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SANYO

Pico Series

'04-07

SANYO

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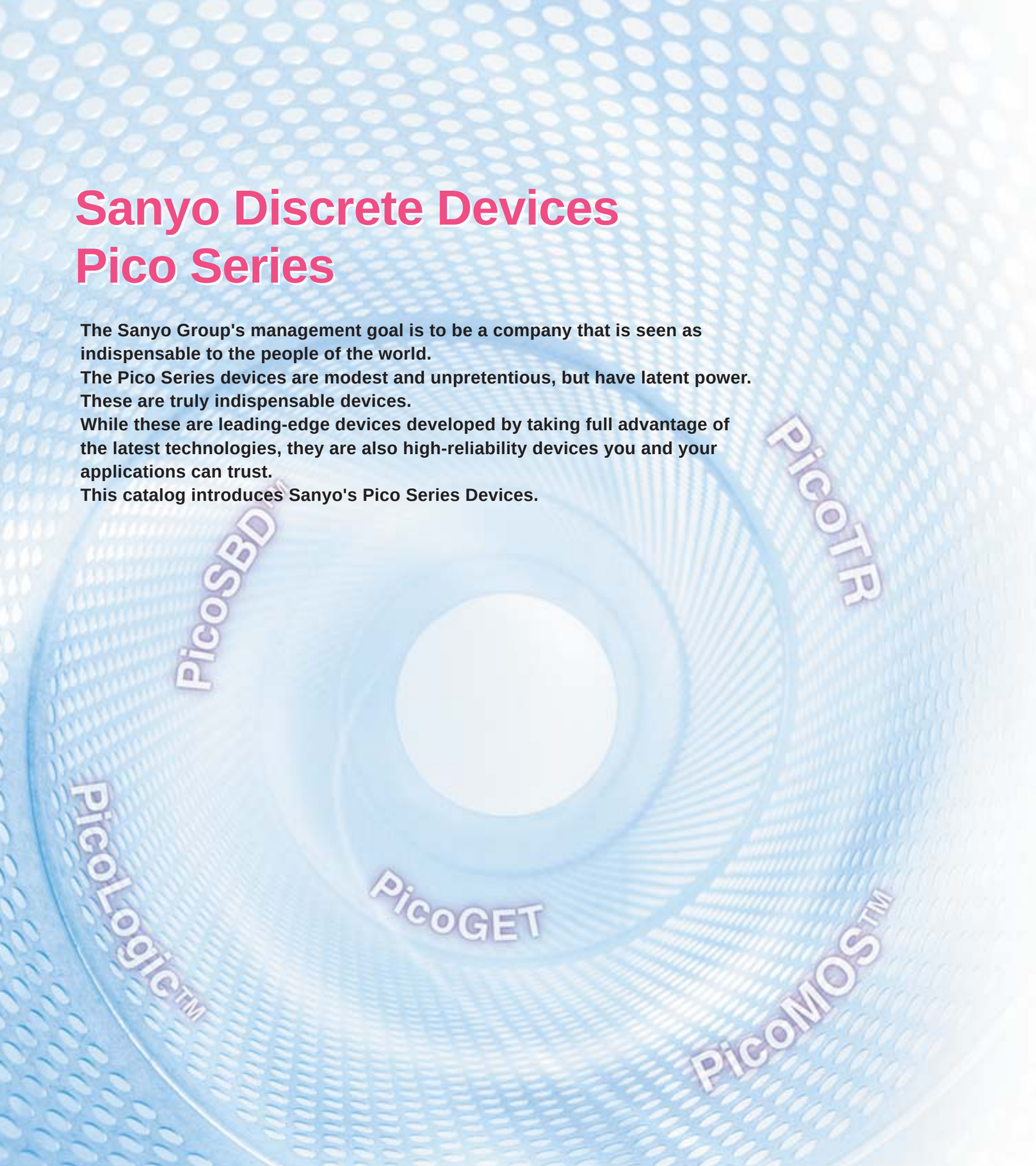
Sanyo Discrete Devices
Pico Series

The Sanyo Group's management goal is to be a company that is seen as indispensable to the people of the world.
The Pico Series devices are modest and unpretentious, but have latent power. These are truly indispensable devices.
While these are leading-edge devices developed by taking full advantage of the latest technologies, they are also high-reliability devices you and your applications can trust.
This catalog introduces Sanyo's Pico Series Devices.



Contents

PicoTR

Powerful in compact package Transistor

PicoTR Series Low Saturation Voltage Transistors

PicoTR Overview

Miniature and attractive transistors with collector current rating up to I_C = 1A for use in portable equipment.

PicoTR Features

- The industry's lowest saturation voltage (Saturation voltages reduced by 50% from earlier products)
- Substantial miniaturization as compared to earlier products (Mounting areas reduced by as much as 60%)
- MBIT-Ⅱ structure (02 type devices)
- Large current capacities
- Low collector-emitter saturation voltage
- Fast switching speeds
- High DC current gain (h_{FE})
- Powerful support for end product miniaturization (wide selection of packages)

Sanyo provides two types of devices in the PicoTR Series to support a wide range of applications.

01 Type

Devices optimal for applications that require higher collector currents (I_C) than general-purpose transistors, that is, applications such as low-current load switching and MOSFET gate drive.
These products, such as the 12A01SS (12 V, 0.5 A, PNP, SSFP package) and 15C01SS (12 V, 0.6 A, SSFP package), include 20 types of devices with voltage ratings (V_{CEO}) of 12 and 30 V, current ratings (I_C) from 0.3 to 0.7 A, both PNP and NPN polarities, and a wide range of package types.

02 Type

Devices optimal for remote control LED drive switching and other miniature switching applications.
These products, such as the 12A02SS (12 V, 0.8 A, PNP, SSFP package) and the 15C02SS (12 V, 0.8 A, SSFP package), include 30 types of devices with voltage ratings (V_{CEO}) of 12, 30, and 50 V, current ratings (I_C) from 0.4 to 1.0 A, both PNP and NPN polarities, and a wide range of package types. The various devices are available in SSFP, SMCP (SC-75A), MCPH (SC-88), CPH (SC-93), and SPA (TO-18) packages.

PicoTR Applications

- Power management block switches in portable equipment
- Miniature DC-DC converters
- Small-scale motor drivers
- MOSFET gate drivers
- Muting circuits in remote controls and audio equipments
- White LED drivers
- Best suited for other portable electronic equipments

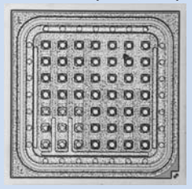
Technology

MBIT-Ⅱ Structure

The MBIT-Ⅱ (Multi-Base Island Transistor Ⅱ) structure features a cell density increased by a factor of 2.2 over the earlier MBIT structure by the use of finer design rules and fabrication, and achieves an even current distribution by its optimized cell layout, optimized diffusion profile, and adoption of the two-layer electrode FBET (Folded Back Electrode Transistor) structure that allows a more efficient and even use of the chip area. Compared to Sanyo's earlier MBIT structure, the MBIT-Ⅱ structure reduces the collector-emitter saturation voltage by 50 to 70% and achieves faster switching times, in particular, the fall time has been reduced by 40%.

Earlier MBIT vs. MBIT-Ⅱ

Earlier MBIT
2SB1396 (10V, 3A)



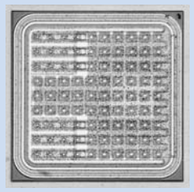
65K cell / inch²

V_{CE}(sat)	220mV
S/W time(t_f)	18ns
Mounting area	19.1mm²

Cell density: doubled

Materials and profile optimized

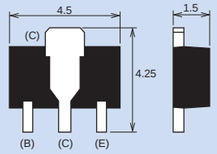
MBIT-Ⅱ
CPH3106 (12V, 3A), MCH3106 (12V, 3A)



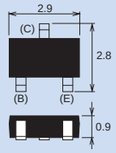
114K cell / inch²

V_{CE}(sat)	110mV
S/W time(t_f)	12ns
Mounting area CPH package / MCPH package	8.1mm² / 4.2mm²

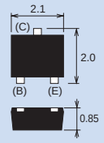
PCP package (SC-62)



CPH package



MCPH package



PicoTR

PicoTR Series Device Naming Conventions

12 A 01 SP

- Package SP: SPA
- Type No. 01: low current, 02: high current
- Polarity A: PNP, C: NPN
- Breakdown voltage: 12 V

Package types

SP	: SPA
CH	: CPH
C	: CP
MH	: MCPH
M	: MCP
S	: SMCP
SS	: SSFP

PicoTR Series Quick Overview

polarity	Absolute Maximum Ratings			SPA	CPH3	CP	MCPH3	MCP	SMCP	SSFP
	V_{CBO} (V)	V_{CEO} (V)	I_C (mA)							
NPN	15	8	800							08C02SS
PNP	15	12	500	12A01SP		12A01C		12A01M	12A01S	12A01SS
			800						12A02S	12A02SS
			1000	12A02SP	12A02CH		12A02MH			
NPN	20	15	600						15C01S	15C01SS
			700	15C01SP		15C01C		15C01M		
			800						15C02S	15C02SS
			1000	15C02SP	15C02CH		15C02MH			
PNP	15	30	300	30A01SP		30A01C		30A01M	30A01S	30A01SS
			600						30A02S	30A02SS
			700	30A02SP	30A02CH		30A02MH			
NPN	20		400	30C01SP		30C01C		30C01M	30C01S	30C01SS
			600						30C02S	30C02SS
			700	30C02SP	30C02CH		30C02MH			
PNP	50	50	400						50A02S	50A02SS
			500	50A02SP	50A02CH		50A02MH			
NPN	60		400						50C02S	50C02SS
			500	50C02SP	50C02CH		50C02MH			

PicoTR Series Lineup

PNP Series

Type No.	Package	Absolute Maximum Ratings V_{CBO} (V)	V_{CEO} (V)	I_C (mA)	P_C (mW)	I_{CP} (A)	V_{CE} (V)	I_C (mA)	hFE	V_{CE}(sat) I_C (mA)	I_B (mA)	typ (mV)
12A01SS	SSFP	15	12	500	200❖	1.0	2	10	300 to 700	200	10	150
12A02SS	SSFP			800		1.2				400	20	120
12A01S	SMCP			500		0.6				200	10	150
12A02S	SMCP			800		1.6				400	20	120
12A01M	MCP			500	300❖❖	1.0				200	10	150
12A02MH	MCPH3			1000	600❖❖	2.0				400	20	120
12A01C	CP			500	300❖	1.0				200	10	150
12A02CH	CPH3			1000	700❖❖	2.0				400	20	120
12A01SP	SPA			500	400	1.0				200	10	150
12A02SP	SPA			1000		2.0				400	20	120
30A01SS	SSFP	30	30	300	200❖	0.6	2	10	200 to 500	100	5	110
30A02SS	SSFP			600		1.2				200	10	
30A01S	SMCP			300		0.6				100	5	
30A02S	SMCP			600		1.2				200	10	
30A01M	MCP			300	300❖	0.6				100	5	
30A02MH	MCPH3			700	600❖❖	1.4				200	10	
30A01C	CP			300	300❖	0.6				100	5	
30A02CH	CPH3			700	700❖❖	1.4				200	10	
30A01SP	SPA			300	400	0.6				100	5	
30A02SP	SPA			700		1.4				200	10	
50A02SS	SSFP	50	50	400	200❖	0.8	2	10	200 to 500			
50A02S	SMCP			400	200❖	0.8						
50A02MH	MCPH3			500	600❖❖	1.0				100	10	70
50A02CH	CPH3			500	700❖❖	1.0						
50A02SP	SPA			500	400	1.0						

❖When mounted on a glass-epoxy PCB (600 mm^2× 1.6 mm) ❖❖ When mounted on a ceramic PCB (600 mm^2× 0.8 mm) *The sign is omitted for PNP devices.

NPN Series

Type No.	Package	Absolute Maximum Ratings V_{CBO} (V)	V_{CEO} (V)	I_C (mA)	P_C (mW)	I_{CP} (A)	V_{CE} (V)	I_C (mA)	hFE	V_{CE}(sat) I_C (mA)	I_B (mA)	typ (mV)
08C02SS	SSFP	15	8	800	200❖	1.6	2	50	300 to 800	400	20	110
15C01SS	SSFP	20	15	600		1.2		10		200	10	150
15C02SS	SSFP			800		1.6		50		400	20	
15C01S	SMCP			600		1.2		10		200	10	
15C02S	SMCP			800		1.6		50		400	20	
15C01M	MCP			700	300❖	1.4		10		200	10	
15C02MH	MCPH3			1000	600❖❖	2.0		50		400	20	
15C01C	CP			700	300❖	1.4		10		200	10	
15C02CH	CPH3			1000	700❖❖	2.0		50		400	20	
15C01SP	SPA			700	400	1.4		10		200	10	
15C02SP	SPA			1000		2.0		50		400	20	
30C01SS	SSFP	40	30	400	200❖	0.8	2	10	300 to 800	100	5	100
30C02SS	SSFP			600		1.2		50		200	10	85
30C01S	SMCP			400		0.8		10		100	5	100
30C02S	SMCP			600		1.2		50		200	10	85
30C01M	MCP			400	300❖	0.8		10		100	5	100
30C02MH	MCPH3			700	600❖❖	1.4		50		200	10	85
30C01C	CP			400	300❖	0.8		10		100	5	100
30C02CH	CPH3			700	700❖❖	1.4		50		200	10	85
30C01SP	SPA			400	400	0.8		10		100	5	100
30C02SP	SPA			700		1.4		50		200	10	85
50C02SS	SSFP	60	50	400	200❖	0.8	2	10	300 to 800			
50C02S	SMCP			400	200❖	0.8						
50C02MH	MCPH3			500	600❖❖	1.0				100	10	60
50C02CH	CPH3			500	700❖❖	1.0						
50C02SP	SPA			500	400	1.0						

❖When mounted on a glass-epoxy PCB (600 mm^2× 1.6 mm) ❖❖ When mounted on a ceramic PCB (600 mm^2× 0.8 mm) *The sign is omitted for PNP devices.

PicoMOS™

Precise interface control MOSFET

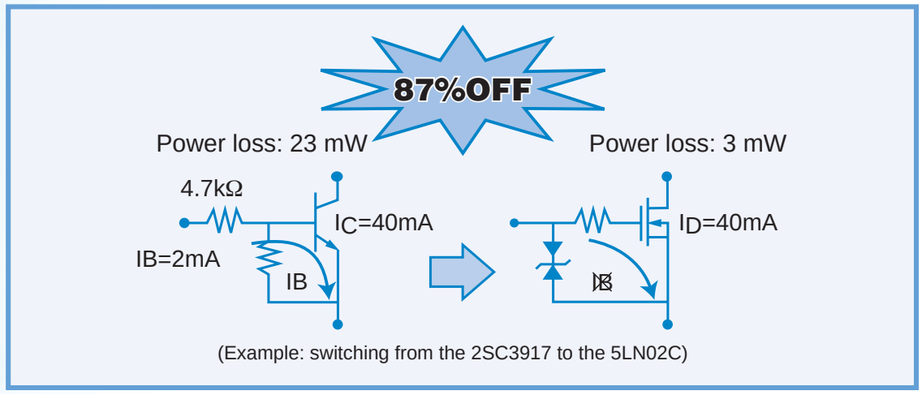
Ultralow ON Resistance MOSFET PicoMOS™ Series

PicoMOS™ Overview

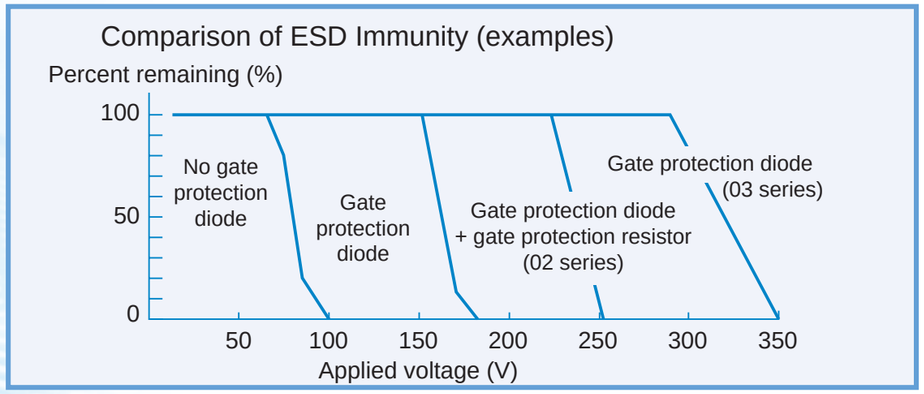
These are low-power high-performance switching devices that provide full support for small-signal interfaces in portable equipment.

PicoMOS™ Features

- Lower power consumption (no drive current required)
- Low-voltage drive (2.5 V drive) and high-speed (4 V drive) devices
- Built-in gate protection diode for improved resistance to ESD
- Powerful support for end product miniaturization (extensive package lineup)
- Since no drive current is required, these devices support reduced power consumption designs. For transistors, designs must take the base current at maximum load into account. Use these devices when efficiency and current drain are critical.

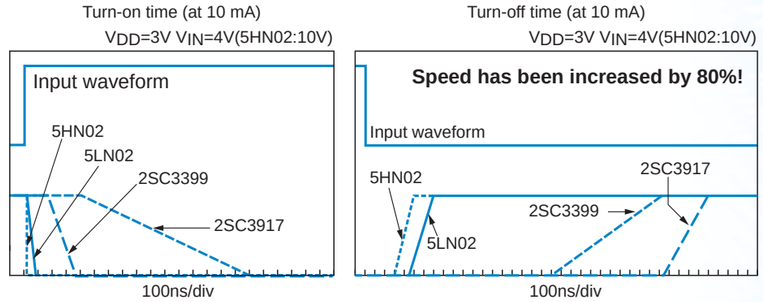


(Example: switching from the 2SC3917 to the 5LN02C)



■Switching characteristics comparison with bipolar transistors with a built-in resistor (N-channel and P-channel)

The PicoMOS™ series devices exhibit almost none of the carrier storage time that is characteristic of bipolar transistors, and thus achieve high-speed switching characteristics.

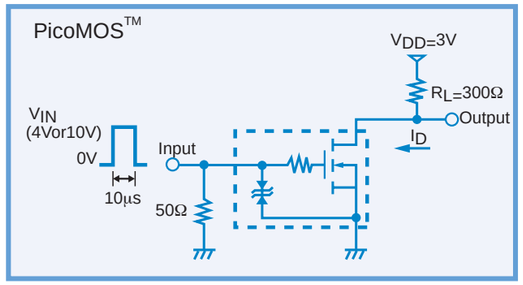


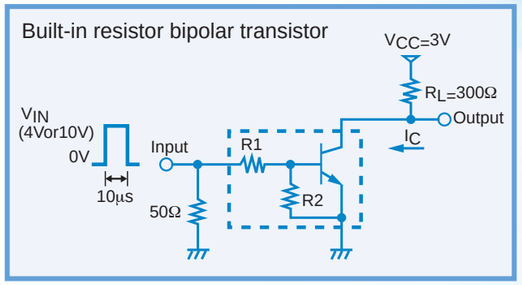
2SC3399 I_C=100mA, R1=R2=47kΩ
2SC3917 I_C=500mA, R1=R2=4.7kΩ

5LN02 : I_D=100mA, V_{GS}= 2.5 V drive
5HN02 : I_D=100mA, V_{GS}= 4 V drive

Test Circuits

***V_{DD}=3V Duty≤1% tr, tf<5ns Z_{out}=50Ω Ta=25°C**





PicoMOS™ Series Naming Conventions

3 L P 01 SS

- Package SS : SSFP
- Type No. 01 to 99
- Polarity P: P-channel, N: N-channel
- L: 2.5 V drive, H: 4.0 V drive
- Breakdown voltage 3: 30 V, 5: 50 V

Package types

SS	: SSFP
S	: SMCP
M	: MCP
C	: CP
SP	: SPA
N	: NP

ECSP package devices

EC 4 3 01 C

- Package type C: ECSP 1008
- Sequence number. 01 to 99
- Type No. 3 : Pch MOSFET 4 : Nch MOSFET
- Number of leads
- E: Environmentally-considered, C: CSP (chip size package)

PicoMOS™

PicoMOS™ Quick Overview

Sanyo also provides the following complex Pch+Nch type products:
MCH6613, MCH6614, MCH6615, and MCH6618. (See page 10.)

Pch Series

V_{DSS}	I_D	V_{GSS}	Drive voltage	R_{DS}(on) V_{GS}=1.5V	R_{DS}(on) V_{GS}=2.5V	R_{DS}(on) V_{GS}=4.0V	R_{DS}(on) V_{GS}=10V		SSFP	SMCP	MCP	CP	SPA	NP	MCPH6*	ECSP1008
30V	100mA	±10V	2.5V	27Ω	11Ω	8Ω	—	3LP01	3LP01SS	3LP01S	3LP01M	3LP01C	3LP01SP	3LP01N	MCH6601	EC4301C
	200mA			10Ω	3.5Ω	2.4Ω	—	3LP02	—	—	3LP02M	3LP02C	3LP02SP	3LP02N	MCH6607	—
	250mA			8.0Ω	2.8Ω	1.9Ω	—	3LP03	3LP03SS	3LP03S	3LP03M	★3LP03C	—	—	MCH6629	EC4304C
50V	70mA			30Ω	20Ω	18Ω	—	5LP01	5LP01SS	5LP01S	5LP01M	5LP01C	5LP01SP	5LP01N	MCH6603	EC4302C
	140mA			10Ω	6.0Ω	5.1Ω	—	5LP02	—	—	5LP02M	5LP02C	5LP02SP	5LP02N	MCH6609	—
	70mA	±20V	4.0V	—	—	23Ω	17Ω	5HP01	5HP01SS	5HP01S	5HP01M	5HP01C	5HP01SP	5HP01N	MCH6605	EC4303C
	140mA			—	—	6.5Ω	4.7Ω	5HP02	—	—	5HP02M	5HP02C	5HP02SP	5HP02N	MCH6611	—

★:Under development *:Complex type device

Nch Series

V_{DSS}	I_D	V_{GSS}	Drive voltage	R_{DS}(on) V_{GS}=1.5V	R_{DS}(on) V_{GS}=2.5V	R_{DS}(on) V_{GS}=4.0V	R_{DS}(on) V_{GS}=10V		SSFP	SMCP	MCP	CP	SPA	NP	MCPH6*	ECSP1008
30V	150mA	±10V	2.5V	6.4Ω	3.7Ω	2.9Ω	—	3LN01	3LN01SS	3LN01S	3LN01M	3LN01C	3LN01SP	3LN01N	MCH6602	EC4401
	300mA			2.6Ω	1.2Ω	0.9Ω	—	3LN02	—	—	3LN02M	3LN02C	3LN02SP	3LN02N	MCH6608	—
	350mA			2.4Ω	1.15Ω	0.9Ω	—	3LN03	3LN03SS	3LN03S	3LN03M	★3LN03C	—	—	MCH6630	EC4404C
50V	100mA			10Ω	7.1Ω	6.0Ω	—	5LN01	5LN01SS	5LN01S	5LN01M	5LN01C	5LN01SP	5LN01N	MCH6604	EC4402C
	200mA			3.2Ω	2.2Ω	1.9Ω	—	5LN02	—	—	5LN02M	5LN02C	5LN02SP	5LN02N	MCH6610	—
	100mA	±20V	4.0V	—	—	7.5Ω	5.8Ω	5HN01	5HN01SS	5HN01S	5HN01M	5HN01C	5HN01SP	5HN01N	MCH6606	EC4403C
	200mA			—	—	2.3Ω	1.8Ω	5HN02	—	—	5HN02M	5HN02C	5HN02SP	5HN02N	MCH6612	—

★:Under development *:Complex type device

PicoMOS™

PicoMOS™ Series Lineup

ECSP® Series Line up (ECSP1008 package)(P_D=150mW)

Type No.	Polarity	V_{DSS} (V)	I_D (mA)	R_{DS}(on) (Ω) V_{GS}=10V typ / max	V_{GS}=4V typ / max	V_{GS}=2.5V typ / max	V_{GS}=1.5V typ / max	Ciss typ (pF)	Qg typ (nc)
EC4301C	Pch	30	100	–	8 / 10.4	11 / 15.4	27 / 54	7.5	1.43
EC4304C			250	–	1.5 / 1.9	2.0 / 2.8	4.0 / 8.0	40	0.8
EC4302C		50	70	–	18 / 23	20 / 28	30 / 60	7.4	1.40
EC4303C			70	17 / 22	23 / 32	–	–	6.2	1.32
EC4401C	Nch	30	150	–	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
EC4404C			350	–	0.7 / 0.9	0.8 / 1.15	1.6 / 2.4	30	1.0
EC4402C		50	100	–	6 / 7.8	7.1 / 9.9	10 / 20	6.6	1.57
EC4403C			100	5.8 / 7.5	7.5 / 10.5	–	–	6.2	1.40

SSFP Series Line up (P_D=150mW)

Type No.	Polarity	V_{DSS} (V)	I_D (mA)	R_{DS}(on) (Ω) V_{GS}=10V typ / max	V_{GS}=4V typ / max	V_{GS}=2.5V typ / max	V_{GS}=1.5V typ / max	Ciss typ (pF)	Qg typ (nc)
3LP01SS	Pch	30	100	–	8 / 10.4	11 / 15.4	27 / 54	7.5	1.43
3LP03SS			250	–	1.5 / 1.9	2 / 2.8	4 / 8	40	0.8
5LP01SS		50	70	–	18 / 23	20 / 28	30 / 60	7.4	1.40
5HP01SS			70	17 / 22	23 / 32	–	–	6.2	1.32
3LN01SS	Nch	30	150	–	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
3LN03SS			350	–	0.7 / 0.9	0.8 / 1.15	1.6 / 2.4	30	1.0
5LN01SS		50	100	–	6 / 7.8	7.1 / 9.9	10 / 20	6.6	1.57
5HN01SS			100	5.8 / 7.5	7.5 / 10.5	–	–	6.2	1.40

SMCP Series Line up (P_D=150mW)

Type No.	Polarity	V_{DSS} (V)	I_D (mA)	R_{DS}(on) (Ω) V_{GS}=10V typ / max	V_{GS}=4V typ / max	V_{GS}=2.5V typ / max	V_{GS}=1.5V typ / max	Ciss typ (pF)	Qg typ (nc)
3LP01S	Pch	30	100	–	8 / 10.4	11 / 15.4	27 / 54	7.5	1.43
3LP03S			250	–	1.5 / 1.9	2 / 2.8	4 / 8	40	0.8
5LP01S		50	70	–	18 / 23	20 / 28	30 / 60	7.4	1.40
5HP01S			70	17 / 22	23 / 32	–	–	6.2	1.32
3LN01S	Nch	30	150	–	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
3LN03S			350	–	0.7 / 0.9	0.8 / 1.15	1.6 / 2.4	30	1.0
5LN01S		50	100	–	6 / 7.8	7.1 / 9.9	10 / 20	6.6	1.57
5HN01S			100	5.8 / 7.5	7.5 / 10.5	–	–	6.2	1.40

MCP(SC-70) Series Line up (P_D=150mW)

Type No.	Polarity	V_{DSS} (V)	I_D (mA)	R_{DS}(on) (Ω) V_{GS}=10V typ / max	V_{GS}=4V typ / max	V_{GS}=2.5V typ / max	V_{GS}=1.5V typ / max	Ciss typ (pF)	Qg typ (nc)
3LP01M	Pch	30	100	–	8 / 10.4	11 / 15.4	27 / 54	7.5	1.43
3LP02M			200	–	2.4 / 3.1	3.5 / 4.9	10 / 20	28	2.0
3LP03M			250	–	1.5 / 1.9	2 / 2.8	4 / 8	40	0.8
5LP01M		50	70	–	18 / 23	20 / 28	30 / 60	7.4	1.40
5LP02M			140	–	5.1 / 6.6	6 / 8.4	10 / 20	28	1.98
5HP01M			70	17 / 22	23 / 32	–	–	6.2	1.32
5HP02M			140	4.7 / 6.1	6.5 / 9.1	–	–	23	1.68
3LN01M	Nch	30	150	–	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
3LN02M			300	–	0.9 / 1.2	1.2 / 1.7	2.6 / 5.2	30	2.34
3LN03M			350	–	0.7 / 0.9	0.8 / 1.15	1.6 / 2.4	30	1.0
5LN01M		50	100	–	6 / 7.8	7.1 / 9.9	10 / 20	6.6	1.57
5LN02M			200	–	1.9 / 2.4	2.2 / 3	3.2 / 6.4	25	2.18
5HN01M			100	5.8 / 7.5	7.5 / 10.5	–	–	6.2	1.40
5HN02M			200	1.8 / 2.3	2.3 / 3.2	–	–	22	1.85

MCPH6 Series Line up (P_D=800mW)

Type No.	Polarity	V_{DSS} (V)	I_D (mA)	R_{DS}(on) (Ω) V_{GS}=4V typ / max	V_{GS}=2.5V typ / max	V_{GS}=1.5V typ / max	Ciss typ (pF)	Qg typ (nc)
MCH6601	Pch×2	30	200	8 / 10.4	11 / 15.4	27 / 54	7.5	1.43
MCH6607			400	2.4 / 3.1	3.5 / 4.9	10 / 20	28	2.0
MCH6603		50	140	18 / 23	20 / 28	30 / 60	7.4	1.40
MCH6609			280	5.1 / 6.6	6 / 8.4	10 / 20	28	1.98
MCH6605			140	23 / 32	♠17 / 22	–	6.2	1.32
MCH6611			280	6.5 / 9.1	♠4.7 / 6.1	–	23	1.68
MCH6602	Nch×2	30	350	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
MCH6608			650	0.9 / 1.2	1.2 / 1.7	2.6 / 5.2	30	2.34
MCH6604		50	250	6 / 7.8	7.1 / 9.9	10 / 20	6.6	1.57
MCH6610			450	1.9 / 2.4	2.2 / 3	3.2 / 6.4	25	2.18
MCH6606			250	7.5 / 10.5	♠5.8 / 7.5	–	6.2	1.40
MCH6612			450	2.3 / 3.2	♠1.8 / 2.3	–	22	1.86
MCH6613	Nch	30	350	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
	Pch		200	8 / 10.4	11 / 15.4	27 / 54	7.5	1.43
MCH6614	Nch		350	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
	Pch		400	2.4 / 3.1	3.5 / 4.9	10 / 20	28	2.0
MCH6615	Nch		650	0.9 / 1.2	1.2 / 1.7	2.6 / 5.2	30	2.34
	Pch		400	2.4 / 3.1	3.5 / 4.9	10 / 20	28	2.0
MCH6616	Nch×2	20	1.6A	180m / 230m	220m / 310m	♥330m / 450m	105	1.4
MCH6617	Pch×2		1A	380m / 500m	540m / 760m	–	115	1.5
MCH6618	Nch	30	350	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
	Pch	50	140	23 / 32	♠17 / 22	–	6.2	1.32
MCH6619	Pch×2	30	1A	720m / 1	♠420m / 550m	–	75	2.6
MCH6629			400	1.5 / 1.9	2.0 / 2.8	4.0 / 8.0	40	0.83
MCH6630			700	0.7 / 0.9	0.8 / 1.15	1.6 / 2.4	30	1.0
MCH6620	Nch×2		1.4A	400m / 560m	♠230m / 300m	–	65	2.5

♠:V_{GS}=10V ♥:V_{GS}=1.8V

CP(SC-59) Series Line up (P_D=250mW)

Type No.	Polarity	V_{DSS} (V)	I_D (mA)	R_{DS}(on) (Ω) V_{GS}=10V typ / max	V_{GS}=4V typ / max	V_{GS}=2.5V typ / max	V_{GS}=1.5V typ / max	Ciss typ (pF)	Qg typ (nc)
3LP01C	Pch	30	100	–	8 / 10.4	11 / 15.4	27 / 54	7.5	1.43
3LP02C			200	–	2.4 / 3.1	3.5 / 4.9	10 / 20	28	2.0
★ 3LP03C			250	–	1.5 / 1.9	2.0 / 2.8	4.0 / 8.0	40	0.8
5LP01C		50	70	–	18 / 23	20 / 28	30 / 60	7.4	1.40
5LP02C			140	–	5.1 / 6.6	6 / 8.4	10 / 20	28	1.98
5HP01C			70	17 / 22	23 / 32	–	–	6.2	1.32
5HP02C			140	4.7 / 6.1	6.5 / 9.1	–	–	23	1.68
3LN01C	Nch	30	150	–	2.9 / 3.7	3.7 / 5.2	6.4 / 12.8	7	1.58
3LN02C			300	–	0.9 / 1.2	1.2 / 1.7	2.6 / 5.2	30	2.34
★ 3LN03C			350	–	0.7 / 0.9	0.8 /1.15	1.6 / 2.4	30	1.0
5LN01C		50	100	–	6 / 7.8	7.1 / 9.9	10 / 20	6.6	1.57
5LN02C			200	–	1.9 / 2.4	2.2 / 3	3.2 / 6.4	25	2.18
5HN01C			100	5.8 / 7.5	7.5 / 10.5	–	–	6.2	1.40
5HN02C			200	1.8 / 2.3	2.3 / 3.2	–	–	22	1.86

★:Under development

*The sign is omitted for P-channel devices.

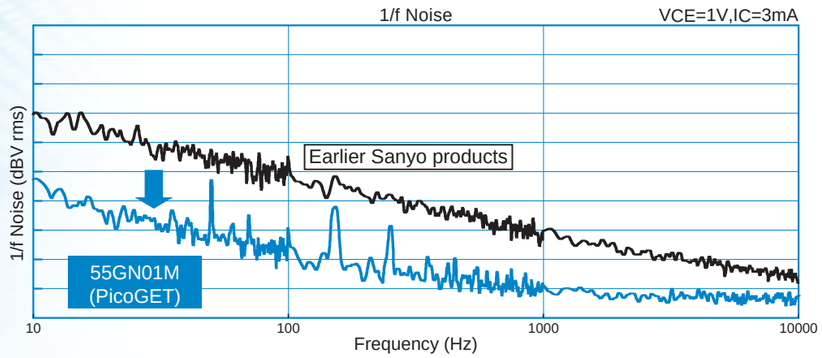
PicoGET

Prominent Chip in COmpact package GHz-band Efficient Transistor

PicoGET Series Miniature High-Frequency Transistors

PicoGET Features

- Appropriate for use in high-frequency bands (100 MHz to 2 GHz)
- Can be used in a wide range of applications, including amplification and switching
- Extensive lineup covering f_T = 1 to 8 GHz, both PNP and NPN types, and low to high current ratings
- Low levels of 1/f noise (Reduced by 5 to 10 dBVrms from earlier products)
- Powerful support for end product miniaturization (extensive package lineup)



PicoGET Applications

- Amplifiers and mixers ... general-purpose amplifiers, low-noise amplifiers, frequency mixers
- Oscillators ... reference oscillators, local oscillators, low phase noise oscillators
- High-frequency switches ... signal switching, transmission control
- Other applications ... impedance conversion (high to low), ESD immunity guarantee, buffers

Finding a PicoGET Device Perfect for Your Application (The most significant device characteristic)

First ...

1. Verify the conditions under which the transistor will be used (frequency, bias conditions V_{CE} / I_C)
2. We recommend using devices in which f_T is 5 to 10 times of the frequency used.

Next ...

3. Check even more precisely the key characteristics that are the key for your application and their specifications.

Amplifiers/mixers	Gain, noise, output power
Oscillators	1/5 noise, oscillator output, phase noise
High-frequency switches	ON resistance (Ron), output capacitance (Cob)
Impedance conversion and other applications	I/O impedance, breakdown voltage, ESD immunity

PicoGET Recommendations by End Product Type

Market / End Product	Application	Frequency band	Type No.				
		fT[GHz]	1.5		2.6	5.5	8
		NPN	15GN01	15GN03		55GN01	80GN01
		PNP			TG6057		
VCR tuners	Switching	600 to 800MHz	●				
Wireless equipment (Transceivers, cordless telephones)	Amplification and mixing	400 to 900MHz				●	●
Optical pickup modules, oscillators	Oscillations	400 to 900MHz				●	●
Digital video and still cameras (CCD and CMOS sensors)	Impedance conversion	200 to 600MHz	●	●	●	●	
Automotive accessories (keyless systems, engine starters)	Amplification and oscillations	200 to 900MHz		●		●	●

PicoGET Series Naming Conventions

55 G N 01 M

- 55: 15: 1.5GHz 55: 5.5GHz 80: 8GHz
- G: PicoGET Series identifier
- N: Polarity N: NPN, P: PNP
- 01: Sequence No. 01 to 99
- M: Package type M : MCP

Package types

F	: SSFP
S	: SMCP
M	: MCP
C	: CP
(CH	: CPH)
N	: NP

PicoGET Series Quick Overview

polarity	fT (GHz)	IC (mA)	VCEO (V)	Ron (Ω)	USE	SSFP (1408)	SMCP (1608)	MCP (2012)	CP (2915)	CPH3 (2916)	NP (5050LEAD)
PNP	2.6	15	30	—	AMP.		★TG6057S	★TG6057M			
NPN	1.5	50	10	2	SW	15GN01F	15GN01S	15GN01M	15GN01C		15GN01N
		70	10	—	AMP.		★15GN03S	★15GN03M			
	5.5	70	10	—	AMP.	55GN01F	55GN01S	55GN01M	55GN01C	★TG6072CH3	55GN01N
	8.0	70	6	—	AMP.		★80GN01S	80GN01M			

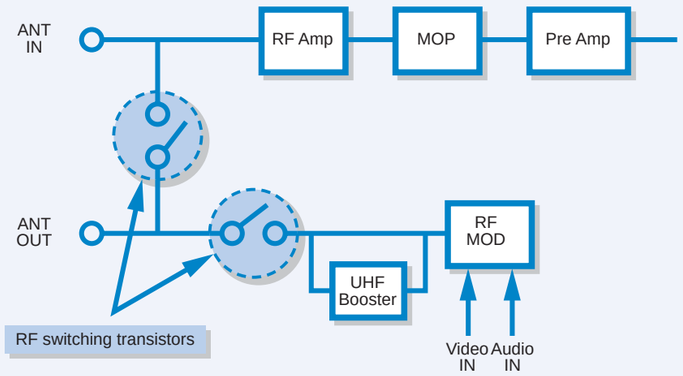
★:Under development

PicoGET

PicoGET Series Lineup

(1) PicoGET Devices used for RF Switch

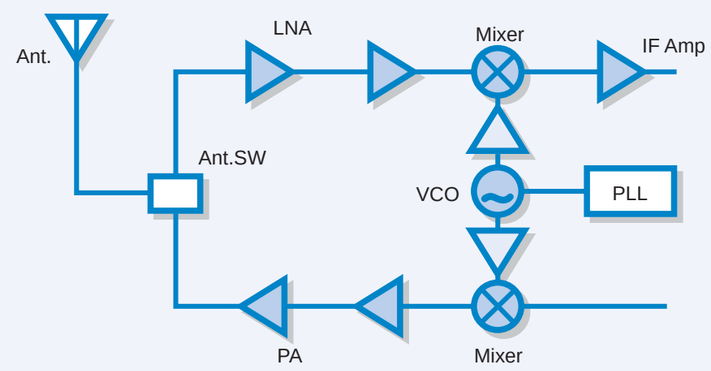
Block Diagram: 3-in-1 VCR Tuner



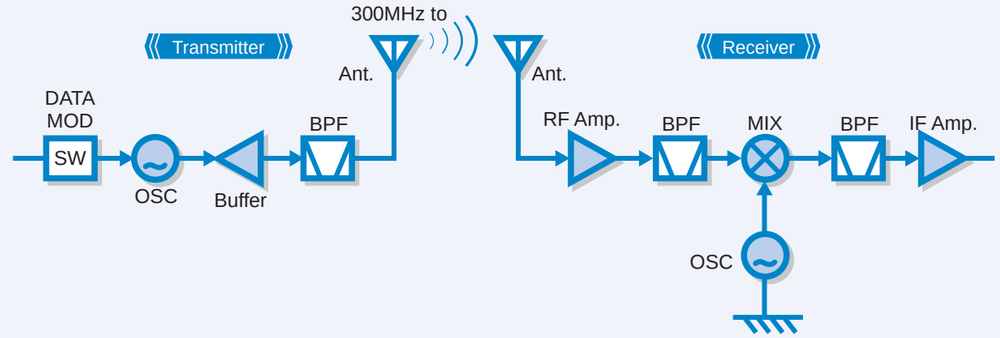
Type No.	Package	Polarity	V_{CBO} (V)	V_{CEO} (V)	I_C (mA)	h_{FE}	f_T (GHz)	Ron (Ω)	Cob (pF)
15GN01F	SSFP	NPN	20	10	50	200 to 400	1.5	2	1.1
15GN01S	SMCP								
15GN01M	MCP								
15GN01C	CP								
15GN01N	NP								

(2) PicoGET Devices used for Amplifier, Oscillator, and Mixer

Block Diagram: Transceiver, Analog Cordless Telephones



Block Diagram: Keyless Entry System (Low-Power Wireless Module)



Type No.	Package	Polarity	V_{CBO} (V)	V_{CEO} (V)	I_C (mA)	h_{FE}	f_T (GHz)	Ron (Ω)	Cob (pF)
15GN01F	SSFP	NPN	20	10	50	200 to 400	1.5	2	1.1
15GN01S	SMCP								
15GN01M	MCP								
15GN01C	CP								
15GN01N	NP								

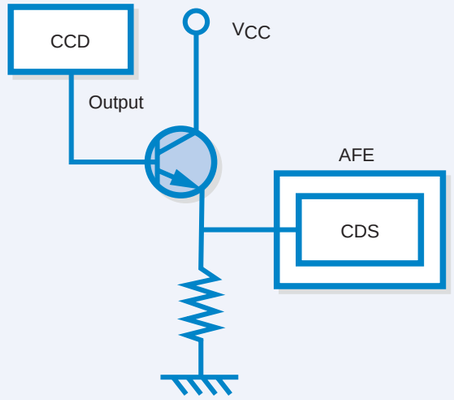
Type No.	Package	Polarity	V_{CBO} (V)	V_{CEO} (V)	I_C (mA)	h_{FE}	f_T (GHz)	$\|S21e\|^2$ (dB)	NF (dB)
15GN03S	SMCP	NPN	20	10	70	100 to 180	1.5	13	2.5
15GN03M	MCP								
55GN01F	SSFP	NPN	20	10	70	100 to 160	5.5	10	1.9
55GN01S	SMCP								
55GN01M	MCP					100 to 180			
55GN01C	CP								
55GN01N	NP						7.0		
80GN01S	SMCP	NPN	10	5	80	100 to 180	8.0	11.5	1.25
80GN01M	MCP								
★TG6057S	SMCP	PNP	30	30	15	20 to 150	2.6	14.5	1.6
★TG6057M	MCP								

★:Under development, *: The sign is omitted for PNP devices.

PicoGET

(3) Impedance Conversion (buffers)

Block Diagram: CCD Output Block



*: AFE (Analog front end)
Analog signal-processing circuit that accepts the analog signal from the CCD and converts it to digital signal.
*: CDS (Correlated double sampling)
Circuit that performs correlated double sampling to remove the CCD reset noise.

Type No.	Package	Polarity	V_{CBO} (V)	V_{CEO} (V)	I_C (mA)	h_{FE}	f_T (GHz)	Ron (Ω)	Cob (pF)
15GN01F	SSFP	NPN	20	10	50	200 to 400	1.5	2	1.1
15GN01S	SMCP								
15GN01M	MCP								
15GN01C	CP								
15GN01N	NP								

PicoSBD™

Powerful in compact package SBD

Low-Voltage Miniature Schottky Barrier Diodes PicoSBD™ Series

PicoSBD™ Features

- Miniature high-performance devices that achieve the industry's lowest forward voltage (V_F)
- Low leakage performance despite achieving low forward voltage characteristics
- Wide selection of package types: ECSP, SMCP, MCPH, CPH, and CP

PicoSBD™ Series Quick Overview

Absolute Maximum Ratings		Type	SSFP	MCPH3	MCPH5	SCH6	ECSP 1006-2	ECSP 1608-4
V_{RRM} (V)	I_O (A)							
15	0.15	Low VF	SBS011					
	0.5					SS05015SH		
	0.5			SS05015M				
	1.0			SS10015M				
	1.0				SBS808M♣			
	2.0			SBS010M				
30	0.07	Low IR					EC2D01B	
	0.2							SB0203EJ
	0.5							SB0503EJ
	0.1	Low VF					EC2D02B	
	0.2							SS0203EJ
	0.5							SS0503EJ
	0.5					SS0503SH		

♣:Two devices in parallel

PicoSBD™ Series Lineup

Type No.	Package	V_{RRM} (V)	I_O (A)	I_{FSM} (A)	I_F (A)	V_F1 max (V)	I_F (A)	V_F2 max (V)	V_R (V)	I_R max (μA)	t_{rr} max (ns)
SBS011	SSFP	15	0.15	3	0.1	0.35	0.15	0.4	6	45	10
SBS010M	MCPH3	5	2	10	0.5	0.32	1	0.35	6	600	15
SS10015M	MCPH3	15	1	10	0.3	0.32	0.5	0.35	6	90	10
SS05015M	MCPH3	15	0.5	5	0.3	0.4	0.5	0.45	6	90	10
SBS808M	MCPH5	15	1	10	0.5	0.35	1.0	0.43	6	90	10
SS05015SH	SCH6	15	0.5	5	0.3	0.4	0.5	0.45	6	90	10
EC2D01B	ECSP1006-2	30	0.07	2	0.07	0.65	–	–	15	5	10
EC2D02B	ECSP1006-2	30	0.1	2	0.05	0.4	0.1	0.48	15	100	10
SB0203EJ	ECSP1608-4	30	0.2	2	0.2	0.55	–	–	15	5	10
SS0203EJ	ECSP1608-4	30	0.2	2	0.2	0.45	–	–	15	200	10
SB0503EJ	ECSP1608-4	30	0.5	5	0.5	0.55	–	–	15	15	10
SS0503EJ	ECSP1608-4	30	0.5	5	0.5	0.45	–	–	15	360	10
SS0503SH	SCH6	30	0.5	5	0.3	0.42	0.50	0.47	15	120	10

PicoLogic™

Precise Interface COntrol Logic

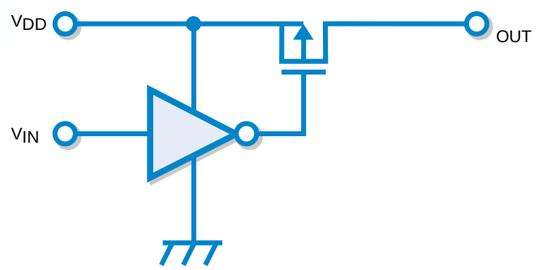
Wide Operating Voltage Range General-Purpose Logic ICs PicoLogic™ Series

PicoLogic™ Features

- A single high breakdown voltage logic circuit is built in a miniature package
- In addition to six general-purpose logic circuits, the lineup also includes four line switching circuits for a total of 10 types of devices.
- Supports end product miniaturization in a wide range of applications.
- High breakdown voltage: these devices achieve 25 V high breakdown voltage operation for the first time in the industry! Thus they can be used without concern for the end product's supply voltage.
- Miniaturization: these products include a single logic circuit in a compact MCPH5 package, and can contribute to board space reduction.

Open-Drain Usage Example

Optimal for use as a power supply line switch between the power supply line and the ground line.



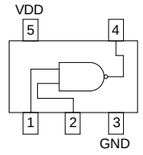
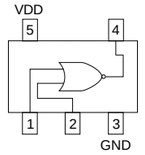
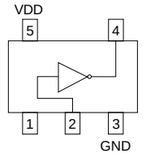
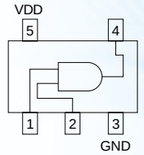
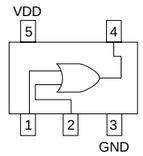
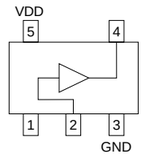
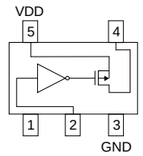
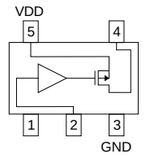
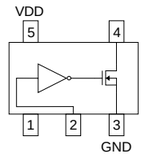
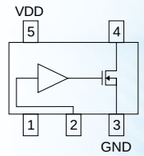
PicoLogic™ Series Naming Conventions

4A 0 04 MH5

- Package MH5 : MCPH5
- Type No. 0: Conforms to standard logic standards
- Type name: O: Standard logic product, M: Open drain type
- Series name: 4A: High breakdown voltage series

PicoLogic™ Series Lineup

Type No.	Function	V_{DD} max (V)	Power supply voltage (V)	I_{OUT} max (mA)	P_D (W)	Function
4A000MH5	NAND	25	3 to 25	50	0.8	MCPH5
4A002MH5	NOR					
4A004MH5	INV					
4A008MH5	AND					
4A032MH5	OR					
4A034MH5	BUF					
4AM01MH5	OPEN DRAIN (1)			75		
4AM02MH5	OPEN DRAIN (2)					
4AM03MH5	OPEN DRAIN (3)					
4AM04MH5	OPEN DRAIN (4)					

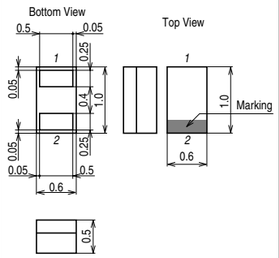
Function	NAND	NOR	INV	AND
Type No.	4A000MH5	4A002MH5	4A004MH5	4A008MH5
Circuit block				
Function	OR	BUF		
Type No.	4A032MH5	4A034MH5		
Circuit block				
Function	OPEN DRAIN (1)	OPEN DRAIN (2)	OPEN DRAIN (3)	OPEN DRAIN (4)
Type No.	4AM01MH5	4AM02MH5	4AM03MH5	4AM04MH5
Circuit block				

MCPH5

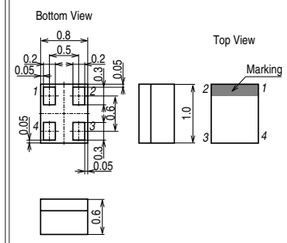
Package Dimensions

(unit : mm)

ECSP1006-2



ECSP1008-4



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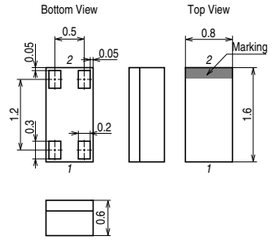

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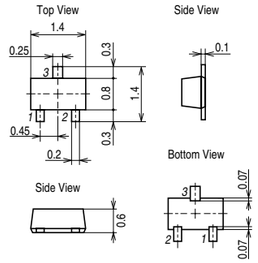

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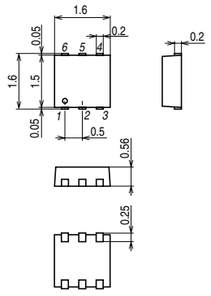

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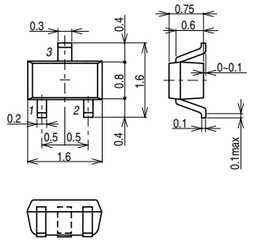

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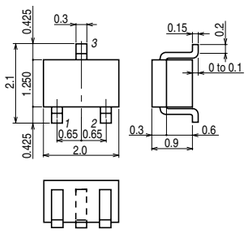

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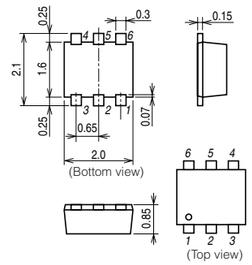

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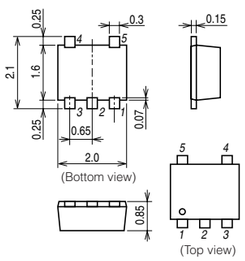

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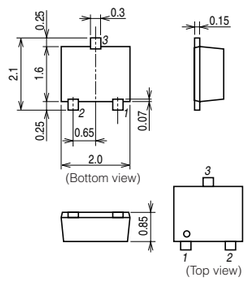

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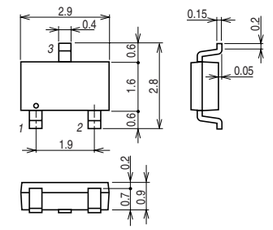

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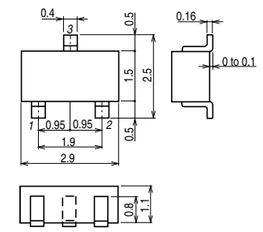

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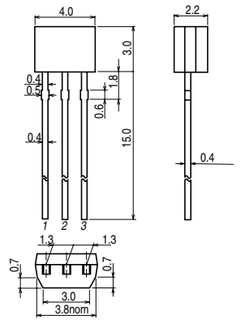

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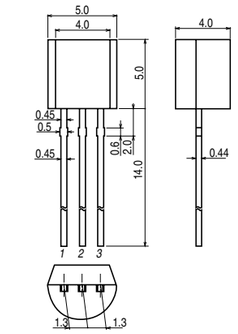

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