



ROHM Discrete products Power tool



ROHM Discrete Product Strategy

Growth in Existing and New Markets

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We focus on Industry Market!!

Approach to New Markets

environmental
problem
reduce CO²

Global energy
problem

Fossil fuel
↓
Recyclable energy

Solar batteries
"Feed-in Tariff"

Enhanced areas

FA

House equipment &
automotives

New field

Environment
Medical treatment
Energy

Medical
treatment
IT

Environment

Medical
treatment

Health
care

New
energy

Electric
car

Robots

Solar
batteries

Biotechnology

New
displays

Power
conditioners

Optical
devices

Micro
machines

Home security

New
light
source

FA

Power
tool

Automotives

IT
Digital

Digital video cameras

DSC

Mobile phones

TV

HDD recorders

Note PCs

Car navigations

Audio players

Games

ROHM proposal products - for Power tool -

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Tr

Middle Power MOSFET for motor

Lineup 40V~100V
Low $R_{DS(ON)}$ * Qgd
0.35um Process CHIP
(Under development)

LSI

Small size DC/DC Converter

LSI

Battery Charger IC

Di

Ultra Low IRSBD

Adoption of ultra low IR barrier metal
High reliability
Strong against thermal runaway

Tr

High Voltage Resistance MOSFET for Switching power source

500 to 800V available.
Low noise, low Ron, high efficiency
and various packages

Tr

Compact bi-polar Transistor for buffer

Compact package(3.0 x 2.8mm)
PNP+NPN Bi-polar Transistors
Element voltage 30V/50V available

Tc

Small Size Tantalum Capacitor

Bottom Surface Electrode Type
Industry's Smallest, Thinnest,
Highest Capacitance
Large capacitance and low ESR



LSI

Ultra Low Power MCU

LSI

LiB Management LSI

Di

Compact Rectifier Diodes

Medium power Diodes
400V/0.7A (1913size)
600V/0.2A (1913size)

Di

Zener Diode KDZ series 2616size

Guaranteed 1W with the size 2616
Conventional line-up
Minimized the size of devices without
losing their special characteristics

R

Ultra-low Ohmic Resistors for Current Detection

Temperature diffusion occurs
with our unique design.
Line up from world's smallest 0603 size

R

ESR series Anti-surge chip Resistors
LTR series High power chip Resistors
KTR series High voltage resistance
chip Resistors

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Transistor

■ Feature

- Broad PKG lineup (HSOP8,HSMT8,HUML,Each Dual)
- Compact, low profile high power package types
- Low ON resistance, High efficiency
- High current Line Up (up to $I_d=35A$)

■ Application

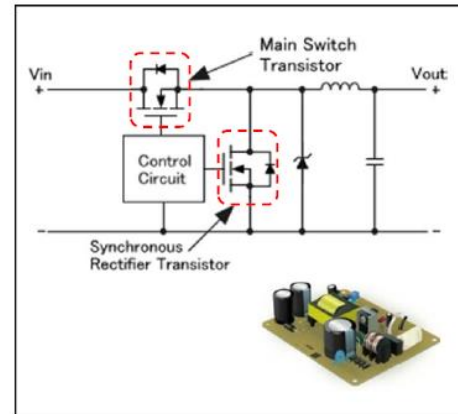
- DC/DC converter
- Li-ion Battery pack
- DC motor

■ Benefit

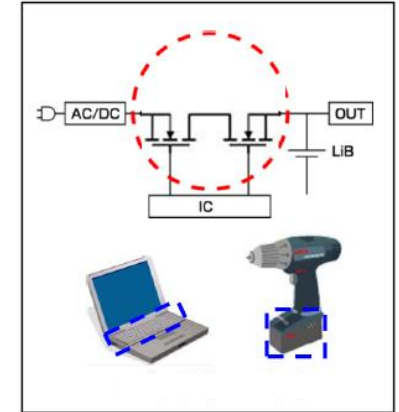
- Complex designs reduce the number of external parts
- Contributes to smaller, thinner sets and high efficiency operation

■ Application Circuit Examples

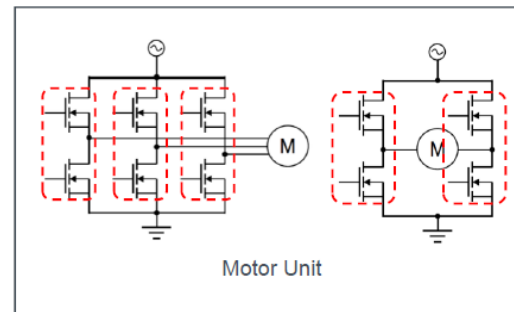
● DC/DC converter



● Li-ion Battery pack



● DC motor



■ Line UP

Line Up of HSOP8(5.0*6.0)



〈Gen4 : Low Ron〉

Package	PD (W)	Process	Part No.	VDSS (V)	VGSS (V)	ID (A)	RON Typ (mΩ)		RON Max	Qg(nC)	Qgd (nC)
							V _{GS} =10V	V _{GS} =4.5V	V _{GS} =4.5V	V _{GS} =4.5V	
HSOP8	3.0	Gen4LR	RS1E350BN	30	20	35	1.2	1.8	2.5	95	40
			RS1E280BN	30	20	28	1.7	2.3	3.2	50	20
			RS1E240BN	30	20	24	2.3	3.3	4.6	35	14
			RS1E200BN	30	20	20	2.8	3.8	5.3	29	11
			RS1E180BN	30	20	18	3.5	4.9	6.9	23	9

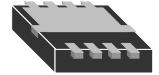
〈Gen4 : High Performance for DCDC〉

Package	PD (W)	Process	Part No.	VDSS (V)	VGSS (V)	ID (A)	RON Typ (mΩ)		RON Max	Qg(nC)	Qgd (nC)
							V _{GS} =10V	V _{GS} =4.5V	V _{GS} =4.5V	V _{GS} =4.5V	
HSOP8	3.0	Gen4HP	RS1E350GN	30	20	35	1.2	1.5	2.0	35.3	7.7
			RS1E320GN	30	20	32	1.4	1.8	2.4	28.2	6.8
			RS1E300GN	30	20	30	1.7	2.2	2.8	23.3	6.5
			RS1E280GN	30	20	28	2.0	2.6	3.3	19.1	5.4
			RS1E240GN	30	20	24	2.6	3.3	4.4	14.2	3.2
			RS1E200GN	30	20	20	3.6	4.6	6.1	9.8	2.2
			RS1E170GN	30	20	17	5.1	6.7	8.7	7.1	1.6
			RS1E150GN	30	20	15	6.7	8.8	11.4	5.4	1.1
			RS1E130GN	30	20	13	8.9	11.7	15.2	4.1	0.8

- High Efficiency
- Low Capacity

■ Line UP

Line Up of HSMT8(3.3*3.3)



〈Gen4 : Low Ron〉

Package	PD (W)	Process	Part No.	VDSS (V)	VGSS (V)	ID (A)	RON Typ (mΩ)		RON Max	Qg(nC)	Qgd (nC)
							V _{GS} =10V	V _{GS} =4.5V		V _{GS} =4.5V	
HSMT8	2.0	Gen4LR	RQ3E180BN	30	20	18	2.8	3.7	5.2	37	16.0
			RQ3E150BN	30	20	15	3.8	5.3	7.4	23	7.0
			RQ3E130BN	30	20	13	4.4	6.7	9.4	16.0	6.0
			RQ3E120BN	30	20	12	6.6	8.6	11.9	14.0	4.7
			RQ3E100BN	30	20	10	7.7	11.0	15.3	10.5	4.2
			RQ3E080BN	30	20	8	11	16	22	7.2	3.0
			RQ3E070BN	30	20	7	20	29	39	4.6	1.4

〈 Gen4 : High Performance for DCDC 〉

Package	PD (W)	Process	Part No.	VDSS (V)	VGSS (V)	ID (A)	RON Typ (mΩ)		RON Max	Qg(nC)	Qgd (nC)
							V _{GS} =10V	V _{GS} =4.5V		V _{GS} =4.5V	
HSMT8	2.0	Gen4HP	RQ3E180GN	30	20	18	3.3	4.3	5.5	13.8	3.9
			RQ3E150GN	30	20	15	4.6	6.2	8.1	8.0	2.3
			RQ3E120GN	30	20	12	6.7	9.1	11.8	5.4	1.1
			RQ3E100GN	30	20	10	8.9	12.0	15.7	4.1	0.8
			RQ3E080GN	30	20	8	12.9	17.5	22.8	2.7	0.6

Package	PD (W)	Part No.	VDSS (V)	VGSS (V)	ID (A)	RON Typ (mΩ)		Qg(nC)	Qgd(nC)	
						V _{GS} =10V	V _{GS} =4.5V	V _{GS} =10V		
HSMT8 (3.3 x 3.3)	2	RQ3G150GN	40	20	15	4.8	6.0	19.0	3.1	
		RQ3G130MN			13	6.0	7.9	17.0	2.0	
		RQ3G100GN			10	9.0	12.0	11.2	1.8	
		RQ3G080GN			8	15.0	20.0	6.7	1.1	
HSML Dual (3 x 3)		HS8K21			8	17.3	22.1	6.4	0.8	
		HS8K22			9	14.1	18.0	8.0	1.0	
					6	27.3	35.1	4.0	0.5	
					9	14.1	18.0	8.0	1.0	
SOP8 (5 x 6)					RGH200N04	20	3.0	3.7	36.0	5.4
		RMH170N04			17	4.0	5.1	31.9	3.6	
		RMH110N04			11	8.4	11.0	15.3	2.1	
		RMH090N04			9	12.5	16.5	10.4	1.4	
HSOP8 (5 x 6)		RS1G300GN			30	2.1	2.7	52.0	7.6	
		RS1G260MN			26	2.4	3.2	44.0	5.2	
		RS1G240GN			24	3.1	3.9	33.0	4.7	
		RS1G180MN			18	5.0	6.7	19.5	2.5	
	RS1G150MN	15			7.6	10.2	15.0	2.0		
	RS1G120MN	12			11.6	15.6	9.4	1.1		
HSOP8 Dual (5 x 6)	HP8K31	14			8.4	10.8	13.2	1.7		
	HP8K32	14			8.9	11.3	13.2	1.7		
		25			2.9	3.6	42.4	5.3		
		14			8.9	11.3	13.2	1.7		
		20			4.4	5.6	54.4	13.1		
	14	8.9			11.3	13.2	1.7			
D-PAK	20	RD3G800GN			80	1.9	2.5	55.0	8.5	
		RD3G600GN			60	3.0	3.9	34.8	5.4	
		RD3G500GN			50	4.0	5.2	26.1	4.0	
		RD3G450GN			45	5.0	6.6	20.9	3.2	
		RD3G400GN			40	7.0	9.2	14.9	2.3	
		D2-PAK			50	RGJ12HN04	120	1.1	1.3	125.0
RMJ10HN04	100					1.5	2.0	120.0	15.0	
RMJ800N04	80					2.5	3.5	60.0	7.5	
RMJ700N04	70					4.5	6.0	26.0	3.5	
RGJ650N04	65					5.0	6.6	24.2	5.0	
TO220	RX1G18BGN(12H)					180	1.1	1.4	125.0	22.4
	RX1G12BGN(800)					120	2.5	3.3	48.0	10.0
	RX1G11BGN(750)					110	3.5	4.6	35.0	7.0
	RX1G09BGN(650)	90			5.0	6.5	24.2	5.0		

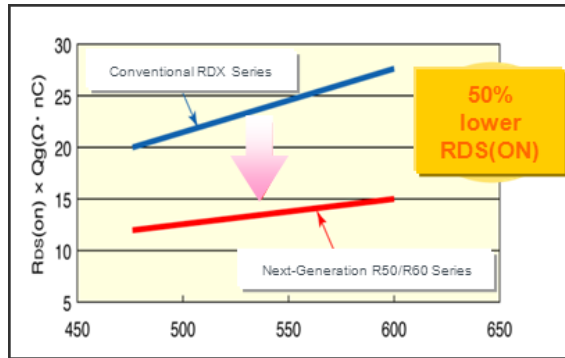
Package	PD (W)	Part No.	VDSS (V)	VGSS (V)	ID (A)	RON Typ (mΩ)		Qg(nC) V _{GS} =10V	Qgd(nC)
						V _{GS} =10V	V _{GS} =4.5V		
HSMT8 (3.3 x 3.3)	2	RQ3L090GN	60	20	9	11.6	16.9	29	3.9
		RQ3L070GN			7	17.0	24.7	20	2.6
		RQ3L050GN			4	43.0	66.0	8	1.0
HSML Dual (3 x 3)		HS8K31			5	34.0	49.3	10	1.3
					5	34.0	49.3	10	1.3
SOP8 (5 x 6)		RGH130N06			13	5.5	7.9	61	8.2
		RGH100N06			10	8.2	11.9	41	5.5
HSOP8 (5 x 6)	3	RS1L200GN			20	4.0	5.8	84	11.3
		RS1L180GN			18	4.9	7.1	69	9.2
		RS1L160GN			16	5.5	8.0	61	8.2
		RS1L140GN			14	6.9	10.5	49	6.5
		RS1L110GN			11	11.0	16.0	31	4.1
		D-PAK			20	RD3L500GN	50	4.0	5.8
RD3L400GN	40					5.0	7.3	67	9.0
RD3L350GN	35					7.0	11.0	48	6.4
RD3L300GN	30					11.0	16.0	31	4.1
RD3L200GN	20					18.0	26.1	19	2.5
RD3L150GN	15					35.0	52.0	10	1.3
RD3L100GN	10					55.0	79.8	6	0.8
D2-PAK	50					RGJ12HN06	120	1.9	2.8
		RGJ11HN06			110	2.5	3.6	134	18.0
		RGJ10HN06			100	3.5	5.0	96	12.9
		RGJ750N06			75	4.0	5.8	84	11.3
		RGJ700N06			70	5.0	7.3	67	9.0
		RGJ550N06			55	8.0	11.6	42	5.6
		RGJ450N06			45	10.0	14.5	34	4.5
		RX1L18CGN(12H)			180	1.8	2.6	187	25.0
RX1L18BGN(11H)		180			2.5	3.6	134	18.0	
RX1L14BGN(800)		140			3.5	5.1	96	12.9	
RX1L09BGN(700)		90			5.0	7.3	67	9.0	
RX1L06BGN(550)		60			8.0	11.6	42	5.6	
RX1L05BGN(450)		50			10.0	14.5	34	4.5	
RX1L03BGN(350)		30			20.0	29.0	17	2.3	
TO220FM		RX2L800GN			80	1.8	2.6	187	25.0
		RX2L750GN			75	3.5	5.1	96	12.9
	RX2L600GN	60			6.0	8.7	56	7.5	

〈 Under Development 〉

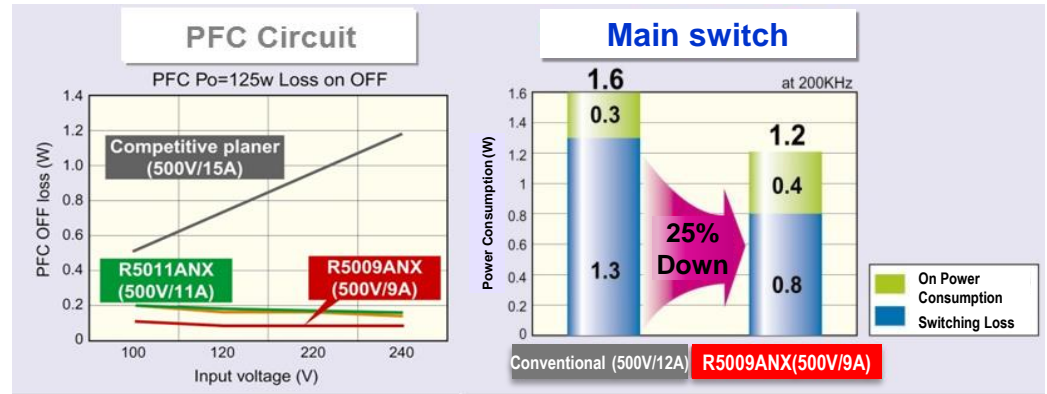
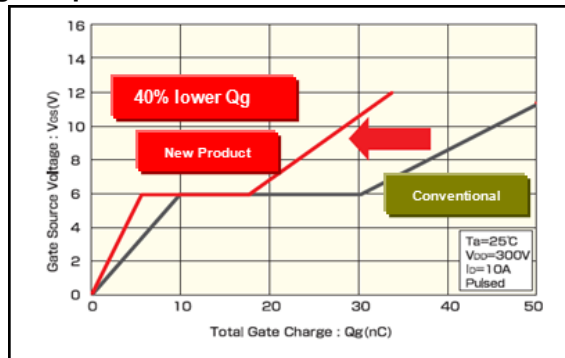
SJ-Multi epi series (Features : Hige Speed SW/ Low $R_{DS(on)}$)

- Wide voltage lineup 500V to 800V (for $\sim 200V$ supply country)
- Reduction of generation of heat by Low ON resistance and Low Qg
- Contributes to smaller, thinner sets and high efficiency operation

<Ron comparison>



<Qg comparison>



*Compared with Planar MOSFET/ IGBT...

- High-speed switching
- High efficiency operation in a low current domain



800V type Super Junction MOSFET

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800V High Voltage SJ MOS(Multi epi type)

◎Features

- Low Ron
- High speed switching
- High power package etc...

◎Application



Power Supply (for 200V~ supply country)

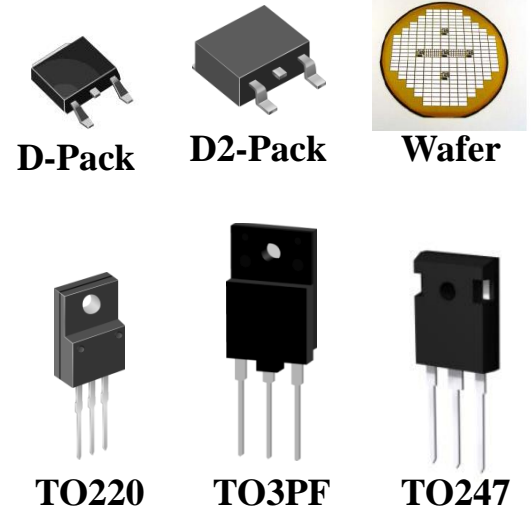


Home Appliance
(ex.air conditioner, IH cooking heater, TV etc.)

Industrial equipment, Inverter (ex.servo amp) etc.

形名	V _{DSS} (V)	I _D (A)	R _(DSon) (Ω) typ.	Q _g (nC) typ.	Package
☆R8001CND	800	1	7.0	※	CPT3
R8002ANX		2	3.3	12.7	TO220FM
R8005ANX		5	1.6	21	
R8008ANX		8	0.79	39	
R8010ANX		10	0.45	62	
☆R8016ANZ1		16	0.22	※	TO247
☆R8020ANZ		20	0.18	※	TO3PF

☆ = Under development



High Voltage Resistance and High Speed Switching Power MOSFET (EN series)

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Planar MOS

<cross section>

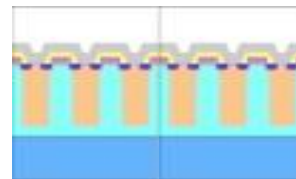


Feature

- Low noise

SJ MOS (AN series)

<cross section>



Feature

- Low RON
- High speed SW

New Generation Super Junction MOS

■ EN series

Feature

An advantage of planar and that of SJ-MOS are united.

● Strength of Planar

Low noise

● Strength of SJ—MOS

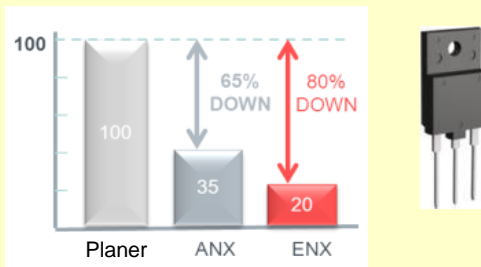
High speed SW, Low RON

Compared to conventional AN series,
A-RON was decreased by around 40%.

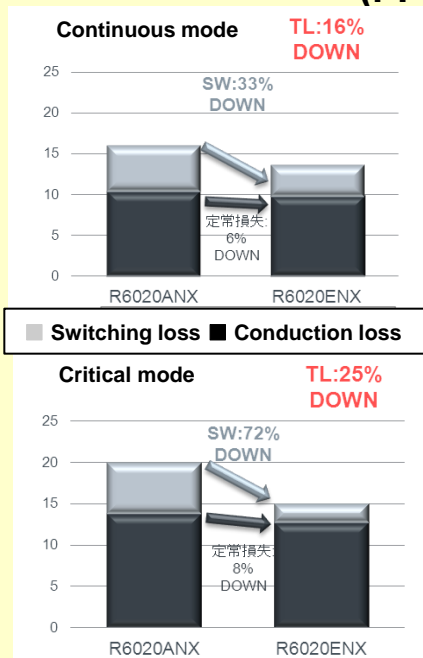
High Voltage Resistance and High Speed Switching Power MOSFET (EN series)

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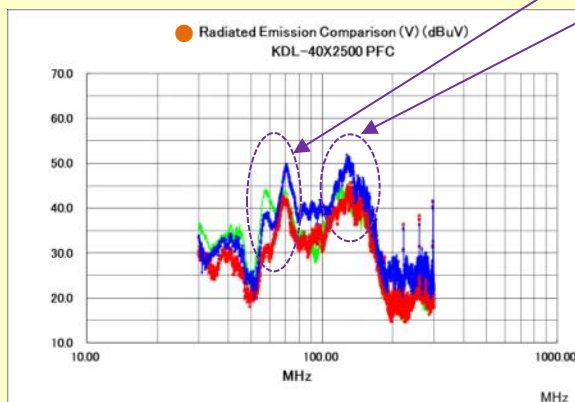
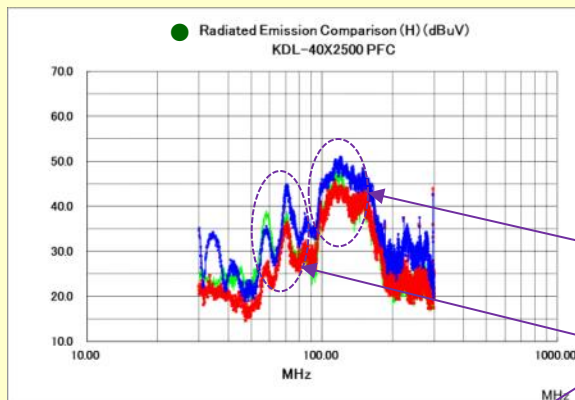
■ Ron comparison (TO220)



■ Power attenuation comparison (PFC circuit)



■ Noise comparison



■ The other company Planar

■ AN series

■ EN series

● EN series vs AN series :

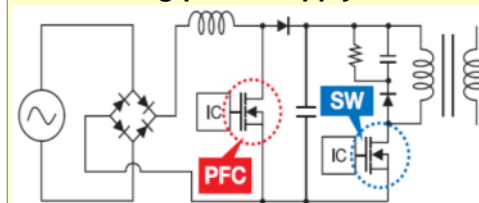
- The peak value of the noise of EN series decreases 6 -10dB.

● The other company Planar vs EN series :

- The noise of the EN series is a low noise even if it compares with Planar .

■ Evaluation circuit

Switching-power-supply circuit



Reference : About dB notation

dB notation : $20 \log_{10}(\text{Gain})$ [dB]

6dB≒twice, 10dB≒3.2 times

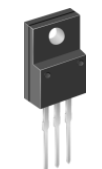
The EN series reduces a noise below in half as compared with the AN series.

High Voltage Resistance and High Speed Switching Power MOSFET (EN series)

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■ Feature

- **Low noise**
- Low ON resistance
- High-speed switching
- High-power package etc...



TO220

Type	BV _{DSS} (V)	I _D (A)	R _{DS(on)} (Ω)	Qg (nC)	Ciss (pF)
R6004ENX	600	4	0.90	15	250
R6007ENX	600	7	0.57	20	390
R6009ENX	600	9	0.50	23	430
R6011ENX	600	11	0.34	32	670
R6015ENX	600	15	0.26	40	910
R6020ENX	600	20	0.17	58	1400
R6024ENX	600	24	0.15	70	1650
R6030ENX	600	30	0.115	85	2100

Type	BV _{DSS} (V)	I _D (A)	R _{DS(on)} (Ω)	Qg (nC)	Ciss
R6004END	600	4	0.90	15	250
★R6007END3	600	7	0.57	20	390
★R6009END3	600	9	0.50	23	430
★R6011END3	600	11	0.34	32	670



TO252

■ Lineup

※Under Development ★DS Not Available

※ Specification may be changed for a development schedule article.

Type	BV _{DSS} (V)	I _D (A)	R _{DS(on)} (Ω)	Qg (nC)	Ciss
R6004ENJ	600	4	0.90	15	250
R6007ENJ	600	7	0.57	20	390
R6009ENJ	600	9	0.50	23	430
R6011ENJ	600	11	0.34	32	670
R6015ENJ	600	15	0.26	40	910
R6020ENJ	600	20	0.17	58	1400
R6024ENJ	600	24	0.15	70	1650



LPTS

Type	BV _{DSS} (V)	I _D (A)	R _{DS(on)} (Ω)	Qg (nC)	Ciss
R6020ENZ1	600	20	0.17	58	1400
R6024ENZ1	600	24	0.15	70	1650
R6030ENZ1	600	30	0.115	85	2100
R6035ENZ1	600	35	0.095	110	2750
R6047ENZ1	600	47	0.070	150	3600
R6076ENZ1	600	76	0.040	250	6500



TO247

Middle power transistor (TSMT3 / TSMT5)

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Line-up



TSMT3
(3.0 × 2.8 × 0.85mm)

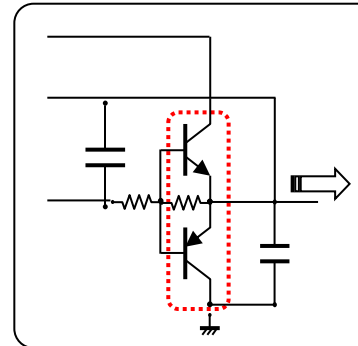


TSMT5
(3.0 × 2.8 × 0.85mm)

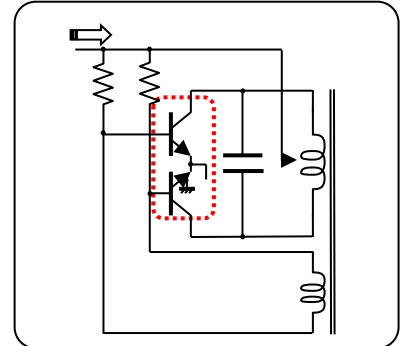
Part No.	PKG	POL	VCE(V)	IC(A)	Conventional
2SAR512R	TSMT3	PNP	-30	-2	2SA2113
2SAR513R	TSMT3	PNP	-50	-1	2SA2092
2SCR553R	TSMT3	PNP	-50	-2	2SA2092
2SAR543R	TSMT3	PNP	-50	-3	2SA2095
2SAR514R	TSMT3	PNP	-80	-0.7	-
2SAR554R	TSMT3	PNP	-80	-1.5	-
2SAR544R	TSMT3	PNP	-80	-2.5	-
2SCR512R	TSMT3	NPN	30	2	2SC5916
2SCR513R	TSMT3	NPN	50	1	2SC5865
2SCR553R	TSMT3	NPN	50	2	2SC5866
2SCR543R	TSMT3	NPN	50	3	2SC5867
2SCR514R	TSMT3	NPN	80	0.7	-
2SCR554R	TSMT3	NPN	80	1.5	-
2SCR544R	TSMT3	NPN	80	2.5	-
QS5W1	TSMT5	NPN × 2	30	3	-
QS5W2	TSMT5	NPN × 2	50	3	-
QS5Y1	TSMT5	PNP+NPN	-30	-3	QSZ4
QS5Y2	TSMT5	PNP+NPN	-50	-3	-
			50	3	

Circuit diagram

● Buffer

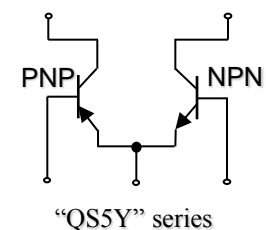
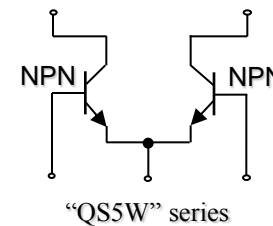


● Collector resonant circuit



Recommend for gate driver of IGBT or MOSFET,
and Inverter circuit of VFD !

“QS5W”, “QS5Y” series Inner Circuit



Diode

Schottky Barrier Diode (SBD) Line Up

19

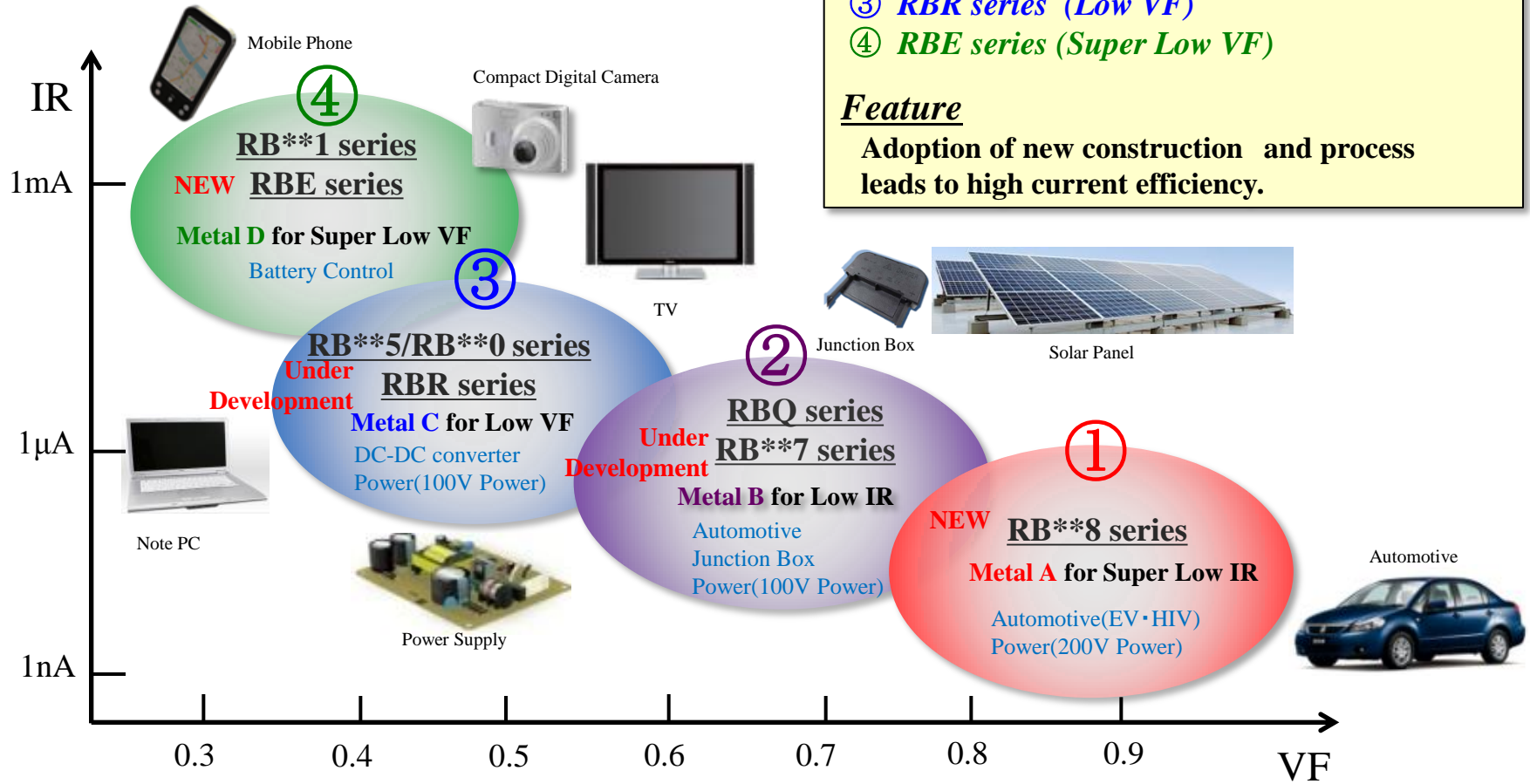
4 Kinds of SBD Metal Line Up

SBD new series

- ① **RB**8 series (Super Low IR)**
- ② **RB**7 series (Low IR)**
- ③ **RBR series (Low VF)**
- ④ **RBE series (Super Low VF)**

Feature

Adoption of new construction and process leads to high current efficiency.



① RB**8 Series ~ Ultra Low IR SBD ~

Mass Production

20

Feature

Ultra Low Reverse Current
No Thermal Runaway
High Reliability

Downsize Proposal ex.

Mounting Area: 72% down

Replacement of Rectifier Diode

REC (200V / 3A) SMC



➡ **RB058L150 PMDS(SMA)**



64% down

REC (200V / 1A) PMDS



➡ **RB168M-60 PMDU**



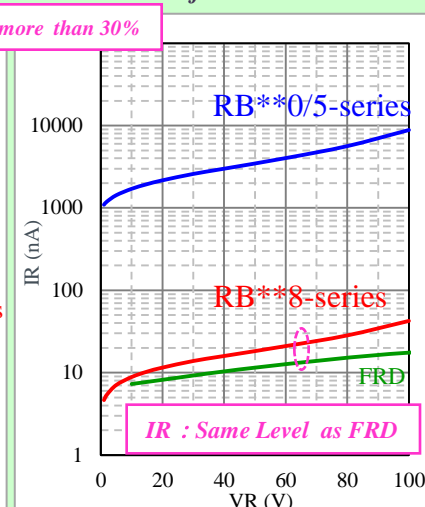
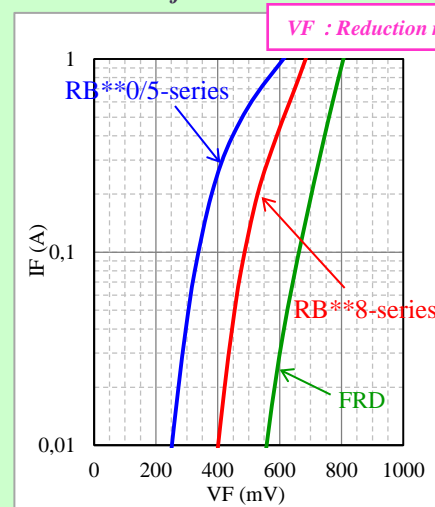
Lineup

Package	Part No.	Absolute Maximum Ratings (Ta=25 °C)		Electrical Characteristic (Ta = 25 °C)			
		VR(V)	Io(A)	VF(V)	Max. IF(A)	Max. IR(uA)	Max. VR(V)
TUMD2	RB558VA150	150	0.5	0.95	0.5	0.5	150
TUMD2	RB557VAM100	100	100	0.85	0.7	0.2	100
PMDU (SOD-123)	RB168M-40	40	1	0.65	1	0.55	40
	RB168M-60	60	1	0.68	1	1.5	60
	RB168M150	150	1	0.84	1	20	150
	RB068M-40	40	2	0.73	2	0.55	40
	RB068M-60	60	2	0.76	2	1.5	60
PMDS (SOD-106)	RB068L-40	40	2	0.69	2	1	40
	RB068L-60	60	2	0.7	2	2	60
	RB068L100	100	2	0.8	2	50	100
	RB068L150	150	2	0.82	2	5	150
	RB058L150	150	3	0.87	3	5	150
	RB058L-40	40	3	0.7	3	5	40
	RB058L-60	60	3	0.64	3	4	60
TO-252M	RB088BM100	100	5 x 2	0.87	5	5	100
	RB088BM150	150	5 x 2	0.88	5	15	150
LPDS (TO-263S)	RB088NS150	150	5 x 2	0.88	5	15	150
	RB228NS100	100	15 x 2	0.87	5	150	100
	RB238NS100	100	20 x 2	0.86	20	20	100
	RB238NS150	150	20 x 2	0.92	20	30	150
TO-220FN	RB088T150	150	5 x 2	0.88	5	15	150
	RB228T100	100	15 x 2	0.87	5	150	100

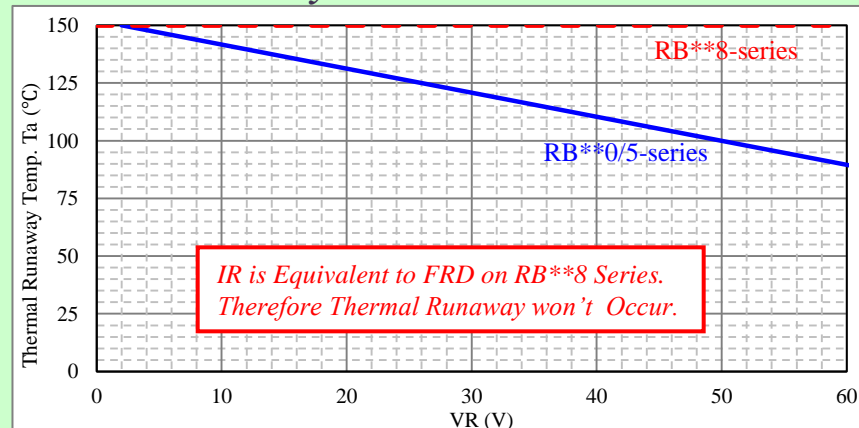
Characteristic data

<VF-IF :Tj =25 °C>

<VR-IR :Tj =25 °C>



<Thermal Runaway>



② RB**7 series ~Low IR SBD~

Under Development

Confidential

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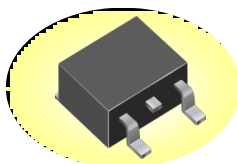
Feature

- *Low leak*
- *High reliability*

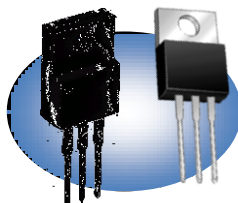
Package



TO252M $I_o=10A\sim30A$
10.0×6.6×2.2mm



TO263S $I_o=10\sim30A$
13.1×10.1×4.5mm



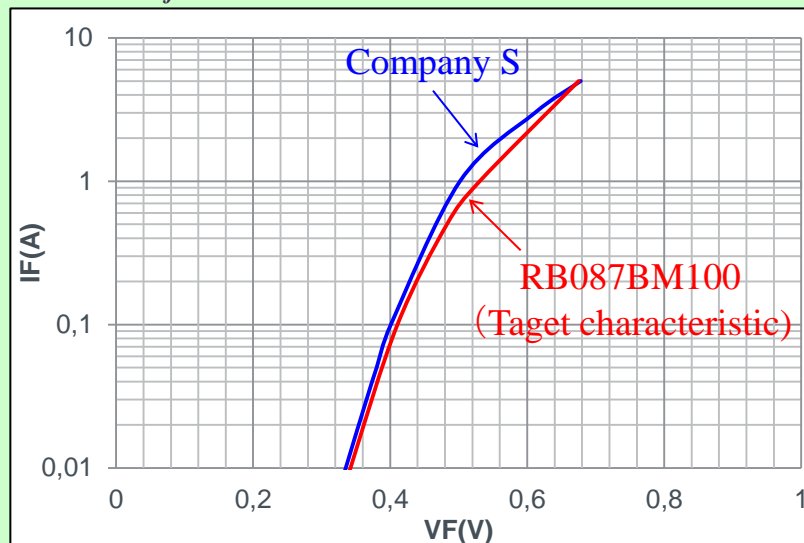
TO220FN TO220AB
 $I_o=10\sim30A$
19.0×10.0×4.5mm

Line Up

Type	I_o/A	$V_F/V(I_o)$	Package
RB087BM100	10	0.86	TO252M
RB087NS100			TO263S
RB087T100			TO220FND
RB087TG100			TO220AB
RB217BM100	20	0.86	TO252M
RB217NS100			TO263S
RB217T100			TO220FND
RB217TG100			TO220AB
RB227BM100	30	0.86	TO252M
RB227NS100			TO263S
RB227T100			TO220FND
RB277TG100			TO220AB

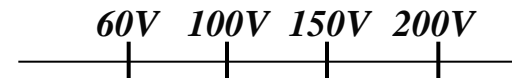
Characteristic data

< V_F-I_F : $T_j=25^\circ C$ > ... 100V/10A



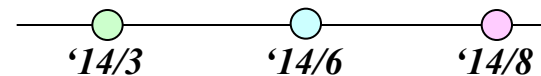
Voltage Lank

RB**7 series
(Low IR)

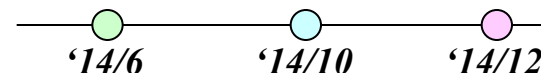


Schedule

~100V Line



100/200V Line



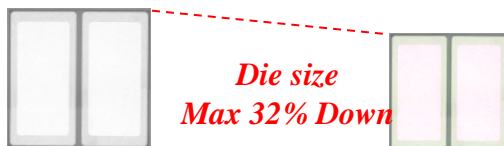
③ RBR series ~ Low VF SBD ~

Under Development

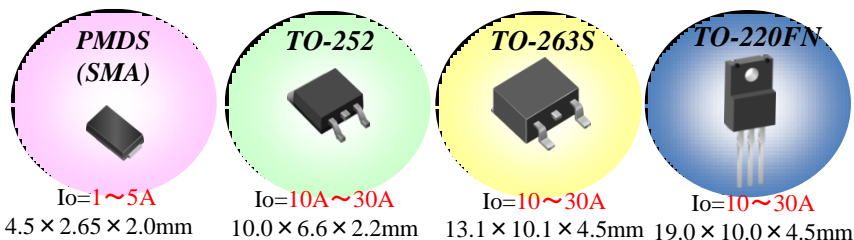
Confidential 22

Feature

• Installation of new line realize the same characteristics with Die Shrink!!



PKG



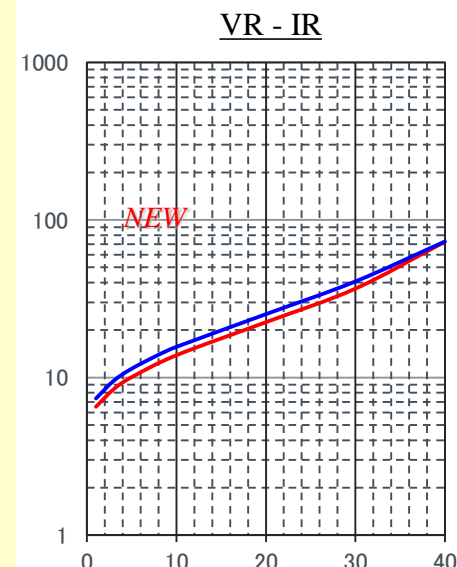
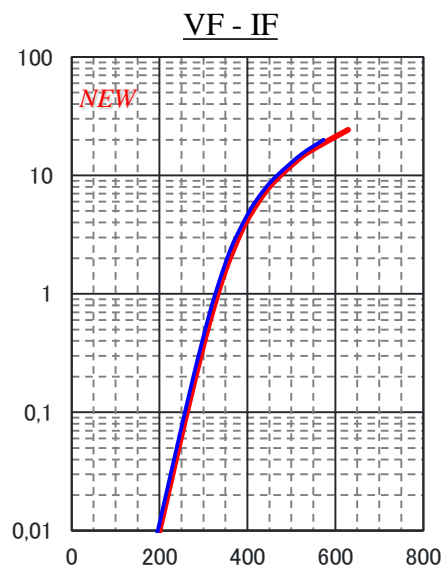
Line UP

Power ~ Cathode common ~

【CS '14/2, MP : '14/4】

Package	Part No.	Absolute Maximum Ratings ($T_a=25\text{ }^{\circ}\text{C}$)		Electrical Characteristic ($T_a = 25\text{ }^{\circ}\text{C}$)				
		VR(V)	Io(A)	VF(V)	Max.	IR(uA)	Max.	
					IF(A)		VR(V)	
TO252M	RBR10BM45A	40	10	0.62	5	0.12	40	
TO263S	RBR10NS40A							
TO220FN	RBR10T40A							
TO252M	RB15BM40A	40	15	0.58	7.5	0.24	40	
TO263S	RBR20NS40A		20	0.62	10			
TO220FN	RBR20T40A							
TO252M	RB20BM40A	40	20	0.57	10	0.36	40	
TO263S	RBR30NS40A		30	0.62	15			
TO220FN	RBR30T40A							

Characteristics



Middle Power ~ Single ~

【CS '14/2, MP : '14/4】

Package	Part No.	Absolute Maximum Ratings ($T_a = 25^\circ C$)		Electrical Characteristic ($T_a = 25^\circ C$)			
		VR(V)	Io(A)	VF(V) Max.	IF(A)	IR(uA) Max.	VR(V)
RBR1L40A	PMDS	40	1	0.52	1	0.05	40
RBR2L40A		40	2	0.5	2	0.15	40
RBR3L40A		40	3	0.69	3	0.05	40
RBR3L40B		40		0.61		0.08	
RBR3L40C		40		0.54		0.1	
RBR5L40A		40	5	0.52	5	0.2	40

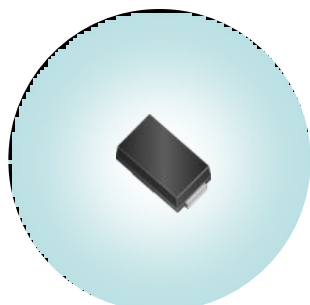
☆ Adding 5A product in the lineup!

Compact Rectifier Diodes

23

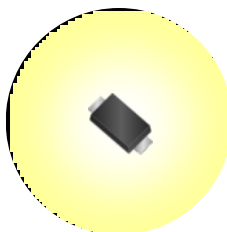
Feature

Improved performance in the TUMD2S package



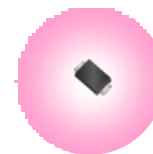
PMDS
4526 size

Smaller



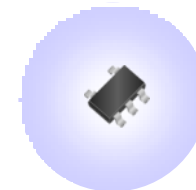
PMDU
2616 size

Smaller



TUMD2S
1913 size

Mixed



TSMD5
2916 size

NEW

NEW

NEW

Part No.		RR2L4S	1SR154-400	RR264M-400	RRE07VSM4S	RRE02VSM4S	RRE04EA4D
Absolute maximum ratings	Io(A)	2.0	1.0	0.7	0.7	0.2	0.4 (*1)
	VR(V)	400	400	400	400	400	400
Electrical characteristics	VF(V)	1.1	1.1	1.1	1.1	1.1	1.1
	IR(μA)	10	10	10	1.0	1.0	1.0
PKG		PMDS	PMDS	PMDU	TUMD2S	TUMD2S	TSMD5










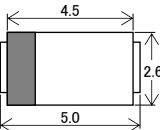
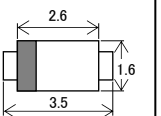
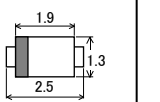
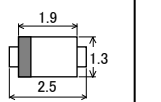
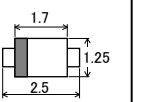
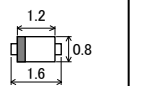
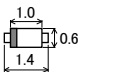
(*1)Per one CHIP

Part No.		RR2L6S	1SR154-600	RR268M-600	RRE07VSM6S	RRE02VSM6S	
Absolute maximum ratings	Io(A)	3.0	1.0	1.0	0.7	0.2	
	VR(V)	600	600	600	600	600	
Electrical characteristics	VF(V)	1.2	1.1	1.1	1.1	1.1	
	IR(μA)	10	10	10	1.0	1.0	
PKG		PMDS	PMDS	PMDU	TUMD2S	TUMD2S	

ROHM Zener Diode

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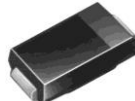

<PKG Lineup>

Zener power voltage rank	1W	1W	0.5W	0.5W	0.2W	0.15W	0.1W
	PTZ series	KDZ series	TDZ series	TFZ series TFZV series	UDZS series UDZV series	EDZ series EDZV series	VDZ series
			 	 			
							
	PMDS(5026) (mm)	PMDU(3516) (mm)	TUMD2(2513) (mm)	TUMD2(2513) (mm)	UMD2(2512) (mm)	EMD2(1618) (mm)	VMD2(1416) (mm)
2.0V ↑ 51V	2.0V MP 51V	2.0V MP 51V	5.1V MP 30V	2.0V MP 39V	2.0V MP 39V	2.0V MP 36V	2.0V MP 36V

Vz 60V~70V Underdevelopment

<Rohm recommendation package>

PTZ series **KDZ series**

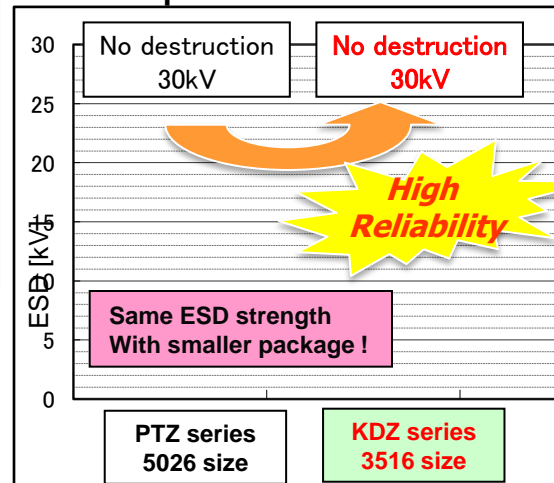
 

Mounting area 1/3

5026(PMDS) **3516(PMDU)**

- Guaranteed 1W with the size 3516
- Voltage lineup equivalent to conventional products
- Minimized the size of devices without losing their special characteristics

<ESD Dispersion MAP>



High Voltage ZenerDiodes (Underdevelopment)

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Feature

- LineUp to 150V
- 0.2W UDZLVseries (2512size)
- 1.0W KDZLVseries (3516size)

Application

- voltage regulation
- surge protection



Schedule

- UDZLV series
DS: Jun/'14
MP: Oct/'14
- KDZLV series
DS: Oct/'14
MP: Dec/'14

※June,2014 investigation

Line up

★:under development

Status	Vz(V)	UDZLVseries  (2512size) 0.2W	KDZLVseries  (3516size) 1.0W	Vz min(V)	Vz max(V)
★	43	UDZLV43	KDZLV43	40	47
★	47	UDZLV47	KDZLV47	44	50
★	51	UDZLV51	KDZLV51	48	54
★	56	UDZLV56	KDZLV56	53	60
★	62	UDZLV62	KDZLV62	58	66
★	68	UDZLV68	KDZLV68	64	72
★	75	UDZLV75	KDZLV75	70	79
★	82	UDZLV82	KDZLV82	77	87
★	91	UDZLV91	KDZLV91	85	96
★	100	UDZLV100	KDZLV100	94	106
★	110	UDZLV110	KDZLV110	104	116
★	120	UDZLV120	KDZLV120	114	126
★	130	UDZLV130	KDZLV130	124	136
★	150	UDZLV150	KDZLV150	140	160

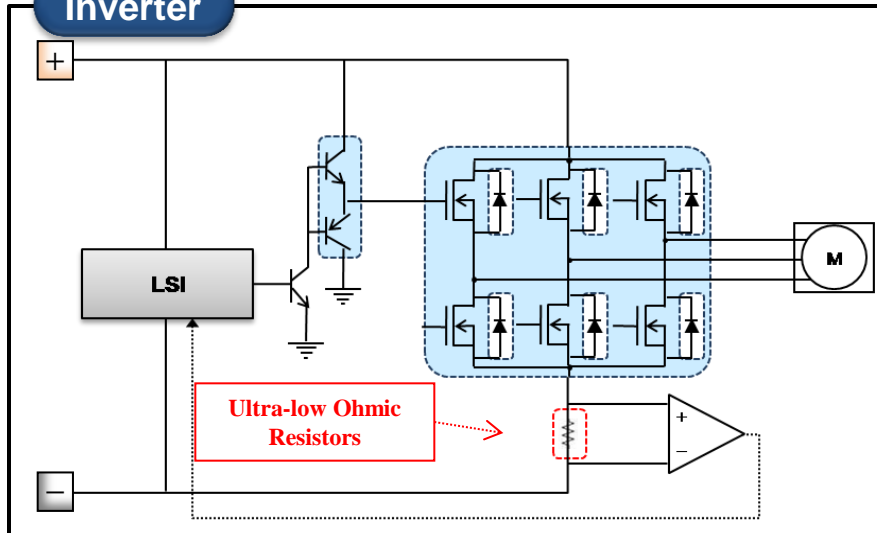
Resistor

(Special Resistor)

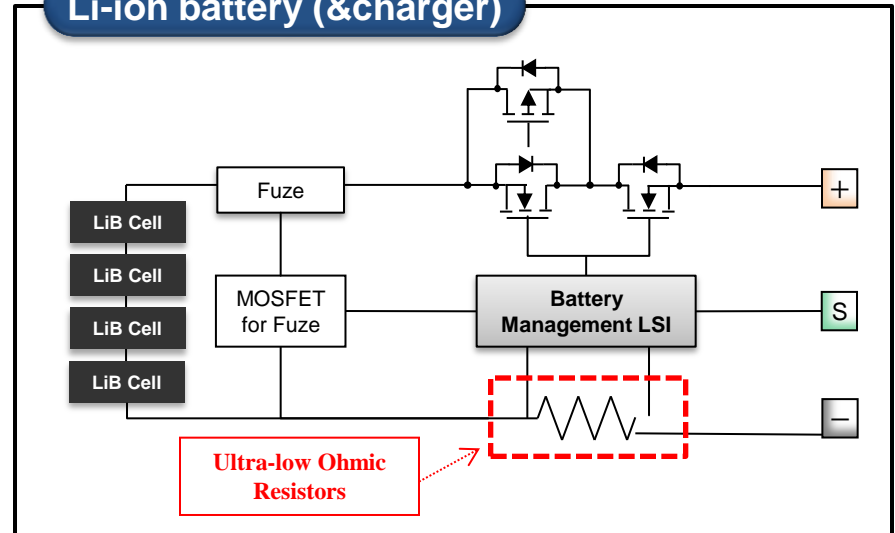
Circuit example

27

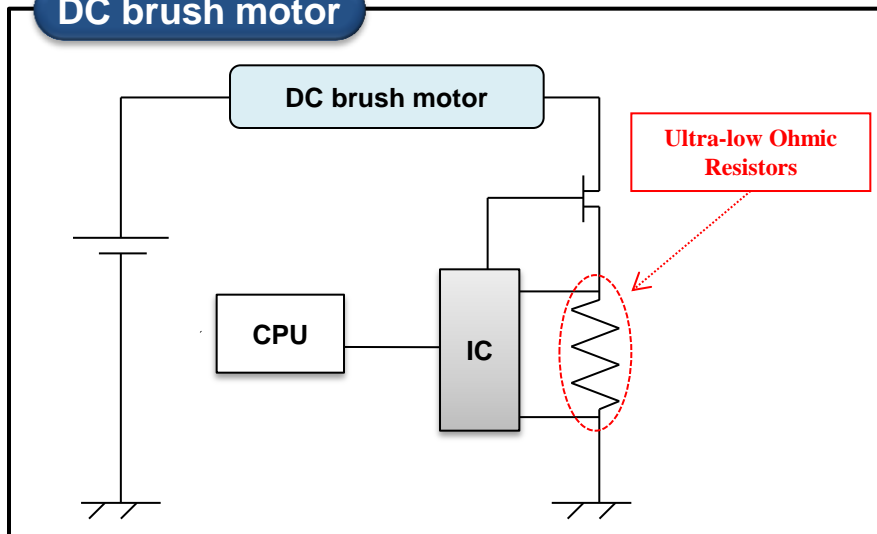
Inverter



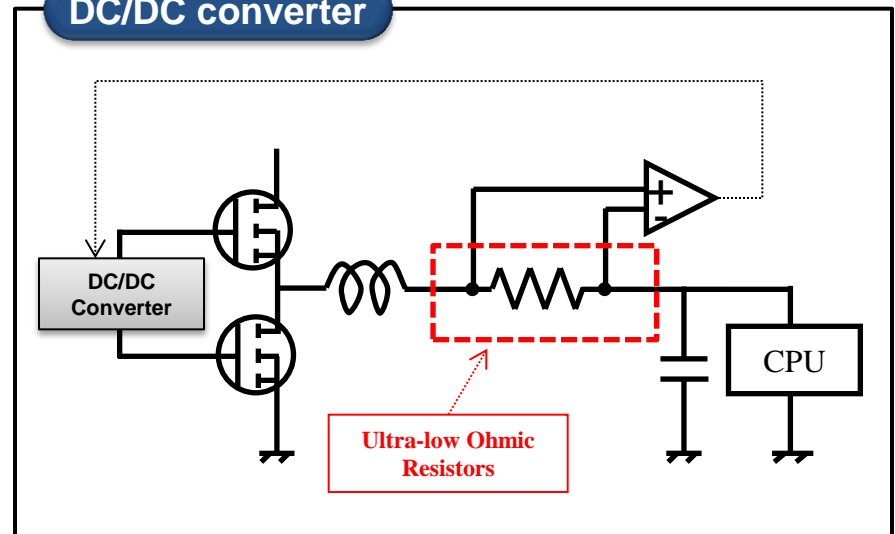
Li-ion battery (& charger)



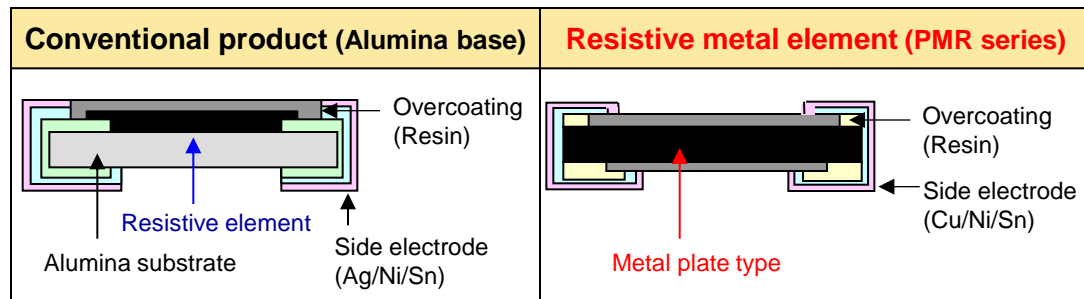
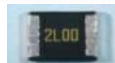
DC brush motor



DC/DC converter



◆ Structure



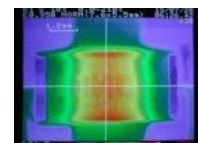
◆ Specification

Part No.	Size mm (inch)	Rated power	Resistance tolerance	Resistance (mΩ)	Temperature coefficient (ppm/°C)	Operating temperature range
PMR006	0603 (0201)	0.1W	J (±5%)	10	0~300	-55~+155℃
PMR01	1005 (0402)	0.2W	J (±5%)	10	0~200	
PMR03	1608 (0603)	0.25W	J (±5%)	10	0~150	
			F (±1%)			
PMR10	2012 (0805)	0.5W	J (±5%)	2,3,4,5,6, 7,8,9,10	±150	
			G (±2%)			
			F (±1%)			
PMR18	3216 (1206)	1W	J (±5%)	1,2,3,4,5,6, 7,8,9,10	±100	
			F (±1%)			
PMR25	3225 (1210)	1W	J (±5%)	1,2,3,4,5	±100	
			F (±1%)			
PMR50	5025 (2010)	1W	J (±5%)	1,2,3,4,5,6, 7,8,9,10	±100	
			F (±1%)			
PMR100	6432 (2512)	2W	J (±5%)	1,2,3,4,5,6, 7,8,9,10	±100 (±150: 1.2mΩ)	
			F (±1%)			

Surface Temperature

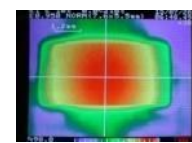
Size: 2512
Rated power: 1W
ROHM: PMR
Competitor: Metal element type

<ROHM>



(88.7°C)

<Competitor>

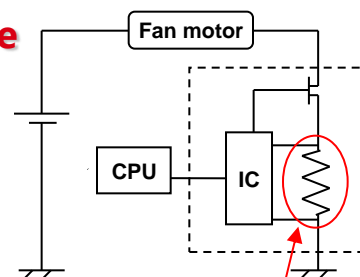


(98.8°C)

Temperature diffusion occurs with our unique design.

◆ Circuit example

<Overcurrent detection>



Ultra-low ohmic resistor for current detection

◆ Applications

Current detection purpose

Notebook PC, HDD, Mobile phones, Small batteries, Chargers, DC/DC converter, and other general Power supplies



☆ : Under development

* Design and specification is supposed to change

◆ Features (Summary of design)

■ High power 4W to 5W

Rohm's unique precision welding technology joining the copper electrode and thick metal resistor, and achieved improvement heat.

■ Ultra low ohmic (min. 0.2mΩ)

We realized the low TCR* even at ultra-low resistance range by adopt a high-performance alloy material in metal resistor.

* : Temperature coefficient of resistance



To adapt to the current sensing applications with a large current set

(Applied current value of at the rated power)

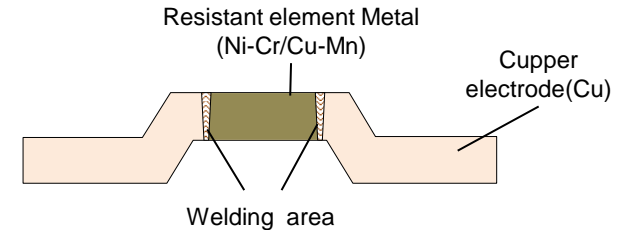
$$P = I^2 \times R \rightarrow I = \sqrt{P/R} = \sqrt{5W/0.0002\Omega} = 158A$$

◆ Target Specification

Part No.	Size (mm)	Rated Power	Resistance tolerance	Resistance (mΩ)	Temperature coefficient(ppm/°C)	Operating temperature range
NEW PSR400	10 × 5.2	4W	J (±5%)	0.3, 0.5	±175	-55 to 170°C
			G (±2%)			
			F (±1%)	1.0, 2.0, 3.0	±75	
NEW PSR500	15 × 7.75	5W	J (±5%)	0.2	±225	
			G (±2%)	0.3, 0.4, 0.5	±175	
			F (±1%)	1.0, 2.0	±75	

* Design and specification is supposed to change

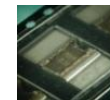
◆ Structure



◆ Application

For Current detection

- Automotive (EPS, Battery surveillance unit, etc...)
- Renewal Energy (Power conditioner)
- Consumer electronics (Air conditioner, Refrigerator)



◆ Dimensions

Part No.	Resistance (mΩ)	Size(mm)		
		L	W	H
PSR400	0.3	10±0.25	5.2±0.25	1.85±0.15
	0.5			1.30±0.15
	1			0.90±0.15
	2			1.10±0.15
	3			0.90±0.15
PSR500	0.2	15±0.25	7.75±0.25	1.85±0.15
	0.3			1.40±0.15
	0.4			1.15±0.15
	0.5			1.05±0.15
	1			1.30±0.15
	2			0.90±0.15

Ultra Low Ohmic Power shunt resistor PMW series

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◆ Features

- High power up to 5W
- Wide resistance range(3m~120m)
- Excellent temperature and frequency characteristic
- It is suitable for the replacement of cement resistance



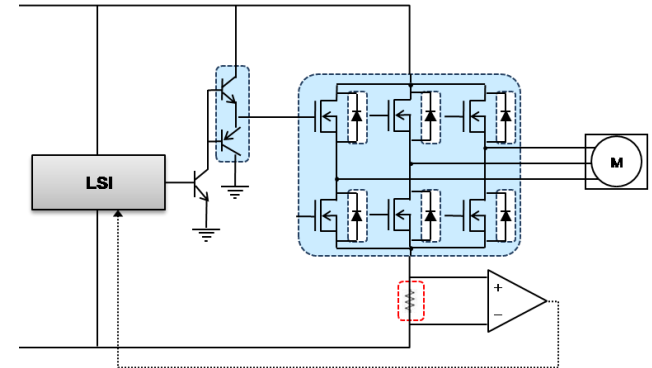
◆ Specification

Under development

Part No.	Size (mm)	Rated Power	Resistance Tolerance	Resistance (mΩ)	Temperature Coefficient (ppm/°C)	Operating Temperature range
PMW100	 6.2 × 3.2	2W	F (±1%) J (±5%)	11 ~ 75	±100	-55°C~170°C
PMW300	 6.7 × 7.2	3W	F (±1%) J (±5%)	51 ~ 100	±50	
		4W	F (±1%) J (±5%)	4 ~ 50	±100	
PMW450	 11.4 × 6.9	5W	F (±1%) J (±5%)	3 ~ 120	±100	

* Design and specification is supposed to change

◆ Circuit example



◆ Applications

Current detection

- White goods (Air conditioner)
- Industrial inverter
- Electronic office equipment
- Power tool
- Power supply etc.



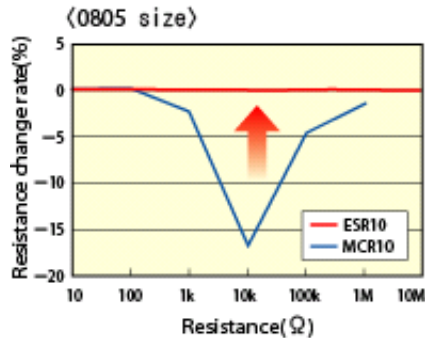
Anti-surge Chip Resistors ESR series

31

◆ Guaranteed 2~5kV ESD resistance!

(EIAJ4701-1 Human Body Model)

■ Conventional chip resistors (MCR series) vs. Anti-surge chip resistors (ESR series)



Significant improvement in endurance surge characteristics



	ESR01	ESR03/10/18	ESR25
DCV(Applied voltage)	2kV	3kV	5kV
Applied cycle	±5 times	±10 times	±10 times
C(Capacitor)	100pF	100pF	100pF
R1(Discharge resistance)	1.5kΩ	1.5kΩ	1.5kΩ

Surge-resistance is much improved by longer conducting distance and resistance pattern to avoid concentration of voltage burden.

◆ Specification

Type	Size Mm(inch)	Rated power (W)	Limiting element voltage (V)	Resistance tolerance	Resistance (Ω)	Temperature coefficient (ppm/°C)	Operating temperature range
ESR01	1005	0.2W	50	J (±5%) F (±1%)	10 to 1M	J:±200 F:±100	-55 to +155°C
ESR03	1608	0.25W	150	J (±5%) F (±1%) D (±0.5%)	J,F:1 to 10M D:10 to 1M	J:±200 F:±100 D:±100	
ESR10	2012	0.4W	150				
ESR18	3216	0.33W	200				
ESR25	3225	0.5W	200				

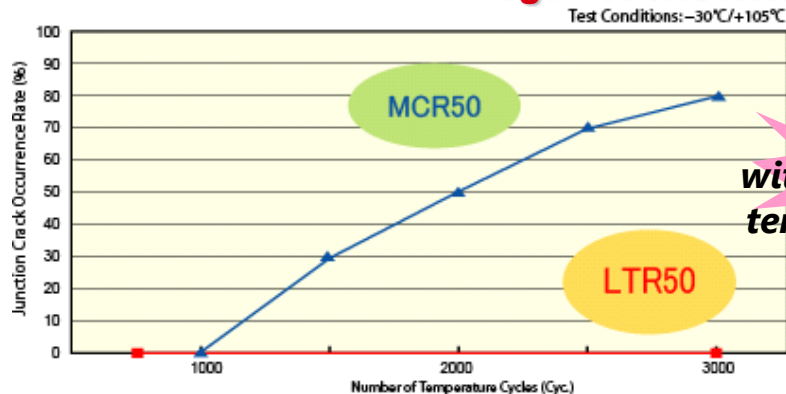
◆ Superior rated power!

mm(inch)	ESR series	MCR series
1005	0.2W	0.063W
1608	0.25W	0.1W
2012	0.4W	0.125W
3216	0.33W	0.25W
3225	0.5W	0.25W
5025	—	0.5W

Improvement of surge-resistance enables to displace smaller size of resistors, and it contributes space savings in your set.



◆ Superior connection reliability against thermal cycling



**0 crack
with the wide
terminal type**

Arranging the electrode in length side shortens the interelectrode distance, and it improves joint reliability to the temperature cycle tremendously.

◆ Specification

Guaranteed anti-surge characteristic in all series!

Part No.	Size mm (inch)	Rated power	Resistance tolerance	Resistance (Ω)	Temperature coefficient (ppm/°C)	Operating temperature range
LTR10	2012 (0805)	0.25W	J (±5%) F (±1%) D (±0.5%)	1~1M (D: 10~1M)	J: ±200 F,D: ±100	-55~155°C
LTR18	3216 (1206)	0.5W 0.75W*		1~1M (D: 10~130K)		
LTR50	5025 (2010)	1W		1~20k (D: 10~20k)		
LTR100	6432 (2512)	2W				

*: Please ask separately us about 0.75W

◆ Superior rated power!

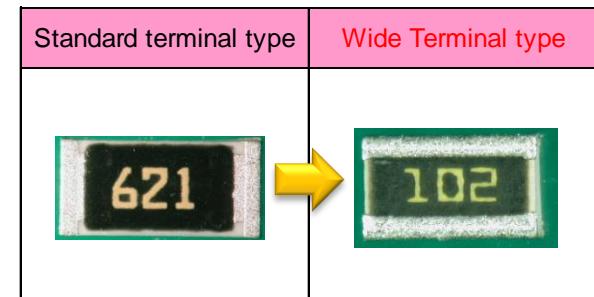
Part No. mm (inch)	LTR Series	MCR Series
2012 (0805)	0.25W	0.125W
3216 (1206)	0.5W	0.25W
5025 (2012)	1W	0.5W
6432 (2512)	2W	1W

Improvement of rated power enables to displace smaller size of resistors, and it contributes space savings in your set.

◆ Applications

Automotive systems: requiring high temperature cycling strength and surge resistance characteristics.

◆ Appearance



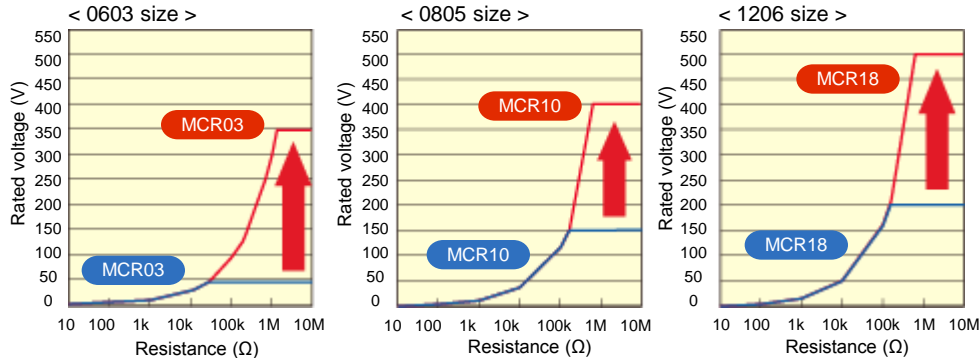
* The products are under development thus the specification might change without notifications

High Voltage Resistance Chip Resistors KTR series

33

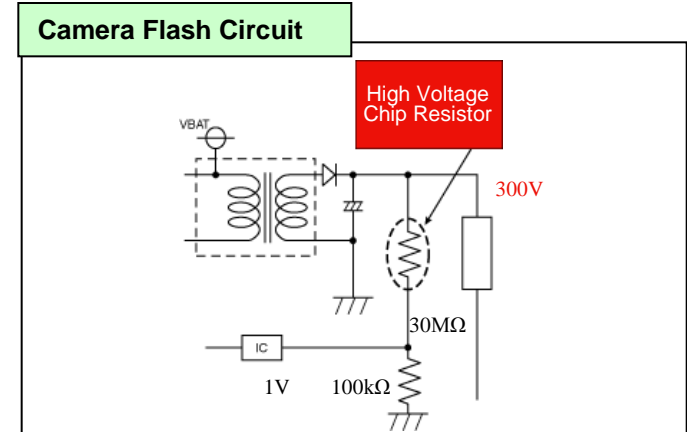
◆ Feature

■ Rated voltage comparison (KTR series VS. MCR series)



ROHM's unique resistance pattern and trimming design prevent concentration of the voltage burden, resulting in more than twice voltage resistance of our own standard conventional parts(MCR series).

◆ Application Circuit Example

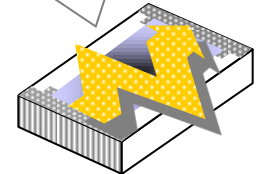


The KTR series reduces the number of resistors required in high-voltage applications.

◆ Specification

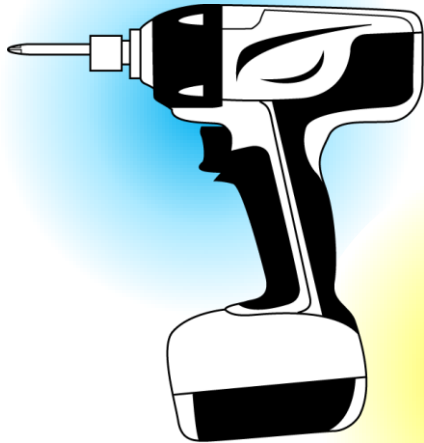
Part No.	Size mm (inch)	Rated power	Limiting element voltage	Resistance tolerance	Resistance(Ω)	Temperature coefficient (ppm/°C)	Operating temperature range
KTR03	1608 (0603)	0.1W	350V	J (±5%) F (±1%)	1 ~ 10M	J : ±200 F : ±100	-55~+155°C
KTR10	2012 (0805)	0.125W	400V				
KTR18	3216 (1206)	0.25W	500V				
KTR25	3225 (1210)	0.33W	600V				

The unique pattern
Maximizes the conducting
distance, preventing voltage
load concentration



Tantalium Capacitor

Feature



Torque control
16~25V
10~22μF

Near driver IC
16~25V
22~47μF

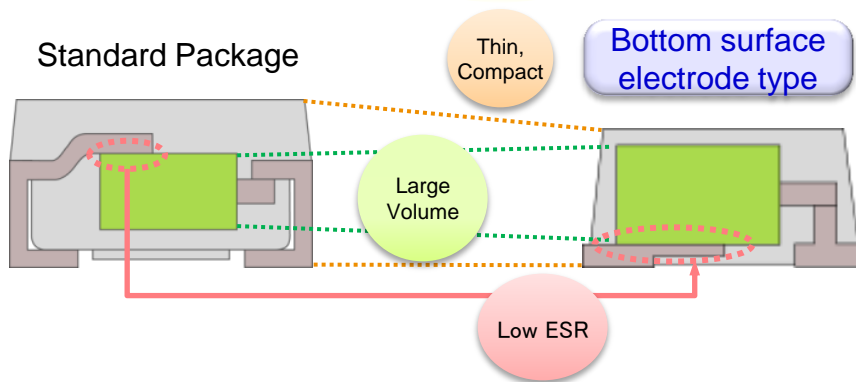
The afterglow
16~25V
10~22μF

AC tool
10~25V
100~220μF

Package \ Chip	Tantalum Capacitor	Conductive Polymer Capacitor
New Bottom surface electrode type 	TCS series M case 1608(0603) ~ 100μF P case 2012(0805) ~ 330μF High efficient PKG High capacitance volume Low ESR ◇ For portable application	TCSO series M case 1608(0603) ~ 47μF P case 2012(0805) ~ 100μF PL case 2012(0805) ~ 68μF High efficient PKG Non Flammable High capacitance polymer Low ESR ◇ For portable application
Bottom surface electrode type 	TCT series 1005(0402)~3216(1206) Smaller and low profile High capacitance volume Low ESR ◇ For portable application	TCTO series 1005(0402)~3528(1411) Smaller and low profile Non Flammable High capacitance volume Low ESR ◇ For DSC/DVC, PC/PC peripherals
Standard type 	TC series 2012(0805) and 3216(1206) Small ◇ For General electric device	TCO series 3528(1411) Smaller and low profile Non Flammable Low ESR ◇ For DSC/DVC, PC/PC peripherals
Fail-safe Open structure type 	TCFG series 3528(1411) Non Flammable ◇ For Automotive and Industry device	This small and low profile products have an extensive lineup!

Internal structure

Standard Package



Thin, Compact

Large Volume

The new structure “Bottom Surface Electrode” was realized both large capacity and miniaturization.

Low ESR

Increasing the contact area between the frame and Ta chip results in lower ESR