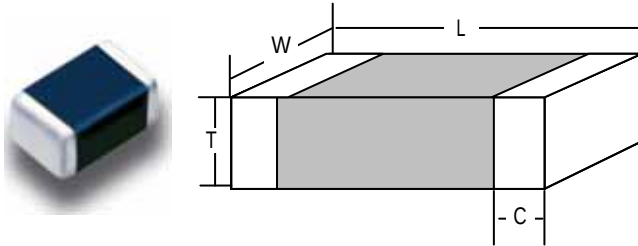


Graph 3. Power efficiency of various types of power inductor

Test Condition : Max8640, $V_{in}=3.7V$, $V_{out}=1.8V$, $f_{sw}=2.0MHz$, $L=2.2\mu H$

Specification (2012 Normal Type)

Shape & Dimensions

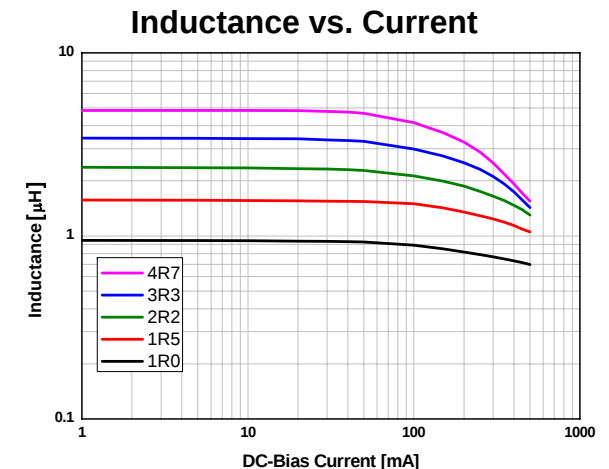
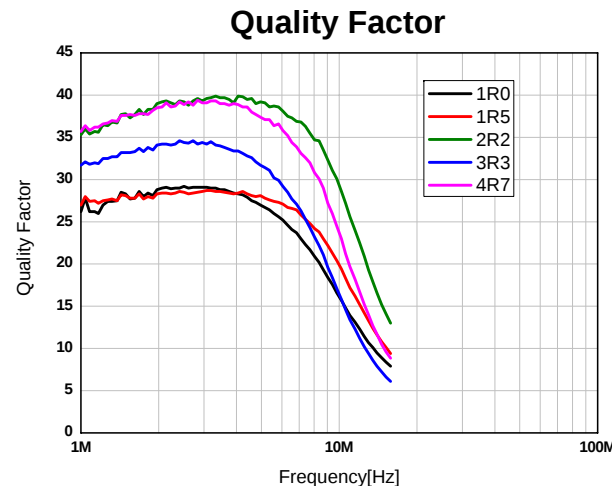
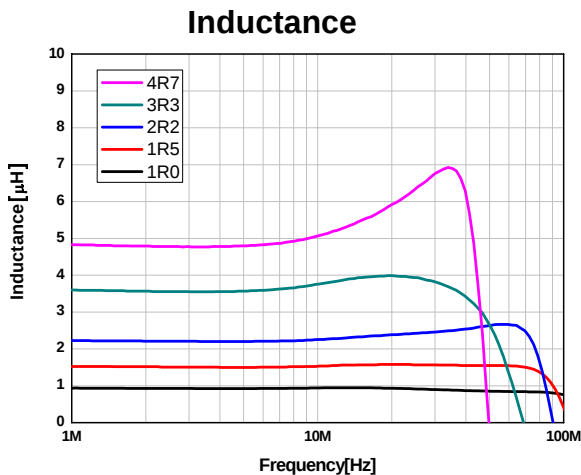


Series	Length(L)	Width(W)	Thickness(t)	C
1608 (0603)	1.6±0.15	0.8±0.15	Max. 0.8	0.2~0.6
2012 (0805)	2.0±0.2	1.25±0.2	Max. 1.0	0.2~0.8
2016 (0805)	2.0±0.2	1.25±0.2	Max. 1.0	0.2~0.8
2520 (1008)	2.5±0.2	2.00±0.2	Max. 1.0	0.2~0.8

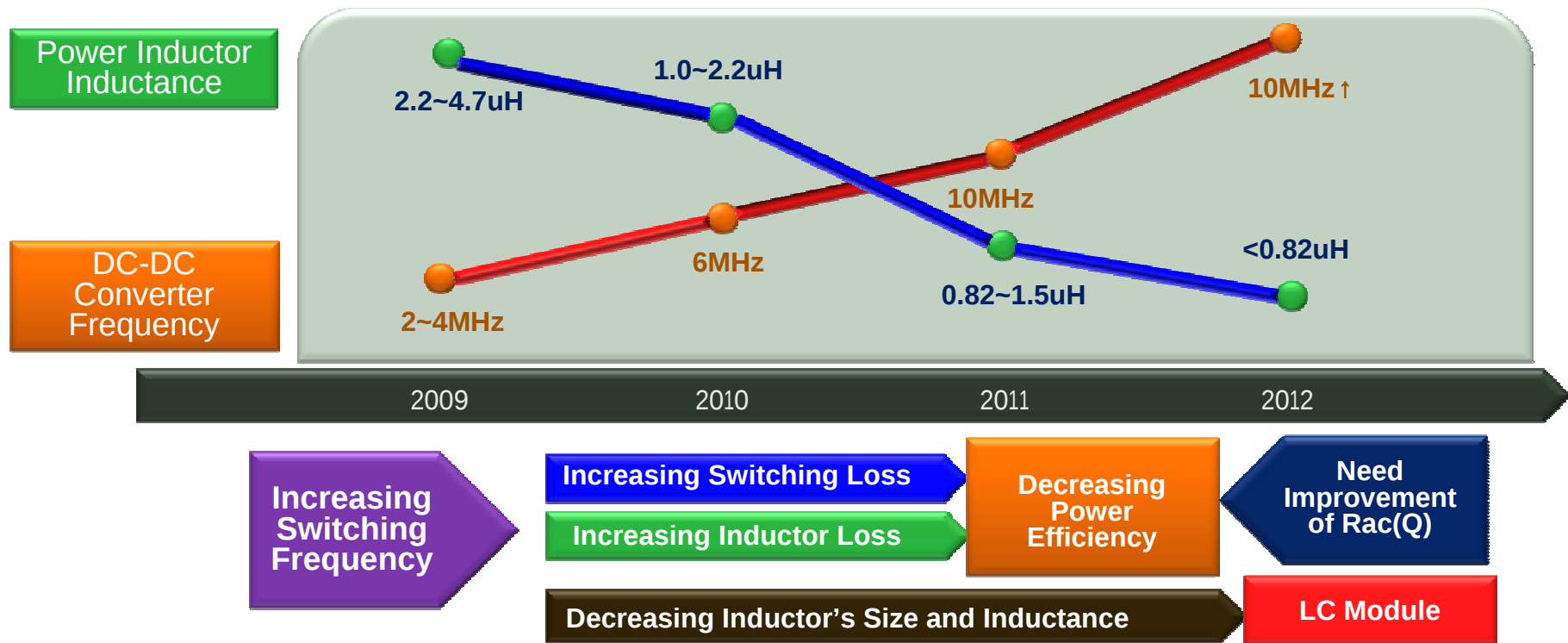
Electrical Specification

Part Number	Inductance (μH) ±20%	Q Min	DC Resistance (Ω) ±20%	Rated Current (mA) Max.
JCPN2012F1R0MNT	1.0	25	0.11	1200
JCPN2012F1R5MNT	1.5	25	0.14	1100
JCPN2012F2R2MNT	2.2	25	0.17	1000
JCPN2012F3R3MNT	3.3	25	0.23	900
JCPN2012F4R7MNT	4.7	25	0.26	800

Characteristics of Power Inductor (2012 Size)



Converter's Trend & Road Map



Multilayer Power Inductor	Type	Size	Inductance (uH)								
			0.47	0.68	1	1.5	2.2	3.3	4.7	6.8	10
	Normal	1608	09.10			09.12					
		2012			Mass Production						
		2016			09.09						
		2520			09.09						
	High Current	1608	10.02			10.05					
		2012			09.10						
		2016			09.11						
		2520			09.12						
L, C Combined		10.08									

Reference of Power Inductor

Company	Part No.	Type	fsw	Imax	Convert No.	Ref. Inductance									Remark
						0.47	0.68	1.0	1.5	2.2	3.3	4.7	6.8	10	
Linear	LTC3101	PMIC	1.27	350	3							3			JCPN 2012
	LTC3407	Converter	1.50	600	2					2					JCPN 2012
	LTC3410	Converter	2.25	1000	1							1			JCPN 2012
	LTC3411	Converter	4.00	1200	1					1					JCPN 2012
	LTC3417	Converter	4.00	800	2				1	1					JCPN 2012
	LTC3455	Converter	1.50	800	2							2			JCPN 2012
	LTC3547	Converter	2.25	300	2							2			JCPN 2012
	LTC3555	Converter	2.25	1000	3					1	2				JCPN 2012
	LTC3556	Converter	2.25	400	2						2				JCPN 2012
	LTC3557	Converter	2.25	600	3						1	2			JCPN 2012
	LTC3564	Converter	2.25	1250	1			1							JCPN 2012
Maxim	Max1513	Converter	1.50	500	1					1					JCPN 2012
	Max1557	Converter	1.00	600	1						1				JCPN 2012
	Max1572	Converter	2.00	800	1					1					JCPN 2012
	Max1586	PMIC	1.00	1300	3						1		1	1	JCPH 2012
	Max1702	PMIC	1.00	900	3							3			JCPN 2012
	Max1733	Converter	1.20	250	1									1	JCPN 2012
	Max1748	Converter	1	1500	1								1		JCPH 2012
	Max1802	PMIC	1.25	800	2									2	JCPN 2012
	Max1820	Converter	1	600	1							1			JCPN 2012
	Max1878	Converter	1	500	2							1		1	JCPN 2012
	Max1896	Converter	1	600	1									1	JCPN 2012
	Max1920	Converter	1.2	400	1							1			JCPN 2012
	Max1927	Converter	1	800	1							1			JCPN 2012
	Max1958	Converter	1	800	1							1			JCPN 2012
	Max1970	Converter	1.4	750	2							2			JCPN 2012
	Max1973	Converter	1.4	1000	1						1				JCPN 2012
	Max1997	Converter	1.5	1300	1						1				JCPH 2012
	Max8500	Converter	1	600	1							1			JCPN 2012
	Max8506	Converter	1	600	1							1			JCPN 2012
	Max8581	Converter	2.5	600	1				1						JCPN 2012
	Max8588	PMIC	1	1300	3						1		1	1	JCPN 2012
	Max8620	Converter	4	500	1					1					JCPN 2012
	Max8621	Converter	4	500	2					2					JCPN 2012
	Max8625	Converter	1	500	1						1				JCPN 2012
	Max8640	Converter	4	500	1			1							JCPN 2012
	Max8662	PMIC	1	1200	2						1	1			JCPN 2012
	Max8667	Converter	1.5	1200	2					2					JCPN 2012
	Max8671	PMIC	2	600	3							3			JCPN 2012
	Max8805	Converter	4	650	1					1					JCPN 2012

Reference of Power Inductor

Company	Part No.	Type	fsw	Imax	Convert No.	Ref. Inductance									Remark
						0.47	0.68	1.0	1.5	2.2	3.3	4.7	6.8	10	
TI	TPS62040	Converter	1.25	1200	1							1			JCPN 2012
	TPS62050	Converter	1.20	800	1									1	JCPN 2520
	TPS62110	Converter	1.40	1500	1								1		JCPH 2520
	TPS62201	Converter	1.00	300	1									1	JCPN 2520
	TPS62250	Converter	2.25	600	1					1					JCPN 2012
	TPS62261	Converter	2.25	600	1					1					JCPN 2012
	TPS62270	Converter	2.25	400	1					1					JCPN 2012
	TPS62290	Converter	2.25	1000	1					1					JCPN 2012
	TPS62301	Converter	3.00	500	1			1							JCPN 2012
	TPS62350	Converter	3.00	800	1			1							JCPN 2012
	TPS62401	Converter	2.25	600	2					2					JCPN 2012
	TPS62410	Converter	2.25	800	2					2					JCPN 2012
	TPS62420	Converter	2.25	1000	2					2					JCPN 2012
	TPS62601	Converter	6.00	500	1	1									JCPN 2012
	TPS65010	PMIC	1.25	1000	2								1	1	JCPN 2520
	TPS65020	PMIC	1.50	1200	3					3					JCPN 2012
	TPS65021	PMIC	1.50	1200	3					3					JCPN 2012
	TPS65023	PMIC	2.25	1500	3					3					JCPH 2012
	TPS65053	PMIC	2.25	1000	2					2					JCPN 2012
	TPS65055	PMIC	2.25	600	2					2					JCPN 2012
	TPS65056	PMIC	2.25	600	2					2					JCPN 2012
	TPS65058	PMIC	2.25	1000	2					2					JCPN 2012
	TPS65800	PMIC	1.50	600	2						2				JCPN 2012
	TPS65810	PMIC	1.50	750	2						2				JCPN 2012
	TPS65920	PMIC	3.2	1200	3			3							JCPN 2012
	TPS650242	PMIC	2.25	1600	3					3					JCPH 2012
	TPS650243	PMIC	2.25	1600	3					3					JCPH 2012
	TPS650244	PMIC	2.25	1600	3					3					JCPH 2012
	TPS650245	PMIC	2.25	1600	3					3					JCPH 2012
	TPS650250	PMIC	2.25	1600	3					3					JCPH 2012

Reference of Power Inductor

Company	Part No.	Type	fsw	Imax	Convert No.	Ref. Inductance									Remark
						0.47	0.68	1.0	1.5	2.2	3.3	4.7	6.8	10	
National	LM2608	Converter	1.00	400	1									1	JCPN 2520
	LM2614	Converter	0.60	400	1									1	JCPN 2520
	LM2618	Converter	0.60	400	1									1	JCPN 2520
	LM2619	Converter	1.00	500	1									1	JCPN 2520
	LM2734	Converter	3.00	1000	1					1					JCPN 2012
	LM2736X	Converter	1.60	750	1							1			JCPN 2012
	LM2738X	Converter	1.60	1500	1					1					JCPH 2012
	LM2830X	Converter	1.60	1000	1					1					JCPN 2012
	LM2830Y	Converter	3.00	1000	1				1						JCPN 2012
	LM2831X	Converter	1.60	1500	1					1					JCPH 2012
	LM2831Z	Converter	3.00	1500	1				1						JCPH 2012
	LM3100	Converter	1.00	1500	1								1		JCPH 2520
	LM3370	Converter	2.00	600	2					2					JCPN 2012
	LM3670	Converter	1.00	350	1									1	JCPN 2520
	LM3671	Converter	2.00	600	1					1					JCPN 2012
	LM3673	Converter	2.00	350	1					1					JCPN 2012
	LM3674	Converter	2.00	600	1					1					JCPN 2012
	LM3676	Converter	2.00	600	1					1					JCPN 2012
	LM3677	Converter	3.00	600	1			1							JCPN 2012
	LM3678	Converter	3.00	600	1			1							JCPN 2012
	LM3679	Converter	3.00	350	1			1							JCPN 2012
	LM3686	Converter	3.00	600	1			1							JCPN 2012
	LM3687	Converter	1.80	600	1			1							JCPN 2012
	LM3691	Converter	4.00	1000	1			1							JCPN 2012
	LM8801	Converter	6.0	600	1	1									JCPN 2012
	LM26480	Converter	2.0	1500	2					2					JCPH 2012
	LP3905	PMIC	2.0	600	2					2					JCPN 2012
	LP3906	PMIC	2.0	1500	2					2					JCPH 2012
	LP3907	PMIC	2.1	1000	2					2					JCPN 2012
	LP3910	PMIC	2.0	600	2					2					JCPN 2012
	LP3913	PMIC	2.0	600	3					3					JCPN 2012
	LP3970	PMIC	2.0	650	2					2					JCPN 2012
	LP3971	PMIC	2.0	1600	2					2					JCPH 2012
	LP3972	PMIC	2.0	1600	3					3					JCPH 2012
	LP5551	PMIC	1.0	300	2							2			JCPN 2012
	LP5552	PMIC	3.6	800	2			2							JCPN 2012
	LP5553	PMIC	3.6	800	2			2							JCPN 2012