

TOSHIBA

Leading Innovation >>>

2008-9

PRODUCT GUIDE

Power MOSFETs TPC Series



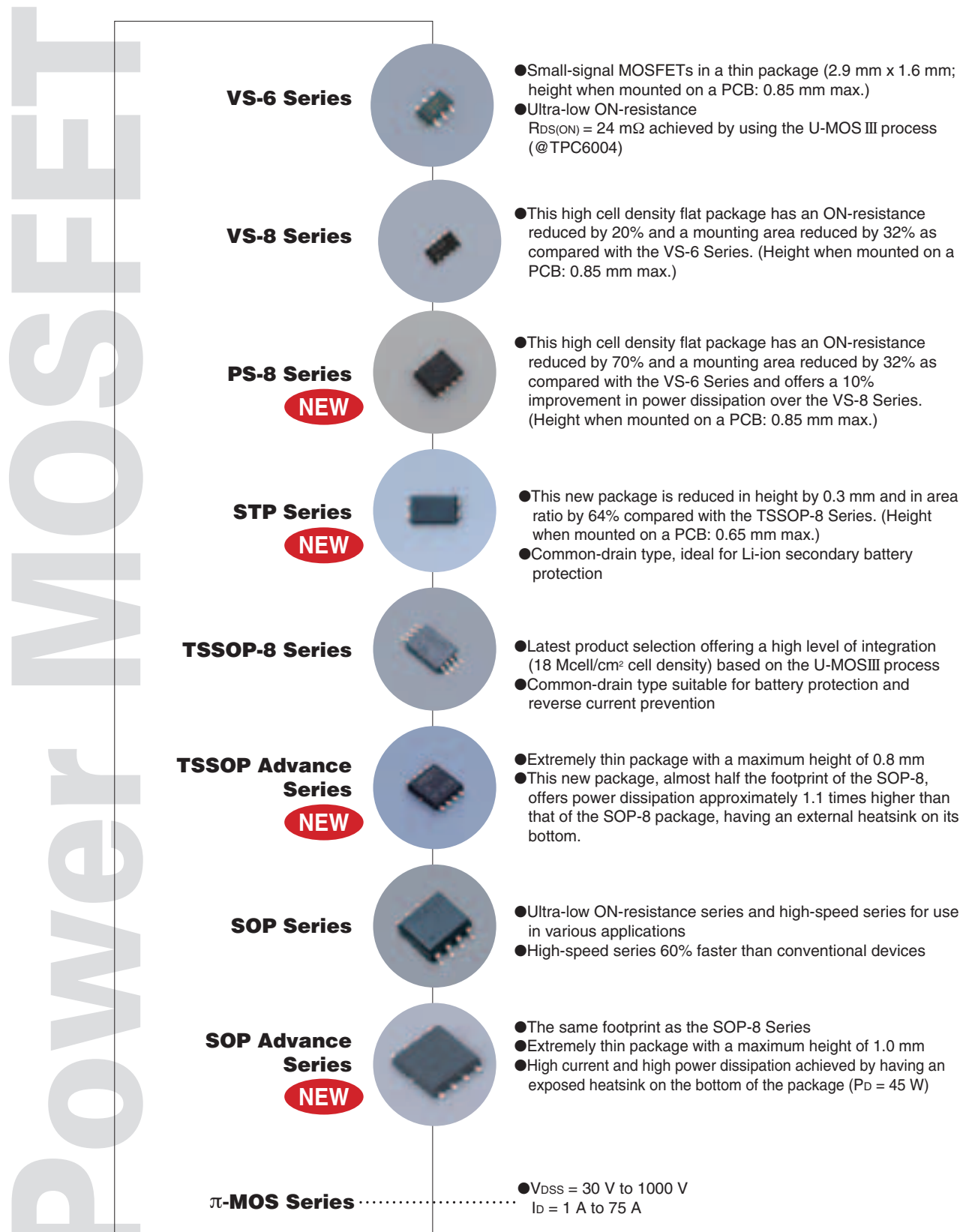
s e m i c o n d u c t o r

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Power MOSFET TPC Series

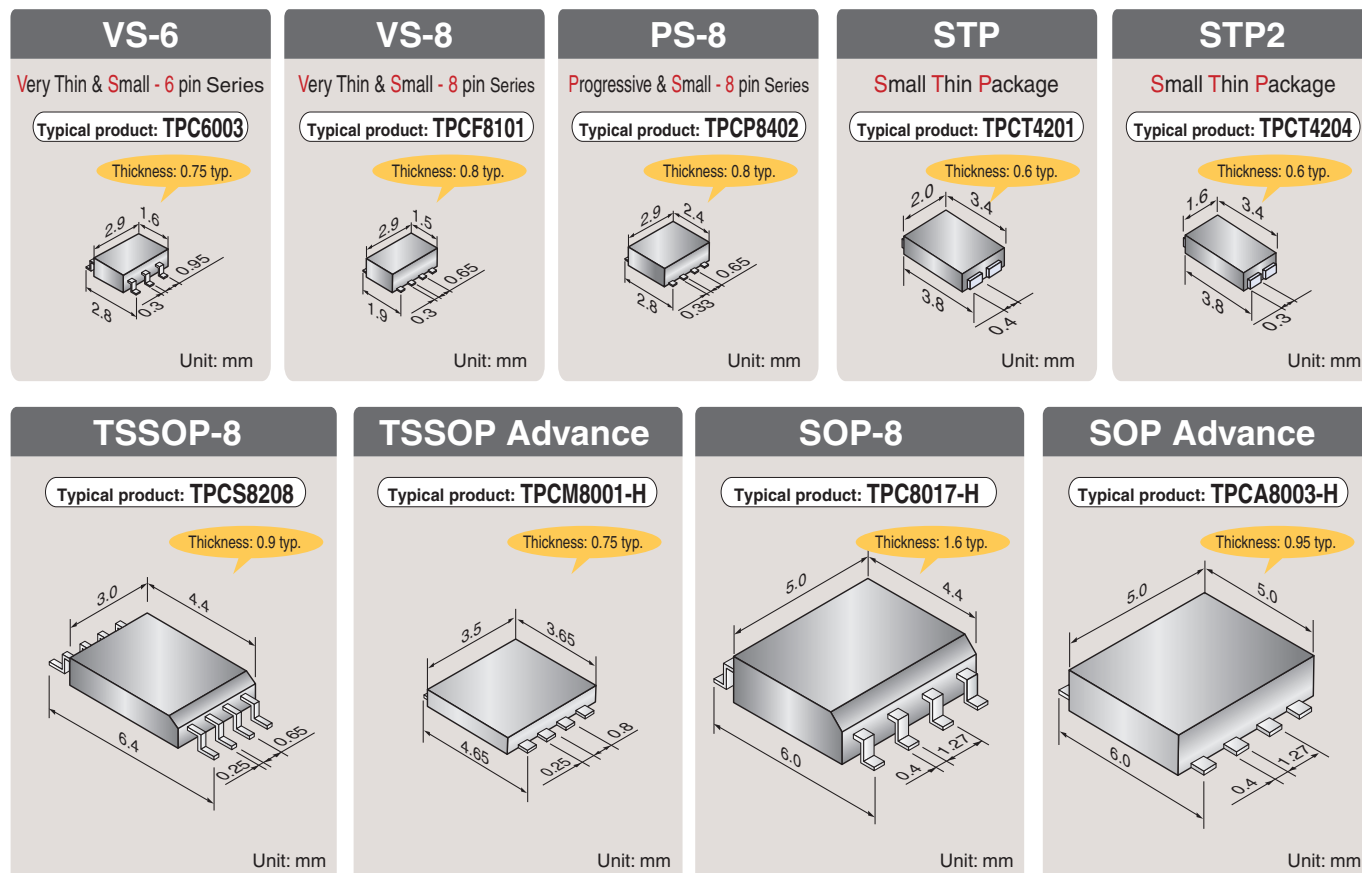
Toshiba Power Compact Series devices have been developed for use in high-speed switching applications and in various interfaces.

Toshiba has developed this high-efficiency low ON-resistance series using processes specially formulated to ensure that the devices can be used in a variety of applications. In addition, combination products are also available. Please select the device most suitable for your application.



1-1 Package List

This is an SOP-type small, thin package suited to portable electronic devices of all kinds. The newly developed TSSOP Advance package has the slimmest profile in the industry, with a maximum height of 0.8 mm.



1-2 Part Numbering Scheme

TPCM8 0 01-H

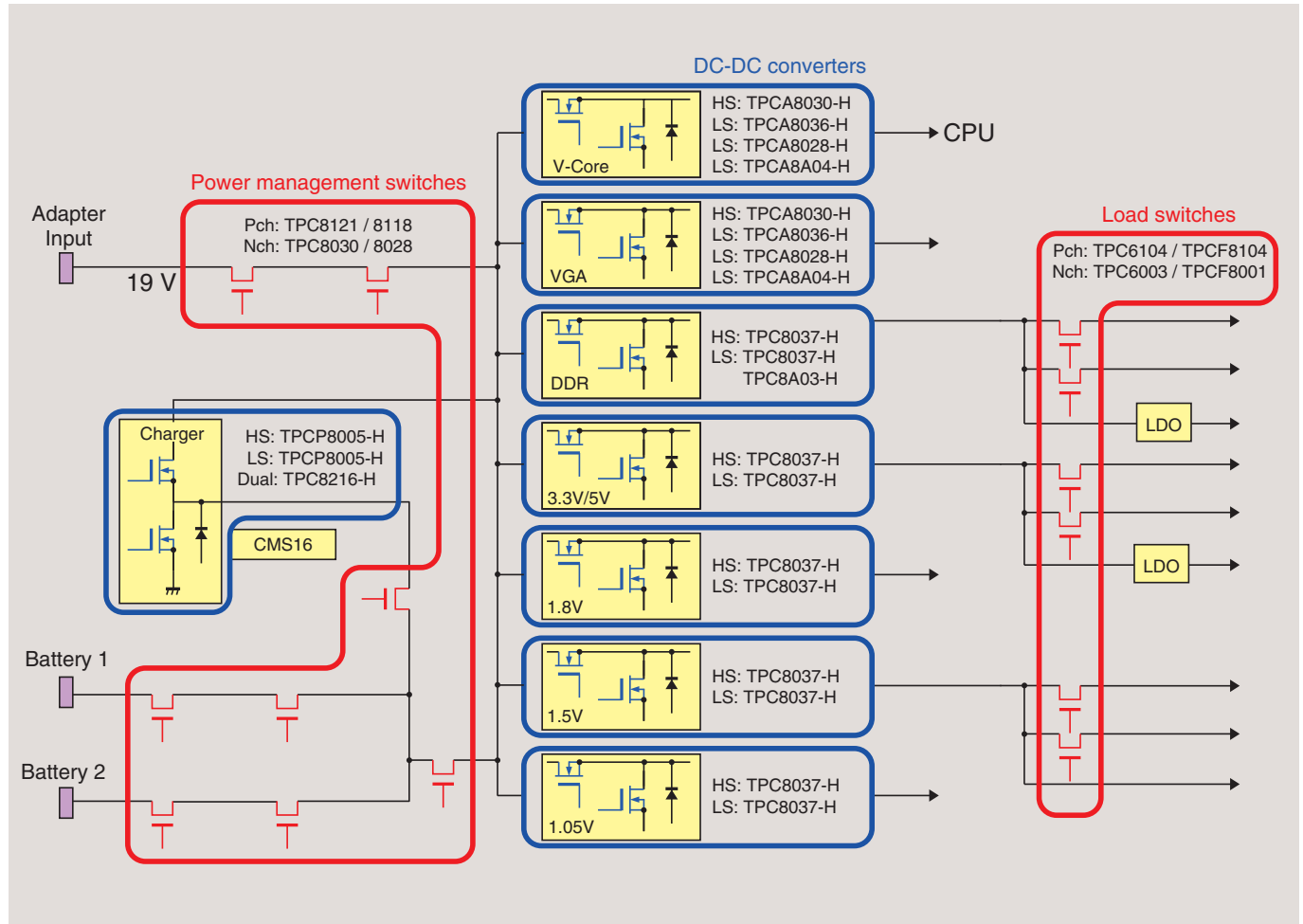
H: High-speed type
None: Low ON-resistance type

Serial number of the product

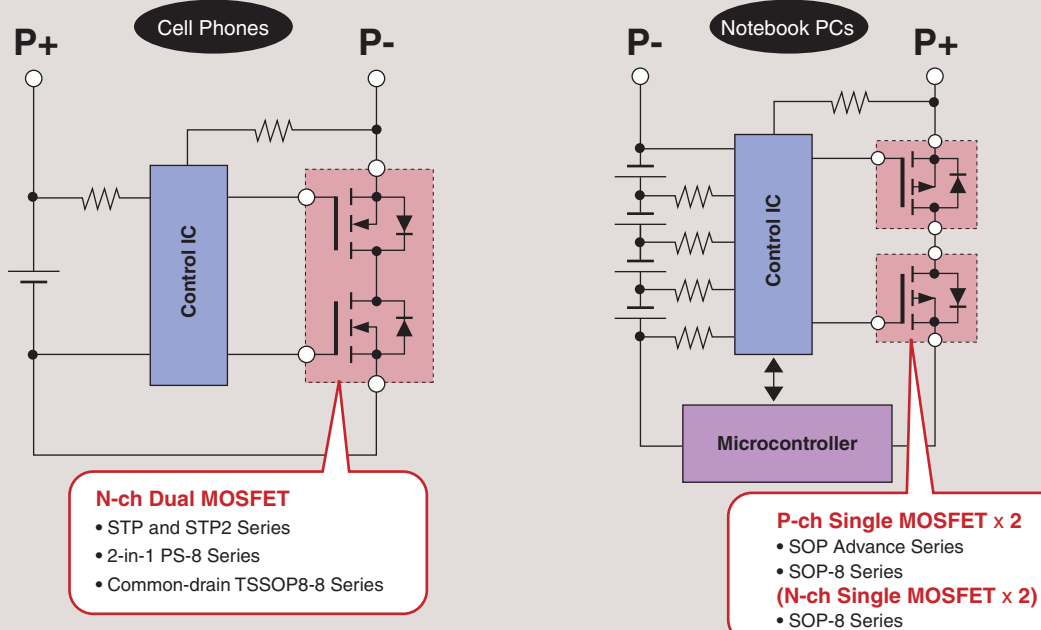
TPC6: VS-6 Series
TPCF8: VS-8 Series
TPCP8: PS-8 Series
TPCS8: TSSOP-8 Series
TPCM8: TSSOP Advance Series
TPC8: SOP-8 Series
TPCA8: SOP Advance Series
TPCT4: STP Series

0: N-channel single
1: P-channel single
2: N-channel dual
3: P-channel dual
4: N-channel and P-channel dual
A: N-channel and SBD
B: P-channel and SBD
J: P-channel and NPN

1-3 Application Example and Block Diagram

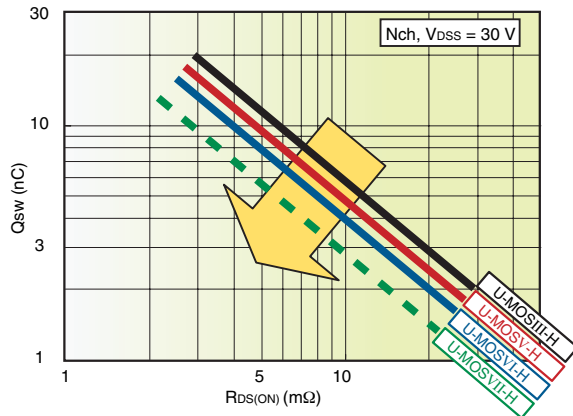


● Lithium-ion Secondary Battery Protection Circuits

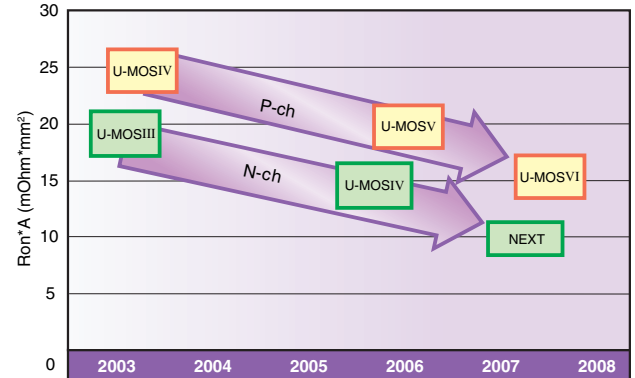


2-1 Trench MOSFET Trend in Chip Technology

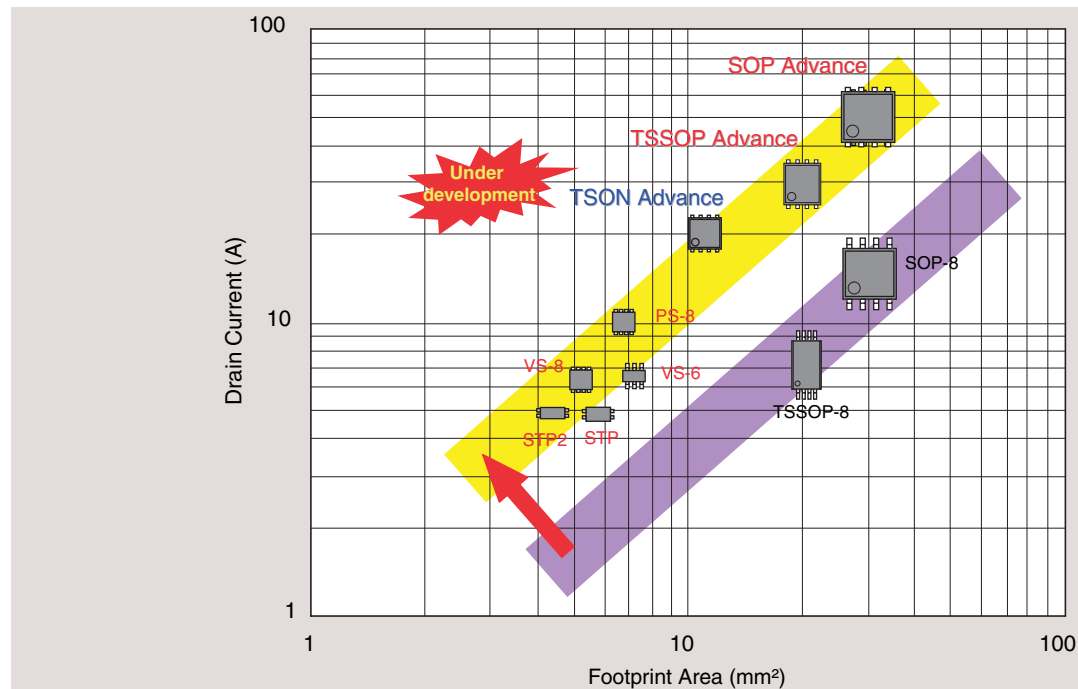
● High-Speed, Low- V_{DS} U-MOS Trend



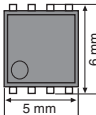
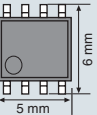
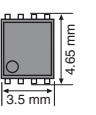
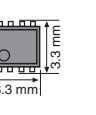
● Low-Ron Trench MOSFET Trend



2-2 Package Trend

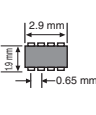
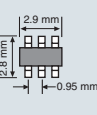
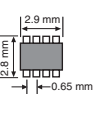


● Thermally Enhanced Packages

	SOP Adv.	SOP-8	TSSOP Adv.	TSON Adv.
				
Footprint Area	30 mm ²	30 mm ²	16.3 mm ² (-46%)	10.9 mm ² (-64%)
Power Dissipation	2.8 W (+47%)	1.9 W	2.3 W (+21%)	1.9 W
Height	1.0 mm (-47%)	1.9 mm	0.8 mm (-58%)	0.9 mm (-53%)

(Percentage relative to SOP-8)

● Compact Packages

	VS-8	VS-6	PS8
			
Footprint Area	5.5 mm ² (-32%)	8.1 mm ²	8.1 mm ²
Power Dissipation	2.5 W (+14%)	2.2 W	2.75 W (+25%)
Height	0.85 mm	0.85 mm	0.85 mm

(Percentage relative to VS-6)

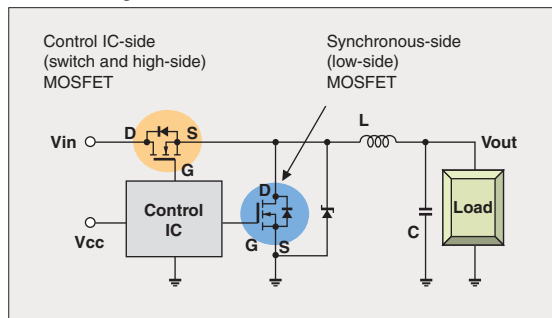
3-1 Product List

Part Number	Absolute Maximum Ratings		Circuit Configuration	Package	R _{DS(ON)} Max (mΩ)		Q _{sw} Typ.(nC) @ V _{DS} = V _{DSS} x 0.8	Mass Production	Series		
	V _{DSS} (V)	I _D (A)			4.5 V	10 V					
TPCA8011-H	20	40	N-ch Single	SOP Advance	3.5	7.5*	16	Y	U-MOSIII-H		
TPC6007-H	30	5		VS-6		79	54	1.8	Y	U-MOSIII-H	
TPC6109-H	−30	−5	P-ch Single			83	59	4.8	Y	U-MOSIII-H	
TPC8216-H	30	6.4	N-ch Dual	SOP-8	23.0	20	3.4	Y	U-MOSVI-H		
TPCP8005-H		11	N-ch Single	PS-8	15.7	12.9	5.0	Y	U-MOSV-H		
TPCC8001-H		TBD		TSON Advance	(15.0)	(12.2)	(6.3)	△	U-MOSV-H		
TPCM8003-H		21		TSSOP Advance		15.7	12.9	5.0	Y	U-MOSV-H	
TPCM8004-H		24				13.4	11	5	Y	U-MOSV-H	
TPCM8002-H		30				8.2	6.2	9.3	Y	U-MOSV-H	
TPC8021-H		11			SOP-8		25	17	3.6	Y	U-MOSIII-H
TPC8031-H		11				16.1	13.3	5.0	Y	U-MOSV-H	
TPC8037-H		12				13.9	11.4	5	Y	U-MOSV-H	
TPC8038-H **		12				13.9	11.4	5	Y	U-MOSV-H	
TPC8032-H		15				8.6	6.5	8.4	Y	U-MOSV-H	
TPC8033-H		17				7.2	5.3	9.6	Y	U-MOSV-H	
TPC8039-H		17				6.9	6.0	8.5	Y	U-MOSVI-H	
TPC8034-H		18		N-ch Single			4.5	3.5	16	Y	U-MOSV-H
TPC8036-H		18					5.1	4.5	13	Y	U-MOSVI-H
TPC8035-H		18					3.6	3.2	17	Y	U-MOSVI-H
TPCA8023-H		21	SOP Advance			15.7	12.9	5.0	Y	U-MOSV-H	
TPCA8030-H		24				13.4	11.0	5	Y	U-MOSV-H	
TPCA8031-H **		24				13.4	11.0	5	Y	U-MOSV-H	
TPCA8018-H		30				8.2	6.2	9.3	Y	U-MOSV-H	
TPCA8039-H		34				6.6	5.7	8.6	Y	U-MOSVI-H	
TPCA8036-H		38				4.8	4.2	13	Y	U-MOSVI-H	
TPCA8012-H		40				6.8	4.9	11.0	Y	U-MOSV-H	
TPCA8019-H		45			4.1	3.1	15.5	Y	U-MOSV-H		
TPCA8028-H		50			3.2	2.8	20	Y	U-MOSVI-H		
TPC6006-H		40		3.9	VS-6	100	75	1.3	Y	U-MOSIII-H	
TPC8022-H			7.5	SOP-8	35	27	3.5	Y	U-MOSIII-H		
TPCA8020-H			7.5	SOP Advance		35	27	3.5	Y	U-MOSIII-H	
TPCA8014-H			30			14	9	7.4	Y	U-MOSIII-H	
TPCA8027-H			30			10	—	8.1	Y	U-MOSIII-H	
TPCA8015-H			35			7.9	5.4	13	Y	U-MOSIII-H	
TPC8213-H		60	5	N-ch Dual	SOP-8	56	50	2.9	Y	U-MOSIII-H	
TPCA8016-H	25		N-ch Single	SOP Advance	26	21	6.6	Y	U-MOSIII-H		
TPCP8003-H	100	2.2		PS-8	190	180	2.0	Y	U-MOSIII-H		
TPC8214-H		2.2	N-ch Dual	SOP-8	190	180	2.0	Y	U-MOSIII-H		
TPCA8022-H	150	22	N-ch Single	SOP Advance	—	26	14	Y	U-MOSIII-H		
TPCS8009-H		2.1		TSSOP-8	—	350	3.3	Y	π-MOSV		
TPCA8009-H		7		SOP Advance	—	350	3.7	Y	π-MOSV		
TPCS8007-H	200	1.9		TSSOP-8	—	450	3.3	Y	π-MOSV		
TPCA8010-H		5.5		SOP Advance	—	450	3.7	Y	π-MOSV		
TPCS8008-H	250	1.7		TSSOP-8	—	580	3.3	Y	π-MOSV		
TPCA8008-H		4		SOP Advance	—	580	3.7	Y	π-MOSV		
TPC8A03-H	30	17	MOSBD	SOP-8	7.0	5.6	8.4	Y	U-MOSV-H		
TPC8A04-H		18			4.5	3.6	13.4	Y	U-MOSV-H		
TPCA8A02-H		34		SOP Advance	6.7	5.3	8.6	Y	U-MOSV-H		
TPCA8A04-H		42			4.1	3.2	13.4	Y	U-MOSV-H		
TPCP8103-H	−40	−4.8	P-ch Single	PS-8	54	40	6.5	Y	U-MOSIII-H		
TPC8116-H		−7.5		SOP-8	37	30	9.7	Y	U-MOSIII-H		
TPCA8107-H		−7.5		SOP Advance	37	30	9.7	Y	U-MOSIII-H		
TPC8406-H	40	6.5	N-ch/P-ch Dual	SOP-8	35	27	3.5	Y	U-MOSIII-H		
	−40	−6.5			37	30	9.7	Y	U-MOSIII-H		

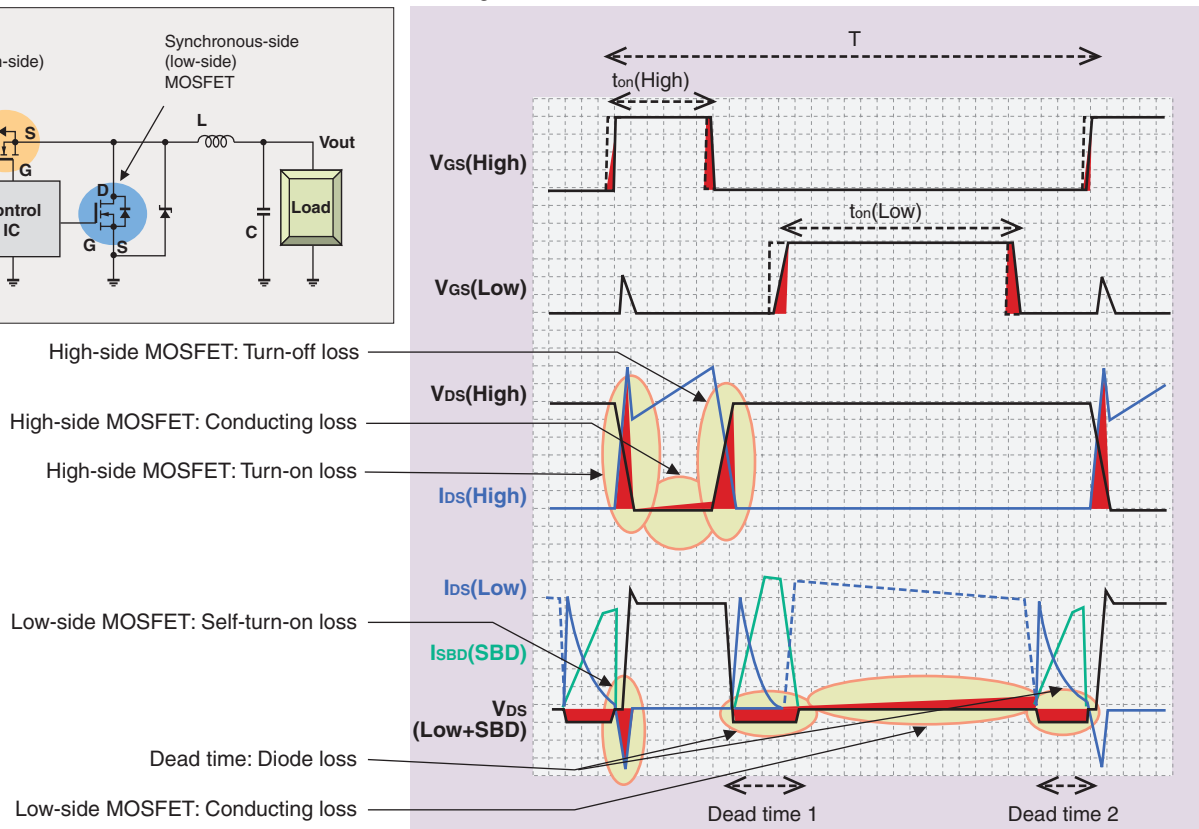
* : V_{GS} = 2.5 V ** : r_g = 3.4 Ω (Typ) △ : Under development

3-2 Synchronous Rectification DC-DC Converters Block Diagram, Timing Chart and Power Loss Components

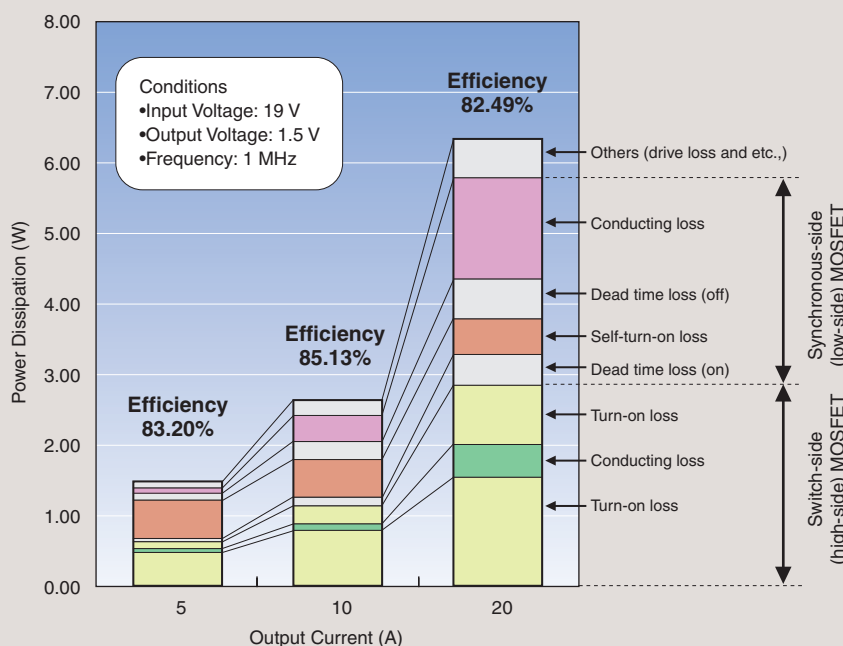
● Block Diagram



● Timing Chart



3-3 Synchronous Rectification DC-DC Converters Summary Results of Power Loss Simulation and Main MOSFET Characteristics



The following main characteristics are important to achieve higher efficiency:

Synchronous-side MOSFET

- Very low $R_{DS(ON)}$
- Reduction of the self-turn-on losses
 - Low Q_{rr}
 - Low C_{gd} , C_{gs}/C_{gs}
 - Low r_g
 - Optimized V_{th}
- Shoot-through current control
- Low Q_g

Switch-side MOSFET

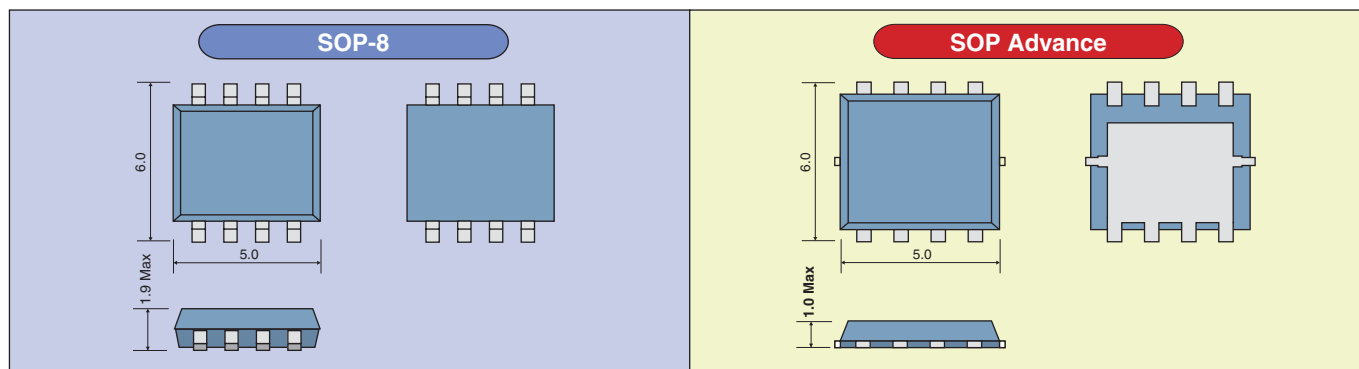
- High-speed switching
 - Low Q_{sw}
 - Low r_g
- Low $R_{DS(ON)}$

3-4 Synchronous Rectification DC-DC Converters Enhanced Efficiency by Thermally Enhanced Package and New Process Technology

Thermally Enhanced Package

Toshiba has developed the SOP Advance package with the same footprint as the standard SOP-8 package. With an external heatsink on the bottom, the SOP Advance package offers enhanced thermal characteristics, realizing a high power dissipation and thus high-current capability.

Unit: mm



	SOP-8	SOP Advance	Features of the SOP Advance
Footprint Area (mm ²)	30	30	Same footprint as the SOP-8
Total height (max) (mm)	1.9	1.0	Low profile, t = 0.9 mm
R _{th(ch-a)} (t = 10 s) (Note 1) (°C / W)	65.8	44.6	High power dissipation
Current rating (A)	18	40	High current guarantee
Package resistance (Note 2) (mΩ)	1.6	0.5	Low package resistance

Note 1: When mounted on a glass-epoxy board (25.4 mm x 25.4 mm x 0.8 mm)

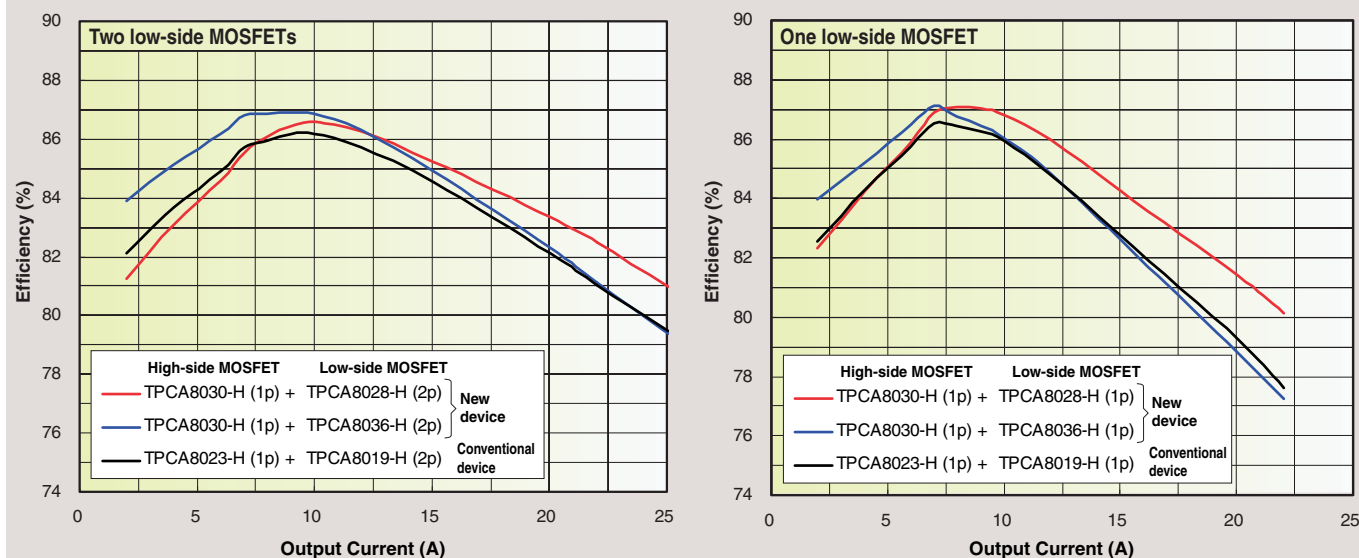
Note 2: Without chip resistance

New Process Technology

TOSHIBA has developed a new process technology to further reduce an internal gate resistance (R_g) and gate capacitance ratio for minimizing the self-turn-on loss while maintaining both the low ON-resistance and low gate charge characteristics.

	R _{DS(ON)} Typ. @ 4.5 V (mΩ)	r _g Typ. (Ω)	C _{gd} /C _{gs} Typ. (%)
TPCA8028-H (New generation)	2.3	1.0	6.8
TPCA8019-H (One gen. ago)	3.1	1.0	6.6
TPCA8004-H (Two gen. ago)	4.8	2.4	12.7

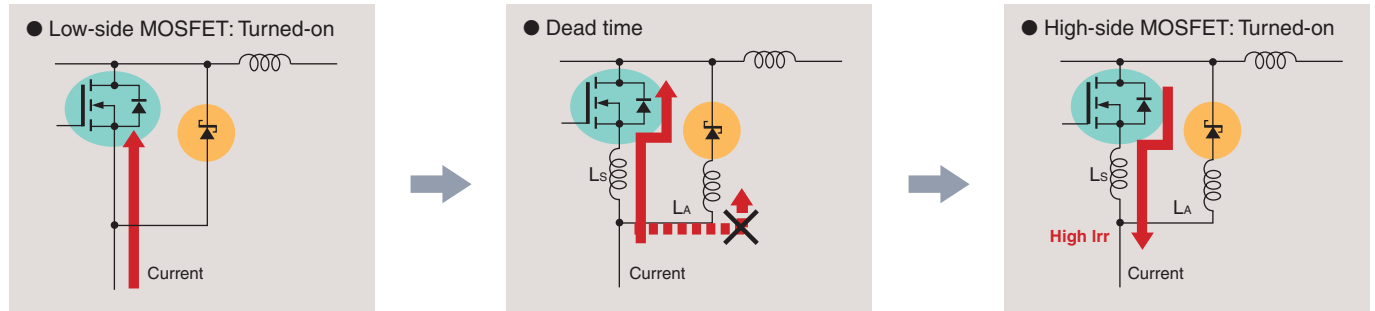
Efficiency Characteristics

f = 300 kHz, V_{IN} = 19.5 V, V_{OUT} = 1.1 V

3-5

Synchronous Rectification DC-DC Converters MOSBD (MOSFET with SBD)

External SBD



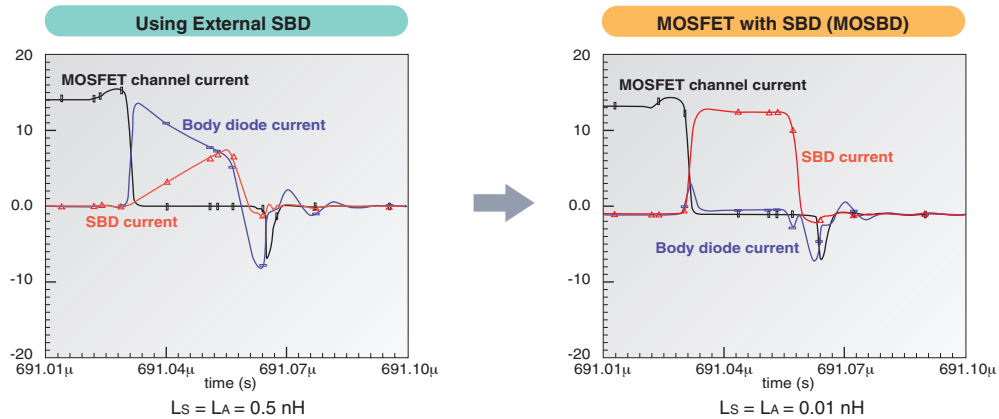
When an SBD is added externally, the SBD can't function fully due to the influence of wire inductances (L_s and L_A); thus a body diode current during the dead time becomes larger and causes the following penalties.

- 1: Increase in the conducting loss of the body diode.
- 2: Increase in the reverse recovery loss due to high di/dt .
- 3: Induces a self-turn-on phenomenon.

MOSFET with SBD (MOSBD)

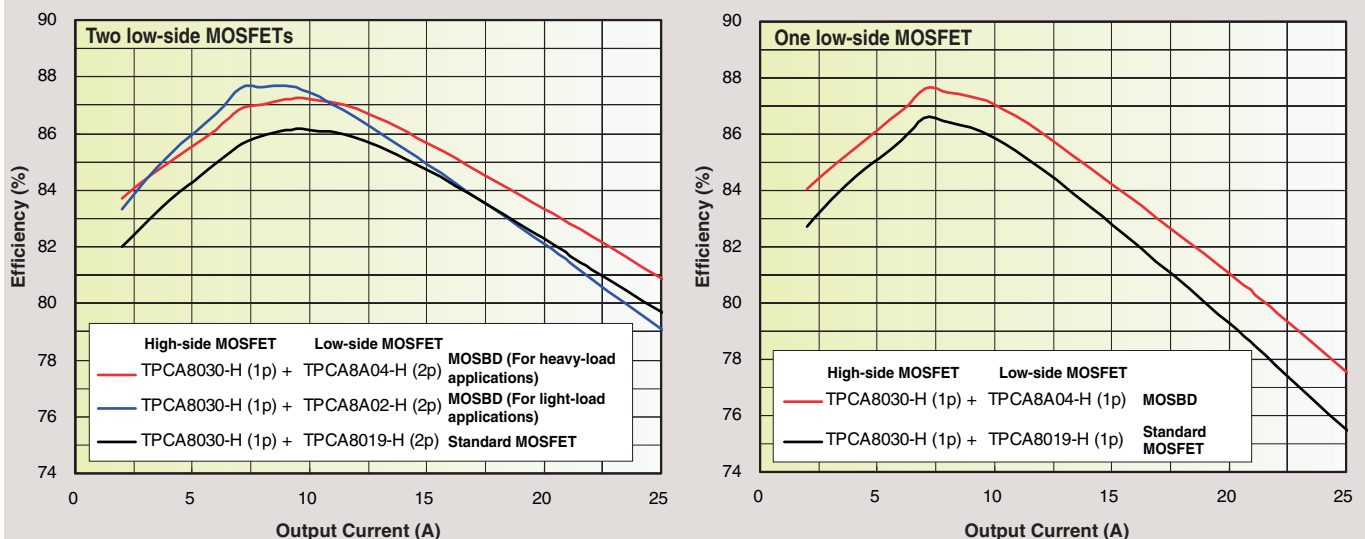
A MOSFET with SBD using a monolithic structure reduces a wire inductance (L_A) and a parasitic inductance (L_S). This structure makes it possible for the SBD to function fully and to reduce losses.

Current Waveform Simulation



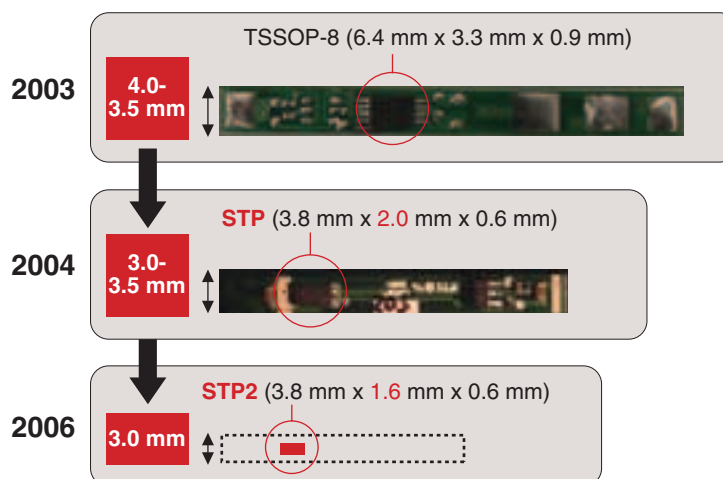
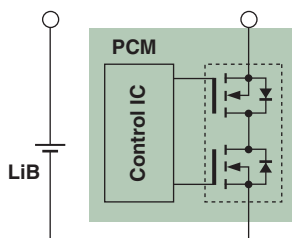
Efficiency Characteristics

$f = 300 \text{ kHz}$, $V_{IN} = 19.5 \text{ V}$, $V_{OUT} = 1.1 \text{ V}$

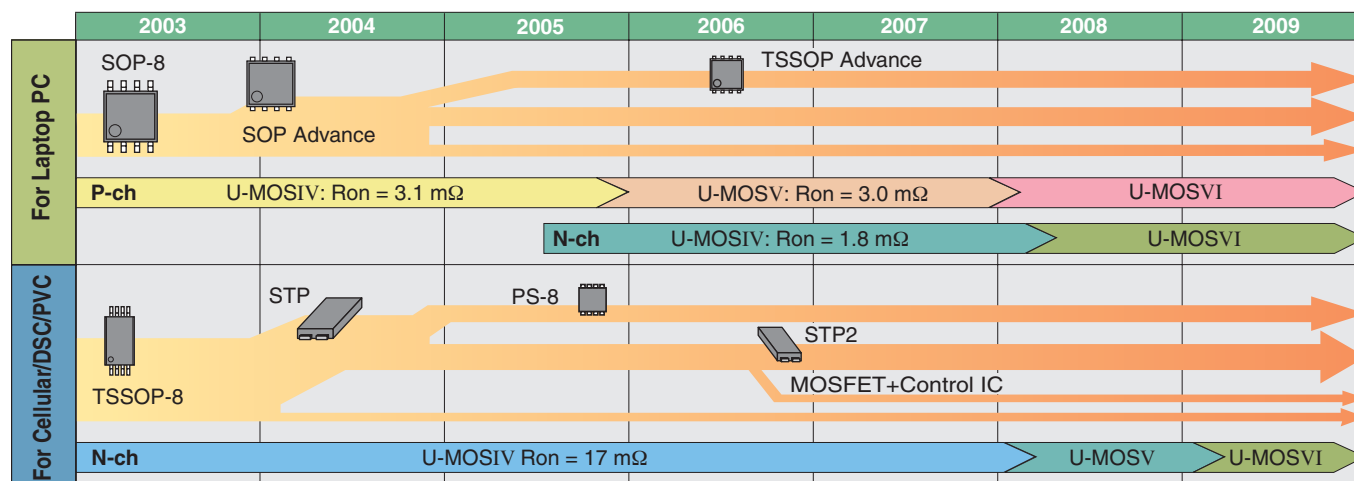


4-1 Lithium-Ion Battery Protection Circuit Trend

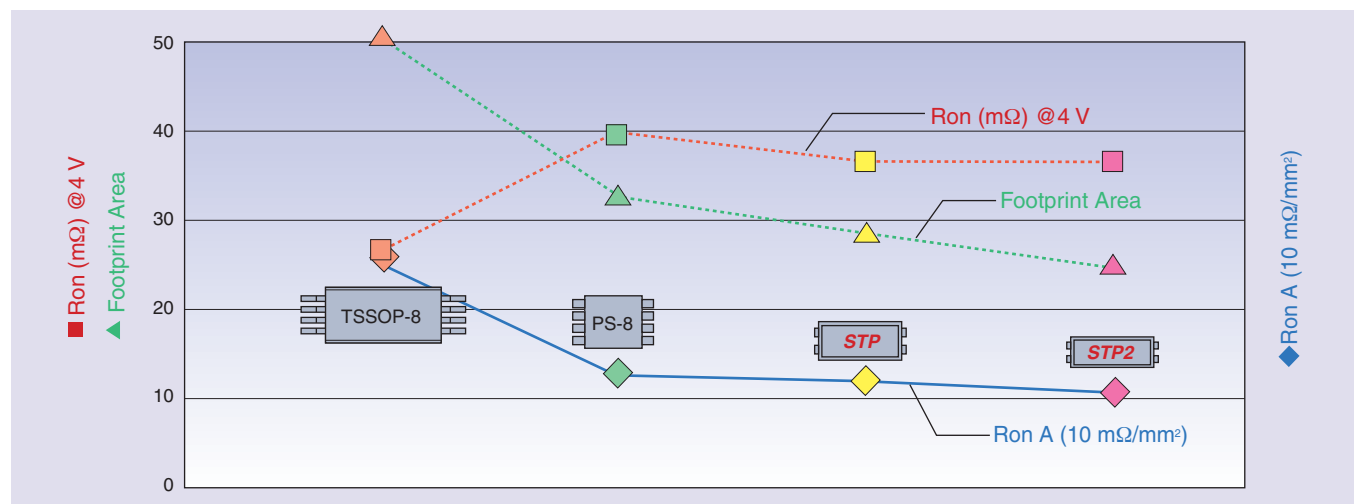
Lithium Ion Secondary Battery Protection



4-2 Development Trend



4-3 Package Comparison



-Ion Battery Protection Circuits)

4-4 Low ON-resistance N-Channel Power MOSFETs

Part Number	Absolute Maximum Ratings		Circuit Configuration	Package	R _{DS(ON)} Max (mΩ)			Mass Production
	V _{DSS} (V)	I _D (A)			2.5 V	4 V	10 V	
TPCT4201	20	6	N-ch Dual	STP	49	32	—	Y
TPCT4202	30	6			52	39	—	Y
TPCT4203 ☆	20	6		STP2	49	32	—	Y
TPCT4204 ☆	30	6			52	39	—	Y
TPCP8202	30	5.5	N-ch Single	PS-8	39	24	—	Y
TPCP8002	20	9.1		SOP-8	13.7	10*	—	Y
TPC8014	30	11			—	22*	14	Y
TPC8025 ☆	30	11			—	14.5*	9	Y
TPC8030 ☆	30	11			—	17*	9	Y
TPC8041 ☆	30	13			—	13.5*	7	Y
TPC8026 ☆	30	13			—	10*	6.6	Y
TPC8028 ☆	30	18			—	8*	4.3	Y
TPC8029 ☆	30	18			—	7*	3.8	Y
TPC8042 ☆	30	18			—	6.5*	3.4	Y
TPC8027 ☆	30	18			—	5.5*	2.7	Y
TPC8208	20	5			N-ch Dual	70	50	—
TPC8207	20	6	30			20	—	Y
TPC8211	30	5.5	—			44*	36	Y
TPC8210	30	8	—			20*	15	Y
TPCA8024 ☆	30	35	N-ch Single	SOP Advance	—	7.8*	4.3	Y
TPCA8025 ☆	30	40			—	6.8*	3.6	Y
TPCA8042 ☆	30	45			—	5.7*	3.3	Y
TPCA8026 ☆	30	45			—	5.3*	2.2	Y
TPCS8209	20	5	N-ch Dual	TSSOP-8	40	30	—	Y
TPCS8210 #	20	5			40	30	—	Y
TPCS8204	20	6			22	17	—	Y
TPCS8208 #	20	6			22	17	—	Y
TPCS8211	20	6			29	24	—	Y
TPCS8212 #	20	6			29	24	—	Y
TPCS8213 #	20	6			18	13	—	Y
TPCS8214 #	30	6			18.5	13.5	—	Y

* : V_{GS} = 4.5 V # : Common-drain ☆ : No protection zener diode between gate and source

4-5 Low ON-resistance P-Channel Power MOSFETs

Part Number	Absolute Maximum Ratings		Circuit Configuration	Package	R _{DS(ON)} Max (mΩ)			Mass Production	
	V _{DSS} (V)	I _D (A)			2.5 V	4 V	10 V		
TPCS8104	−30	−11	P-ch Single	TSSOP-8	—	18	12	Y	
TPCS8105	−30	−11			—	19.5	13.5	Y	
TPCS8303	−20	−5	P-ch Dual		30	21*	—	Y	
TPCS8302	−20	−5			60	35*	—	Y	
TPC8115	−30	−10	P-ch Single		SOP-8	14	10*	—	Y
TPC8109	−30	−10				—	30	20	Y
TPC8119 ☆	−30	−10		—		28	13	Y	
TPC8121 ☆	−30	−11		—		24	12	Y	
TPC8111	−30	−11		—		18	12	Y	
TPC8113	−30	−11		—		18	10	Y	
TPC8122 ☆	−30	−12		—		16.5	8	Y	
TPC8107	−30	−13		—		15	7	Y	
TPC8118 ☆	−30	−13		—		15	7	Y	
TPC8112	−30	−13		—		14	6	Y	
TPC8114	−30	−18		—		6.8	4.5	Y	
TPC8117 ☆	−30	−18		—		7.9	3.9	Y	
TPC8405	30	6		N-ch/P-ch Dual		—	33*	26	Y
	−30	−4.5				—	42*	33	
TPCM8102 ☆	−30	−25	P-ch Single	TSSOP Advance		—	16	7.7	Y
TPCA8105	−12	−6		SOP Advance		51	33	—	Y
TPCA8102	−30	−40				—	14	6	Y
TPCA8103	−30	−40				—	6.8	4.2	Y
TPCA8106 ☆	−30	−40			—	7.8	3.7	Y	

* : V_{GS} = 4.5 V ☆ : No protection zener diode between gate and source

5-1 VS-6 Series ... [Part Number: TPC6xxx]

■ Features

- Ultra-low ON-resistance achieved by employing the U-MOSIII process
- Zener diode between gate and source for all products
- Thin package, with a height as low as 0.85 mm (max) when mounted on a board

■ Product List

Part Number	Absolute Maximum Ratings		Circuit Configuration	R _{DS(ON)} Max (mΩ)					Q _g Typ. (nC)	C _{iss} Typ. (pF)	Marking	Series
	V _{DS} (V)	I _D (A)		10 V	4.5 V	2.5 V	2.0 V	1.8 V				
TPC6004	20	6	N-ch Single	—	24	32	37	—	17	1400	S2C	U-MOSIII
TPC6003	30	6		24	32	—	—	—	25	1250	S2D	U-MOSIII
TPC6005	30	6		—	28	35	41	—	19	1420	S2E	U-MOSIII
TPC6007-H	30	5		54	79	—	—	—	2.8	240	S2G	U-MOSIII-H
TPC6006-H	40	3.9		75	100	—	—	—	2.4	251	S2F	U-MOSIII-H
TPC6103	-12	-5.5	P-ch Single	—	35	55	—	90	20	1520	S3C	U-MOSIII
TPC6105	-20	-2.7		—	110	160	—	300	6	470	S3E	U-MOSIII
TPC6107	-20	-4.5		—	55	100	180	—	9.8	680	S3G	U-MOSIV
TPC6104	-20	-5.5		—	40	60	—	120	19	1430	S3D	U-MOSIII
TPC6108	-30	-4.5		60	100	—	—	—	13	570	S3H	U-MOSIV
TPC6109-H	-30	-5		59	83	—	—	—	7.2	471	S3J	U-MOSIII-H



5-2 VS-8 Series ... [Part Number: TPC8Fxxx]

■ Features

- Ultra-low ON-resistance achieved by employing the U-MOSIII/IV process
- Zener diode between gate and source for all products
- Thin package, with a height as low as 0.85 mm (max) when mounted on a board
- 32% mounting area reduction compared with the VS-6 (TSOP-6) Series, employing a flat package with high cell density
- P_D = 2.5 W @ t = 5 s when the device is mounted on a glass epoxy board

■ Product List

Part Number	Absolute Maximum Ratings		Circuit Configuration	R _{DS(ON)} Max (mΩ)					Q _g Typ. (nC)	C _{iss} Typ. (pF)	Marking	Series
	V _{DS} (V)	I _D (A)		10 V	4.5 V	2.5 V	2.0 V	1.8 V				
TPCF8001	30	7	N-ch Single	23	31	—	—	—	25.4	1270	F2A	U-MOSIII
TPCF8101	-12	-6	P-ch Single	—	28	40	—	85	18	1600	F3A	U-MOSIII
TPCF8103	-20	-2.7		—	110	160	—	300	6	470	F3C	U-MOSIII
TPCF8102	-20	-6		—	30	41	—	90	19	1550	F3B	U-MOSIII
TPCF8104	-30	-6	N-ch Dual	28	38	—	—	—	34	1760	F3D	U-MOSIV
TPCF8201	20	3		—	49	66	100	—	7.5	590	F4A	U-MOSIII
TPCF8301	-20	-2.7		—	110	160	—	300	6	470	F5A	U-MOSIII
TPCF8302	-20	-3	P-ch Dual	—	59	95	200	—	11	800	F5B	U-MOSIV
TPCF8303	-20	-3		—	58	87	—	250	11	860	F5C	U-MOSIV
TPCF8304	-30	-3.2		72	105	—	—	—	14	600	F5D	U-MOSIV
TPCF8402	30	4	N-ch + P-ch	50	77	—	—	—	10	470	F6B	U-MOSIII
	-30	-3.2		72	105	—	—	—	14	600		U-MOSIV
TPCF8A01	20	3.0	N-ch + SBD	—	49	66	100	—	7.5	590	F7A	U-MOSIII
TPCF8B01	-20	-2.7	P-ch + SBD	—	110	160	—	300	6	470	F8A	U-MOSIII



5-3 PS-8 Series ... [Part Number: TPCP8xxx]

■ Features

- Mounting area the same as the VS-6 (TSOP-6) Series
- Using flat leads and the latest U-MOS process (U-MOSIV), the PS-8 Series offers a 70% R_{DS(ON)} reduction compared with the VS-6 Series.
- Zener diode between gate and source for all products

■ Product List

Part Number	Absolute Maximum Ratings		Circuit Configuration	R _{DS(ON)} Max (mΩ)				Series
	V _{DS} (V)	I _D (A)		10 V	4.5 V	2.5 V	1.8 V	
TPCP8002	20	9.1	N-ch Single	—	10	13.7	—	U-MOSIV
TPCP8006	20	9.1		—	10	13.7	—	U-MOSIV
TPCP8001-H	30	7.2		16	25	—	—	U-MOSIII-H
TPCP8004	30	8.3		8.5	14.5	—	—	U-MOSIV
TPCP8005-H	30	11		12.9	15.7	—	—	U-MOSV-H
TPCP8003-H	100	2.2	P-ch Single	180	190	—	—	U-MOSIII-H
TPCP8101	-20	-5.6		—	30	41	90	U-MOSIII
TPCP8102	-20	-7.2		—	18	30	—	U-MOSIV
TPCP8103-H	-40	-4.8	N-ch Dual	40	54	—	—	U-MOSIII-H
TPCP8201	30	4.2		50	77	—	—	U-MOSIII
TPCP8202	30	5.5		—	23	39	—	U-MOSIV
TPCP8203	40	4.7	P-ch Dual	40	60	—	—	U-MOSIII
TPCP8301	-20	-5		—	31	60	—	U-MOSIV
TPCP8302	-20	-5		—	33*	45	95	U-MOSIV
TPCP8401	20	0.1	N-ch/P-ch Load Switch	—	362*	402	—	π-MOSVI
	-12	-5.5		—	38	58	103	U-MOSIII
TPCP8402	30	4.2	N-ch + P-ch	50	77	—	—	U-MOSIII
	-30	-3.4		72	105	—	—	U-MOSIV
TPCP8403	40	4.7		40	60	—	—	U-MOSIII
	-40	-3.4	P-ch + NPN	70	105	—	—	U-MOSIII
	-32	-5.5		35	49*	—	—	U-MOSIV
TPCP8J01	50	0.1		—	—	—	—	Bip-Tr

*: V_{GS} = 4 V



5-4 STP Series ... [Part Number: TPCT4xxx]

■ Feature of the STP2

- 80% reduction in area ratio compared with the previous STP package contributes to further size reduction of end-products.
- A new chip design using Toshiba U-MOSIV process technology is housed in a pump structured new package. This realizes a small and thin package while offering low ON-resistance.



STP



STP2

■ Product List

Part Number	Package	Absolute Maximum Ratings		Circuit Configuration	R _{DS(ON)} Max (mΩ)			Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
		V _{DSS} (V)	I _S (A)		2.5 V	4 V	4.5 V			
TPCT4201	STP	20	6	N-ch Dual	49	32	31	21	1740	U-MOSIII
TPCT4202	STP	30	6		52	39	38	21	1540	U-MOSIII
TPCT4203	STP2	20	6		49	32	31	11	790	U-MOSIV
TPCT4204	STP2	30	6		52	39	38	12	780	U-MOSIV

5-5 TSSOP Advance Series ... [Part Number: TPCM8xxx]

■ Product List

Part Number	Absolute Maximum Ratings		Circuit Configuration	R _{DS(ON)} Max (mΩ)		Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	I _D (A)		10 V	4.5 V			
TPCM8001-H	30	20	N-ch Single	9.5	14	19	1130	U-MOSIII-H
TPCM8003-H	30	21		12.9	15.7	11	1433	U-MOSV-H
TPCM8004-H	30	24		11	13.4	11	1433	U-MOSV-H
TPCM8006	30	25		7.0	13.5	26	1270	U-MOSIV
TPCM8002-H	30	30		6.2	8.2	18	2270	U-MOSV-H
TPCM8102	-30	-25	P-ch Single	7.7	16*	60	2450	U-MOSV

*: 4 V



5-6 TSSOP-8 Series ... [Part Number: TPCS8xxx]

■ Features

- The TSSOP-8 achieves a 17 mΩ of R_{DS(ON)} for the TPCS8204 by adopting the U-MOSIII design.
- Common-drain types are available:
Ideal for use in lithium-ion battery protections and reverse current prevention circuits.



■ Product List

Part Number	Absolute Maximum Ratings		Circuit Configuration	R _{DS(ON)} Max (mΩ)				Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	I _D (A)		10 V	4 V	2.5 V	2.0 V			
TPCS8004	200	1.3	N-ch Single	800	—	—	—	12	380	π-MOSV
TPCS8009-H	150	2.1		350	—	—	—	10	600	π-MOSV MACHII
TPCS8007-H	200	1.9		450	—	—	—	10	600	π-MOSV MACHII
TPCS8008-H	250	1.7		580	—	—	—	10	600	π-MOSV MACHII
TPCS8104	-30	-11	P-ch Single	12	18	—	—	107	5710	U-MOSIV
TPCS8105	-30	-11		13.5	19.5	—	—	107	5710	U-MOSIV
TPCS8209	20	5	N-ch Dual	—	30	40	60	15	1280	U-MOSIII
TPCS8210 #	20	5		—	30	40	60	15	1280	U-MOSIII
TPCS8204	20	6		—	17	22	35	22	2160	U-MOSIII
TPCS8208 #	20	6		—	17	22	35	22	2160	U-MOSIII
TPCS8211	20	6		—	24	29	45	20	1590	U-MOSIII
TPCS8212 #	20	6		—	24	29	45	20	1590	U-MOSIII
TPCS8213	20	6		—	13	18	—	49	3140	U-MOSIII
TPCS8214	30	6		—	13.5	18.5	—	42	3240	U-MOSIII
TPCS8302	-20	-6	P-ch Dual	—	35*	60	95	28.5	1590	U-MOSIII
TPCS8303	-20	-5		—	21*	30	80	33	2560	U-MOSIV

: Common drain * : V_{GS} = 4.5 V

5-7 SOP-8 Series ... [Part Number: TPC8xxx]

■ Features

- Low ON-resistance and high-speed switching series are available.
Low ON-resistance series: UMOSIV/V
High-speed switching series: U-MOSIII-H and U-MOSV-H
- ON-resistance reduction through the use of an Al straps structure

■ Product List



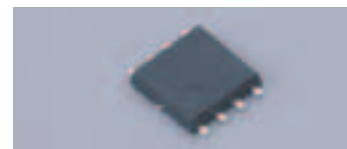
Part Number	Absolute Maximum Ratings		Circuit Configuration	R _{DS(ON)} Max (mΩ)				Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	I _D (A)		10 V	4.5 V	4 V	2.5 V			
TPC8021-H	30	11	N-ch Single	17	25	—	—	11	640	U-MOSIII-H
TPC8014	30	11		14	22	—	—	39	1860	U-MOSIII
TPC8020-H *	30	13		9	13	—	—	23	1395	U-MOSIII-H
TPC8017-H *	30	15		6.6	9.5	—	—	25	1465	U-MOSIII-H
TPC8018-H *	30	18		4.6	6.2	—	—	38	2265	U-MOSIII-H
TPC8031-H ☆	30	11		13.3	16.1	—	—	11	1433	U-MOSV-H
TPC8037-H ☆	30	12		11.4	13.9	—	—	11	1433	U-MOSV-H
TPC8038-H ☆	30	12		11.4	13.9	—	—	11	1433	U-MOSV-H
TPC8032-H ☆	30	15		6.5	8.6	—	—	17	2270	U-MOSV-H
TPC8033-H ☆	30	17		5.3	7.2	—	—	22	2900	U-MOSV-H
TPC8034-H ☆	30	18		3.5	4.5	—	—	35	4614	U-MOSV-H
TPC8039-H ☆	30	17		5.7	6.6	—	—	18	2600	U-MOSVI-H
TPC8036-H ☆	30	18		4.5	5.1	—	—	26	3500	U-MOSVI-H
TPC8035-H ☆	30	18		3.2	3.6	—	—	44	6000	U-MOSVI-H
TPC8022-H	40	7.5	N-ch Dual	27	35	—	—	11	650	U-MOSIII-H
TPC8012-H	200	1.8		400	—	—	—	11	440	π-MOSV
TPC8208	20	5		—	—	50	70	9.5	780	U-MOSIII
TPC8207	20	6		—	—	20	30	22	2010	U-MOSIII
TPC8211	30	5.5		36	44	—	—	25	1250	U-MOSIII
TPC8212-H	30	6		21	27	—	—	16	840	U-MOSIII-H
TPC8216-H ☆	30	6.4		20	23	—	—	7.6	900	U-MOSVI-H
TPC8210	30	8	N-ch Single	15	20	—	—	75	3530	U-MOSIII
TPC8213-H	60	5		50	56	—	—	6	625	U-MOSIII-H
TPC8214-H	100	2.2		180	190	—	—	4.5	360	U-MOSIII-H
TPC8025 ☆	30	11		9	14.5	—	—	26	1270	U-MOSIV
TPC8030 ☆	30	11		8.5	17	—	—	24	1140	U-MOSIV
TPC8041 ☆	30	13		7	13.5	—	—	27	1270	U-MOSIV
TPC8026 ☆	30	13		6.6	10	—	—	42	1800	U-MOSIV
TPC8028 ☆	30	18	P-ch Single	4.3	8	—	—	45	1800	U-MOSIV
TPC8029 ☆	30	18		3.8	7	—	—	49	2200	U-MOSIV
TPC8042 ☆	30	18		3.4	6.5	—	—	56	2900	U-MOSIV
TPC8027 ☆	30	18		2.7	5.5	—	—	113	4200	U-MOSIV
TPC8109	-30	-10		20	—	30	—	45	2260	U-MOSIII
TPC8119 ☆	-30	-10		13	—	28	—	40	1560	U-MOSV
TPC8121 ☆	-30	-11		12	—	24	—	42	1770	U-MOSV
TPC8111 ☆	-30	-11	N-ch/P-ch Dual	12	—	18	—	107	5710	U-MOSIV
TPC8113 ☆	-30	-11		10	—	18	—	107	4500	U-MOSIV
TPC8122 ☆	-30	-12		8	—	16.5	—	62	2450	U-MOSV
TPC8107	-30	-13		7	—	15	—	130	5880	U-MOSIII
TPC8118 ☆	-30	-13		7	—	15	—	65	2700	U-MOSV
TPC8112 ☆	-30	-13		6	—	14	—	130	5880	U-MOSIII
TPC8114 ☆	-30	-18		4.5	—	6.8	—	180	7480	U-MOSIV
TPC8117 ☆	-30	-18	MOSBD	3.9	—	7.9	—	120	4600	U-MOSV
TPC8115	-20	-10		—	10	—	14	115	9130	U-MOSIV
TPC8110	-40	-8		25	—	35	—	48	2180	U-MOSIII
TPC8116-H	-40	-7.5		30	37	—	—	27	1190	U-MOSIII-H
TPC8405	30	6		26	33	—	—	27	1240	U-MOSIII
TPC8406-H	-30	-4.5		33	42	—	—	40	1540	U-MOSIV
	40	6.5		27	35	—	—	11	650	U-MOSIII-H
TPC8A01	-40	-6.5		30	37	—	—	27	1190	U-MOSIII-H
	30	6	N-ch/ N-ch + SBD	25	30	—	—	17	940	U-MOSIII
TPC8A02-H *	30	8.5/1		18	21	—	—	49	2295	U-MOSIII
TPC8A03-H ☆	30	16/1	MOSBD	5.6	8.5	—	—	34	1970	U-MOSIII-H
TPC8A04-H ☆	30	17/1		5.6	7	—	—	19	2640	U-MOSV-H
TPC8A04-H ☆	30	18		3.6	4.5	—	—	TBD	4400	U-MOSV-H

*: Al straps ☆: No protection zener diode between gate and source

5-8 SOP Advance Series ... [Part Number: TPCA8xxx]

■ Features

- Low ON-resistance and high-speed switching series are available.
Low ON-resistance series: UMOSIV/V
High-speed switching series: U-MOSIII-H and U-MOSIV-H
- High current, thin and thermally enhanced package



■ Product List

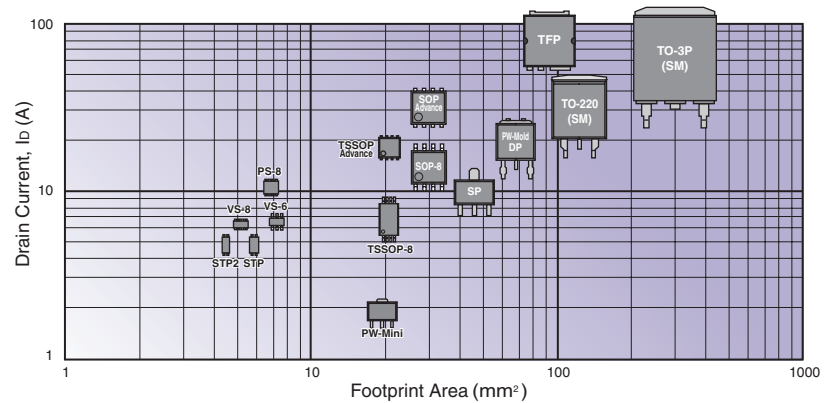
Part Number	Absolute Maximum Ratings		Circuit Configuration	R _{DS(ON)} Max (mΩ)					Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	I _D (A)		10 V	4.5 V	4.0 V	2.5 V	1.8 V			
TPCA8011-H	20	40	N-ch Single	—	3.5	—	7.5	—	32	2900	U-MOSIII-H
TPCA8023-H ☆	30	21		12.9	15.7	—	—	—	11	1433	U-MOSV-H
TPCA8030-H ☆☆	30	24		11.0	13.4	—	—	—	83	1433	U-MOSV-H
TPCA8031-H ☆☆	30	24		11.0	13.4	—	—	—	83	1433	U-MOSV-H
TPCA8005-H	30	27		9	13	—	—	—	24	1395	U-MOSIII-H
TPCA8018-H ☆	30	30		6.2	8.2	—	—	—	18	2270	U-MOSV-H
TPCA8039-H ☆☆	30	34		5.7	6.6	—	—	—	19	2600	U-MOSVI-H
TPCA8003-H	30	35		6.6	9.5	—	—	—	25	1465	U-MOSIII-H
TPCA8024 ☆	30	35		4.3	7.8	—	—	—	45	1800	U-MOSIV
TPCA8036-H ☆☆	30	38		4.2	4.8	—	—	—	26	3500	U-MOSVI-H
TPCA8004-H	30	40		4.6	6.2	—	—	—	37	2265	U-MOSIII-H
TPCA8012-H ☆	30	40		4.9	6.8	—	—	—	22	2900	U-MOSV-H
TPCA8025 ☆	30	40		3.5	6.0	—	—	—	49	2200	U-MOSIV
TPCA8042 ☆☆	30	45		3.3	5.7	—	—	—	56	2900	U-MOSIV
TPCA8019-H ☆	30	45		3.1	4.1	—	—	—	34	4614	U-MOSV-H
TPCA8026 ☆	30	45		2.2	4.5	—	—	—	113	4200	U-MOSIV
TPCA8028-H ☆	30	50		2.8	3.2	—	—	—	46	6000	U-MOSVI-H
TPCA8A01-H	30	36	MOSBD	5.6	8.5	—	—	—	19	1970	U-MOSIII-H
TPCA8A02-H ☆	30	34		5.3	6.7	—	—	—	19	2640	U-MOSV-H
TPCA8A04-H ☆☆	30	42		3.2	4.1	—	—	—	30	4400	U-MOSV-H
TPCA8020-H	40	7.5	N-ch Single	27	35	—	—	—	11	650	U-MOSIII-H
TPCA8014-H	40	30		9	14	—	—	—	22	1365	U-MOSIII-H
TPCA8027-H	40	30		10	—	—	—	—	23	1430	U-MOSIII-H
TPCA8015-H	40	35		5.4	7.9	—	—	—	37	2155	U-MOSIII-H
TPCA8016-H	60	25		21	26	—	—	—	22	1375	U-MOSIII-H
TPCA8006-H	100	18		67	—	—	—	—	12	780	π-MOSVII
TPCA8022-H	100	22		26	—	—	—	—	38	2330	U-MOSIII-H
TPCA8009-H	150	7		350	—	—	—	—	10	600	π-MOSV MACHII
TPCA8010-H	200	5.5		450	—	—	—	—	10	600	π-MOSV MACHII
TPCA8008-H	250	4		580	—	—	—	—	10	600	π-MOSV MACHII
TPCA8105	−12	−6	P-ch Single	—	33	—	51	92	18	1600	U-MOSIV
TPCA8106 ☆	−30	−40		3.7	—	7.8	—	—	120	4600	U-MOSV
TPCA8102	−30	−40		6	—	14	—	—	109	4600	U-MOSIII
TPCA8103	−30	−40		4.2	—	6.8	—	—	184	7880	U-MOSIV
TPCA8107-H	−40	−7.5		30	37	—	—	—	27	1190	U-MOSIII-H
TPCA8108	−40	−40		9.5	—	—	—	—	100	4820	U-MOSIII
TPCA8104	−60	−40		16	—	24	—	—	90	4300	U-MOSIII

*: Al straps ☆: No protection zener diode between gate and source

6

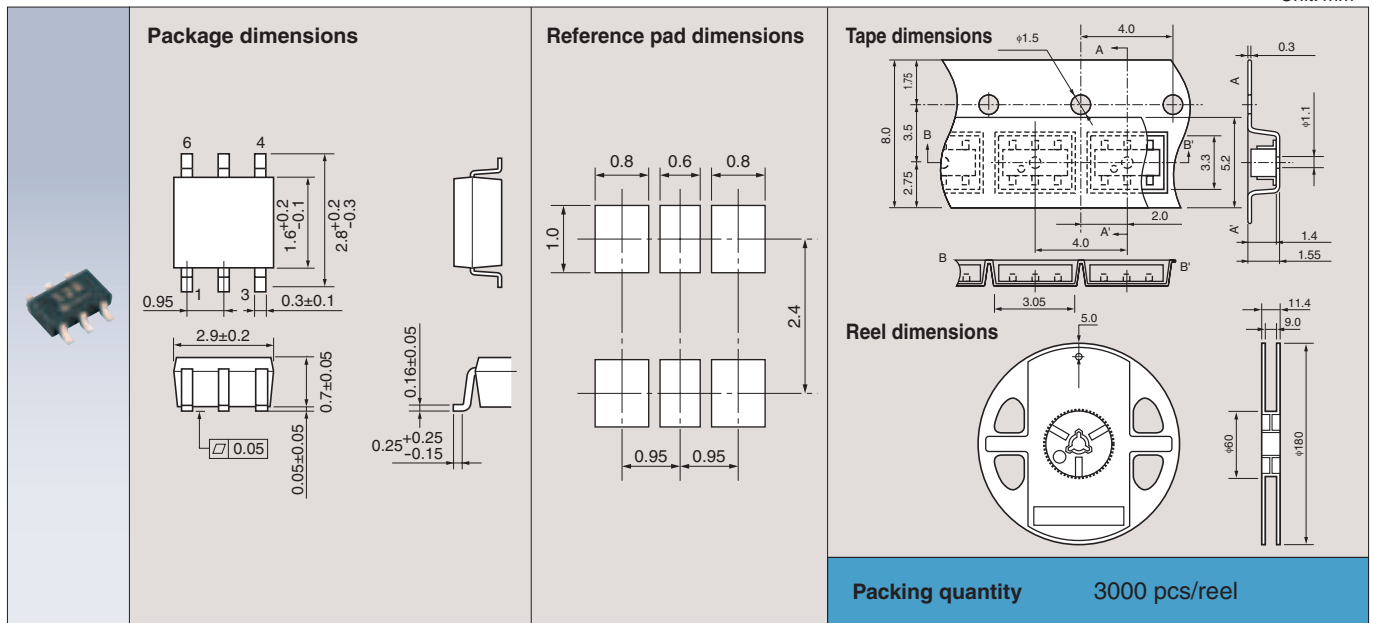
Package List

To meet requirements for compact and thin equipment, Toshiba offers various packages with a power dissipation of 1 to 150 W and a drain current of 1 to 75 A.



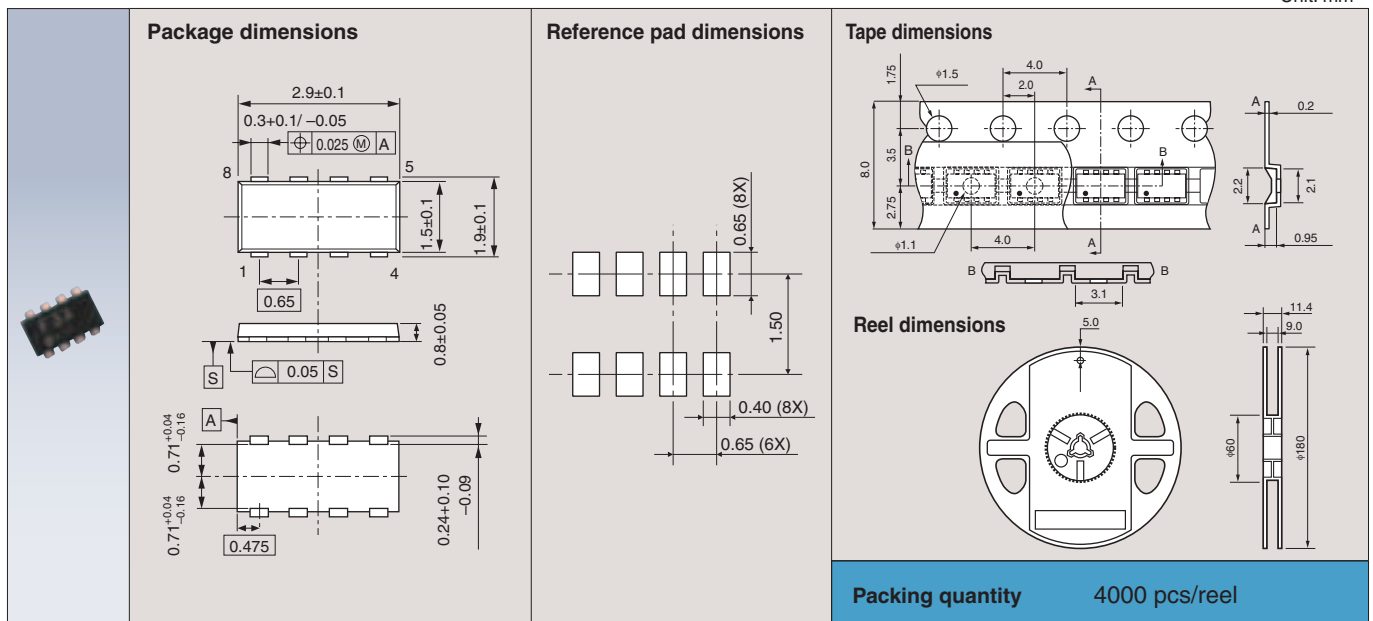
■ VS-6

Unit: mm



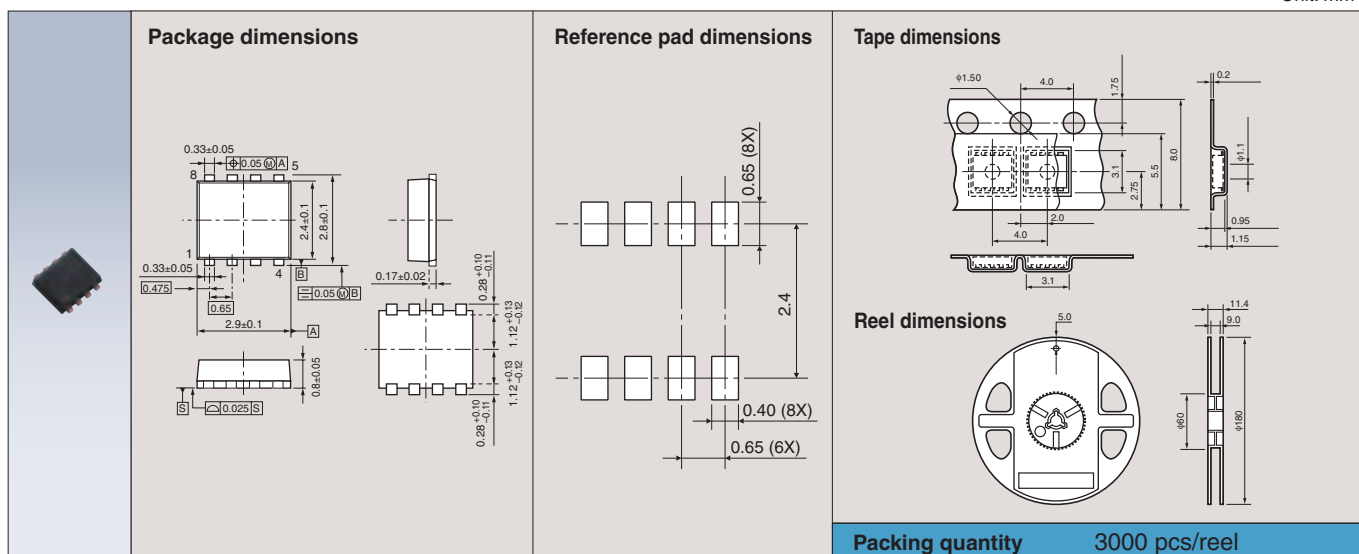
■ VS-8

Unit: mm



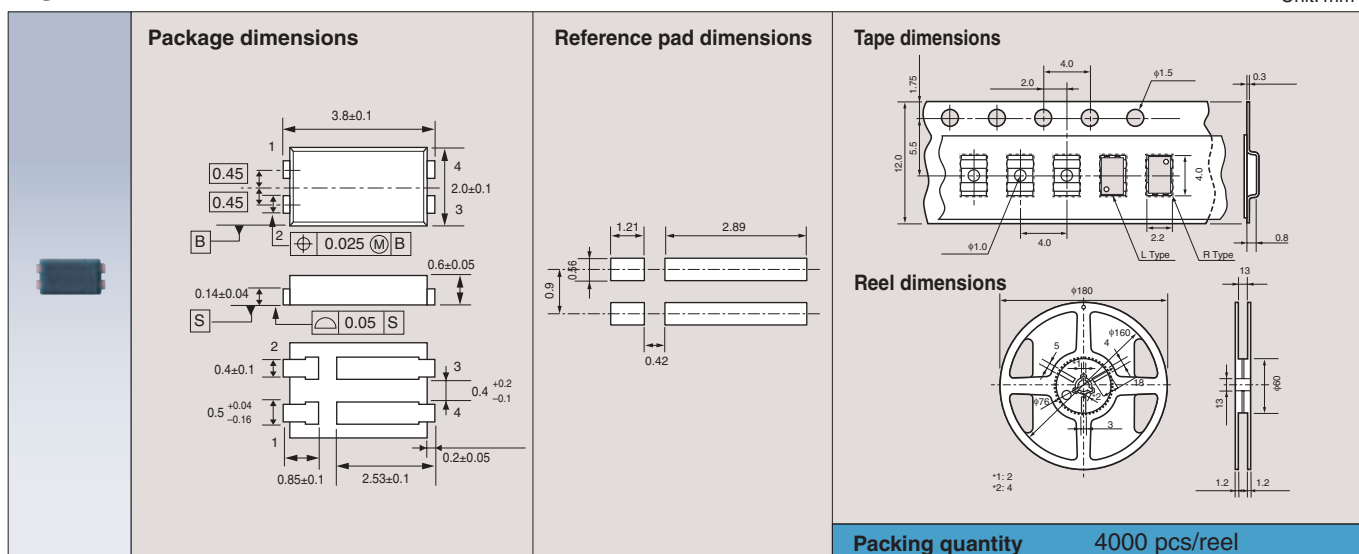
■ PS-8

Unit: mm



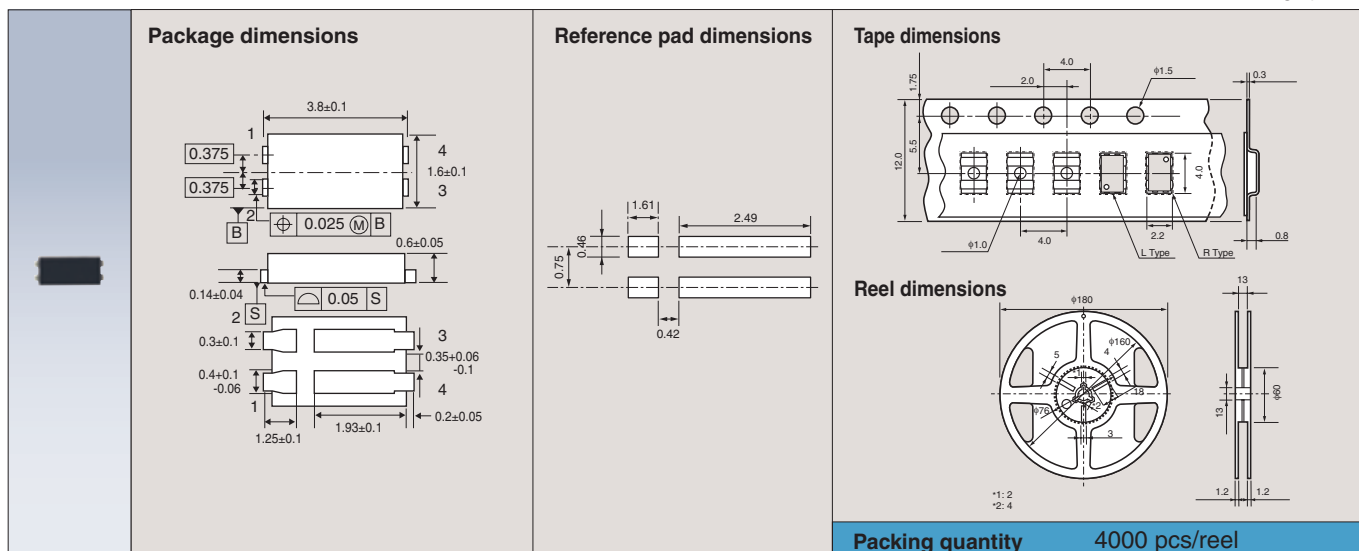
■ STP

Unit: mm



■ STP2

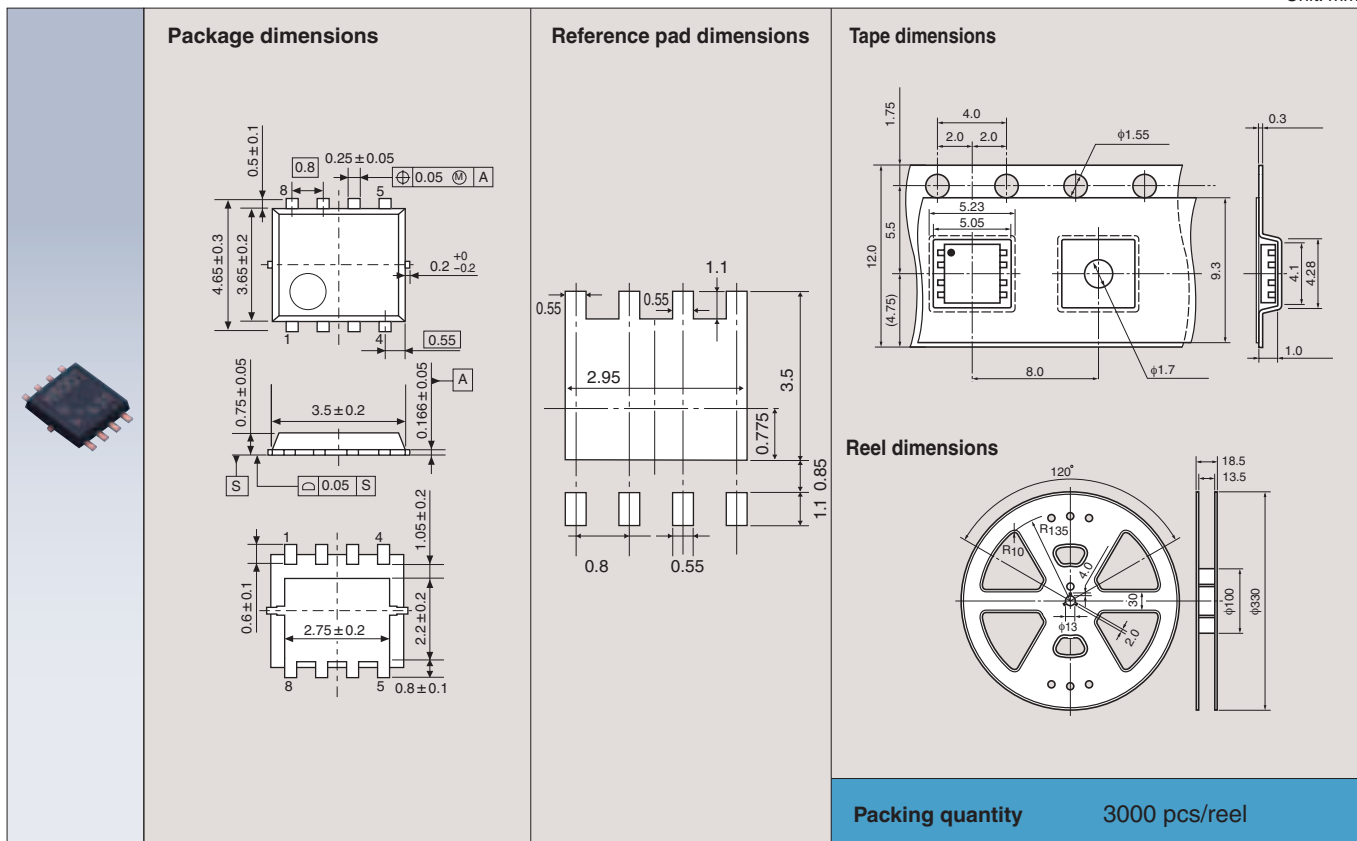
Unit: mm



Package List

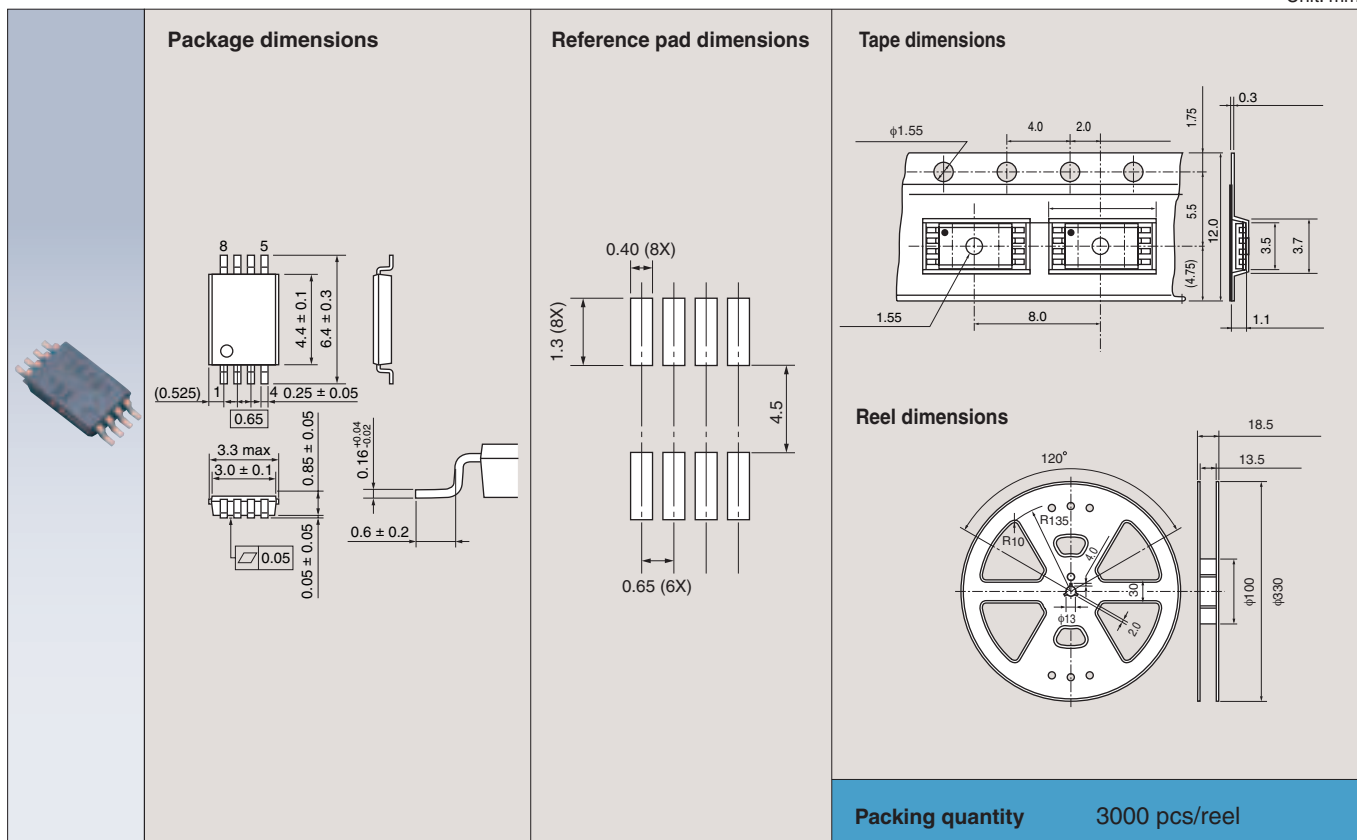
■ TSSOP Advance

Unit: mm



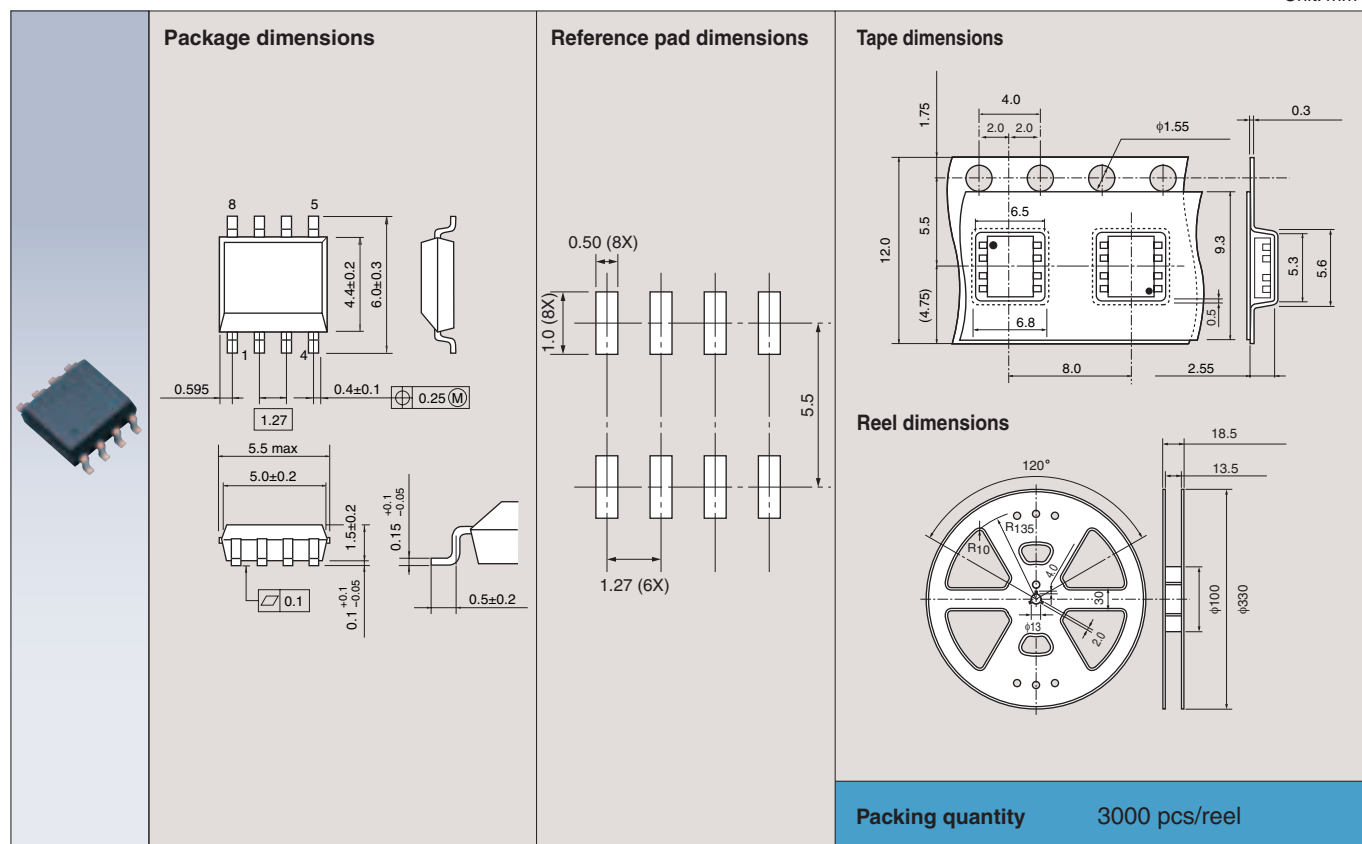
■ TSSOP-8

Unit: mm



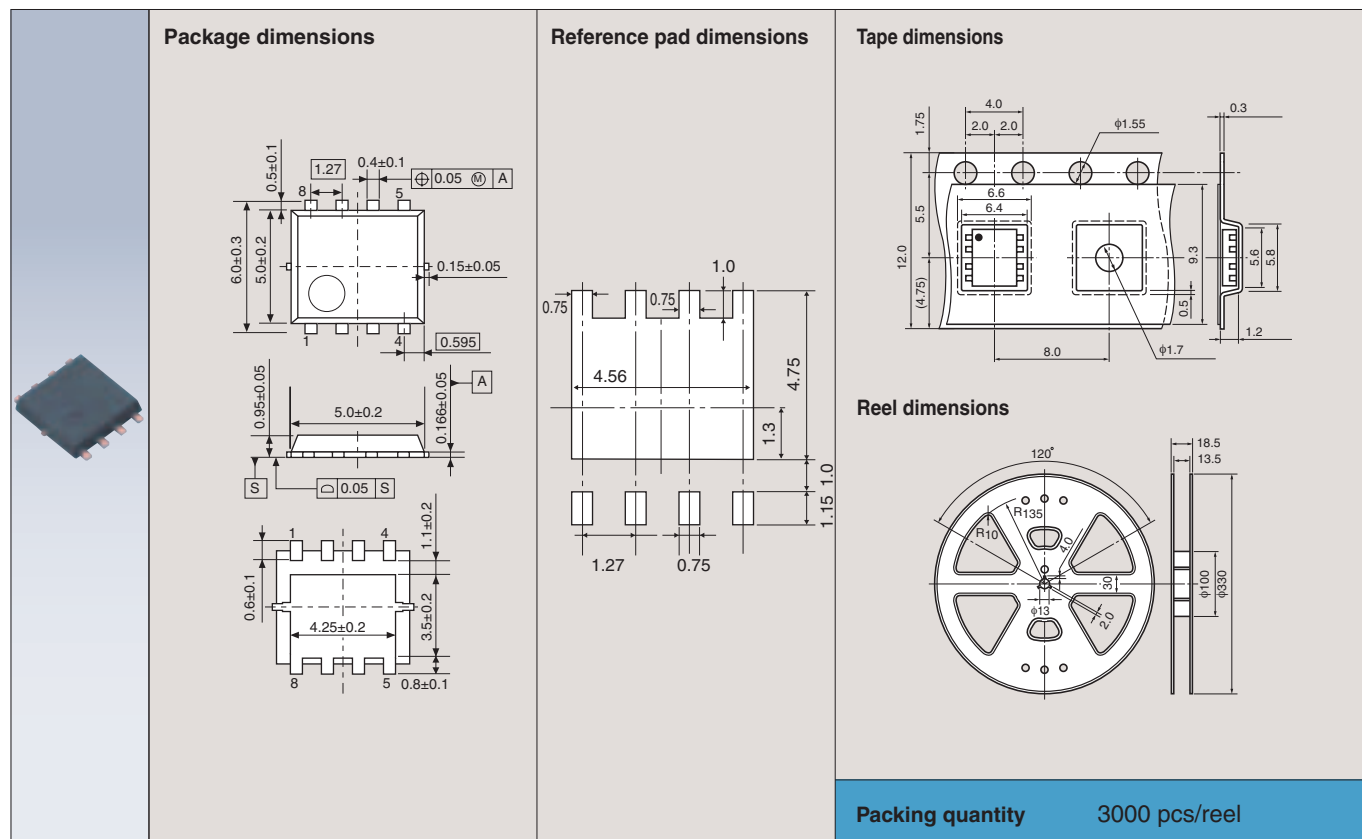
■ SOP-8

Unit: mm



■ SOP Advance

Unit: mm



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