EMD9 / UMD9N / IMD9A

NPN + PNP Complex Digital Transistors (Bias Resistor Built-in Transistors)

<For DTr1(NPN)>

Parameter	Value
V _{CC}	50V
I _{C(MAX.)}	100mA
R ₁	10kΩ
R_2	47kΩ

<For DTr2(PNP)>

Parameter	Value
V _{CC}	-50V
I _{C(MAX.)}	-100mA
R ₁	10kΩ
R_2	47kΩ

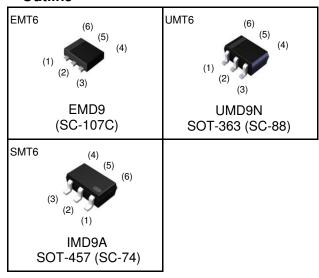
Features

- 1) Both the DTC114Y chip and DTA114Y chip in one package.
- 2) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see inner circuit).
- 3) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of completely eliminating parasitic effects.
- Only the on/off conditions need to be set for operation, making the circuit design easy.
- 5) Lead Free/RoHS Compliant.

Application

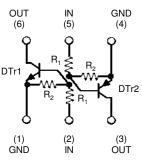
Inverter circuit, Interface circuit, Driver circuit

Outline

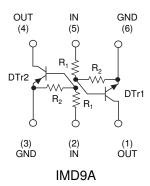


Datasheet

•Inner circuit



EMD9 / UMD9N



Packaging specifications

Part No.	Package	Package size (mm)	Taping code	Reel size (mm)	Tape width (mm)	Basic ordering unit (pcs)	Marking
EMD9	EMT6	1616	T2R	180	8	8,000	D9
UMD9N	UMT6	2021	TR	180	8	3,000	D9
IMD9A	SMT6	2928	T108	180	8	3,000	D9

● Absolute maximum ratings (Ta = 25°C)

Para	Parameter			DTr2(PNP)	Unit
Supply voltage		V _{CC}	50	-50	V
Input voltage		V _{IN}	−6 to +40	-40 to +6	V
Output current		Io	70	-70	mA
Collector current		I _{C(MAX.)} *1	100	-100	mA
Power discipation	EMD9 / UMD9N	- P _D *2	150 (Total)*3		mW
Power dissipation IMD9A		T PD	300 (Total)*4		mW
Junction temperature		T _j	150		°C
Range of storage temperature		T _{stg}	−55 to +150		°C

●Electrical characteristics(Ta = 25°C) <For DTr1(NPN)>

Parameter	Symbol	Conditions	Min.	Тур.	Max.	Unit
Input voltage	$V_{I(off)}$	$V_{CC} = 5V, I_{O} = 100 \mu A$	-	-	0.3	V
	$V_{I(on)}$	$V_{O} = 0.3V, I_{O} = 1mA$	1.4	-	-	v
Output voltage	$V_{O(on)}$	$I_{O}/I_{I} = 5mA/0.25mA$	-	0.1	0.3	V
Input current	I _I	$V_1 = 5V$	-	-	0.88	mA
Output current	$I_{O(off)}$	$V_{CC} = 50V, V_I = 0V$	-	-	0.5	μΑ
DC current gain	G _I	$V_O = 5V$, $I_O = 5mA$	68	1	-	-
Input resistance	R ₁	-	7	10	13	kΩ
Resistance ratio	R ₂ /R ₁	-	3.7	4.7	5.7	-
Transition frequency	f _T *1	$V_{CE} = 10V, I_{E} = -5mA$ f = 100MHz	-	250	-	MHz

● Electrical characteristics(Ta = 25°C) < For DTr2(PNP)>

Parameter	Symbol	Conditions	Min.	Тур.	Max.	Unit
Input voltage	$V_{I(off)}$	$V_{CC} = -5V, I_{O} = -100 \mu A$	-	-	-0.3	V
	$V_{I(on)}$	$V_{O} = -0.3V, I_{O} = -1mA$	-1.4	ı	ı	V
Output voltage	$V_{O(on)}$	$I_{O}/I_{I} = -5mA/-0.25mA$	-	-0.1	-0.3	V
Input current	l ₁	$V_1 = -5V$	-	-	-0.88	mA
Output current	$I_{O(off)}$	$V_{CC} = -50V, V_I = 0V$	1	1	-0.5	μΑ
DC current gain	G _I	$V_{O} = -5V, I_{O} = -5mA$	68	-	-	-
Input resistance	R ₁	-	7	10	13	kΩ
Resistance ratio	R ₂ /R ₁	-	3.7	4.7	5.7	-
Transition frequency	f _T *1	$V_{CE} = -10V, I_{E} = 5mA$ f = 100MHz	-	250	-	MHz

^{*1} Characteristics of built-in transistor

^{*2} Each terminal mounted on a reference footprint

^{*3 120}mW per element must not be exceeded.

^{*4 200}mW per element must not be exceeded.

●Electrical characteristic curves (Ta = 25°C) <For DTr1(NPN)>

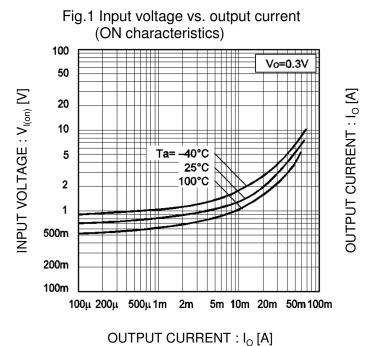


Fig.2 Output current vs. input voltage (OFF characteristics) 10m 5m 2m 1m 500μ 100°C 200μ 25°C 40°C 100μ 50μ 20μ 10μ 5μ 2μ 1μ 0 1.5 3.0 INPUT VOLTAGE : $V_{I(off)}[V]$

Fig.3 Output current vs. output voltage

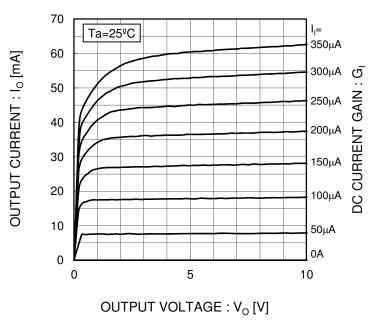
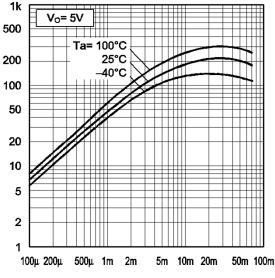


Fig.4 DC current gain vs. output current

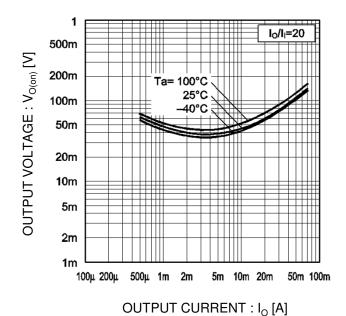


OUTPUT CURRENT : Io [A]

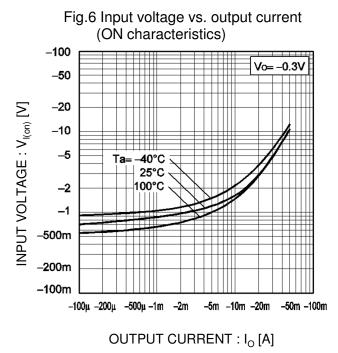
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●Electrical characteristic curves (Ta = 25°C) <For DTr1(NPN)>

Fig.5 Output voltage vs. output current



●Electrical characteristic curves (Ta = 25°C) <For DTr2(PNP)>



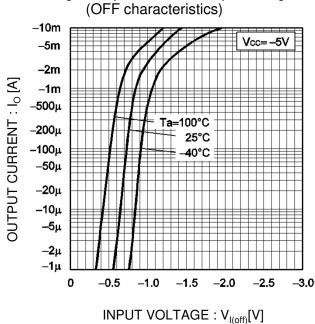
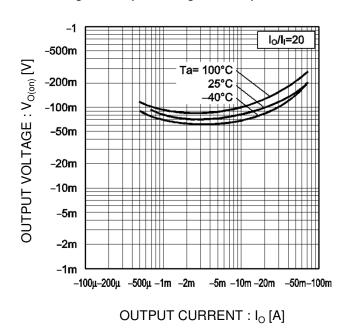


Fig.7 Output current vs. input voltage

●Electrical characteristic curves (Ta = 25°C) <For DTr2(PNP)>

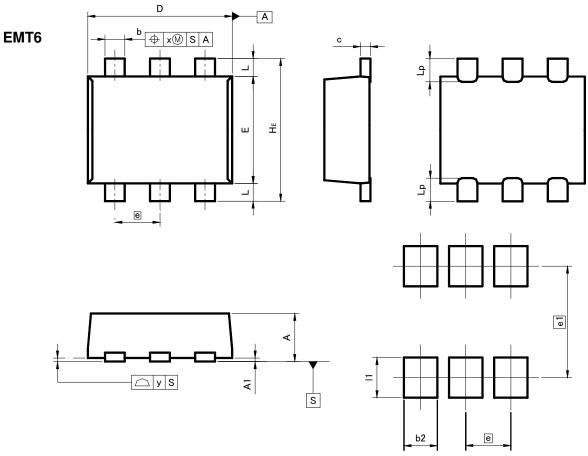
Fig.8 Output current vs. output voltage Fig.9 DC current gain vs. output current $I_{I} = -500 \mu A -450 \mu A$ –400μA -70 -350μA 500 Ta= 100°C -60 OUTPUT CURRENT: Io [mA] 25°C -300μA -40°C 200 -50 **JC CURRENT GAIN** -250μΑ 100 -40 50 -200μA -30 20 -150μA 10 -20 -100μΑ 5 Ta=25ºC -10 2 -50μA 0 OA -5 0 -10 -100µ-200µ -500µ -1m -2m -5m -10m -20m -50m-100m OUTPUT CURRENT: Io [A] OUTPUT VOLTAGE: Vo [V]

Fig.10 Output voltage vs. output current



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● **Dimensions** (Unit: mm)



Pattern of terminal position areas [Not a recommended pattern of soldering pads]

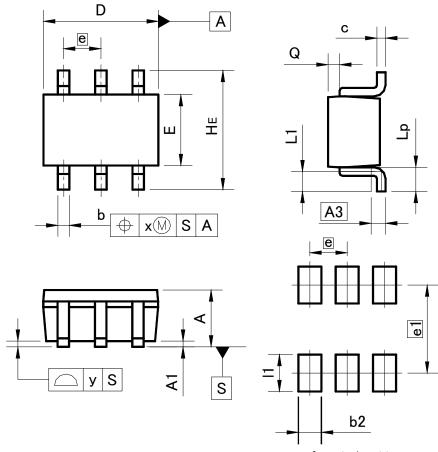
DIM	MILIM	ETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α	0.45	0.55	0.018	0.022
A1	0.00	0.10	0.000	0.004
b	0.17	0.27	0.007	0.011
С	0.08	0.18	0.003	0.007
D	1.50	1.70	0.059	0.067
Е	1.10	1.30	0.043	0.051
е	0.	50	0.020	
HE	1.50	1.70	0.059	0.067
L	0.10	0.30	0.004	0.012
Lp	_	0.35	-	0.014
х	_	0.10		0.004
У	_	0.10		0.004

DIM	MILIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
b2	_	0.37	-	0.015
e1	1.25		0.0	049
l1	_	0.45	_	0.018

Dimension in mm / inches

● **Dimensions** (Unit: mm)





Pattern of terminal position areas [Not a recommended pattern of soldering pads]

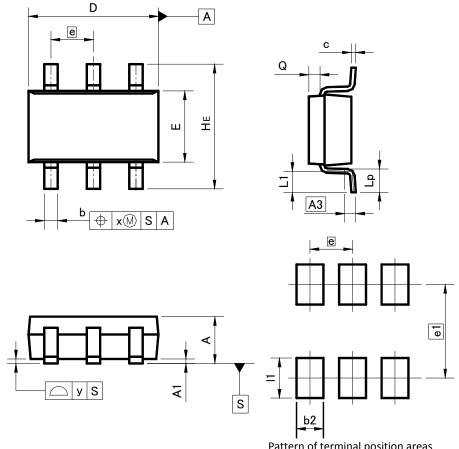
DIM	MILIM	ETERS	INC	HES
DIM	MIN	MAX	MIN	MAX
Α	0.80	1.00	0.031	0.039
A1	0.00	0.10	0.000	0.004
A3	0.3	25	0.0	10
b	0.15	0.30	0.006	0.012
С	0.10	0.20	0.004	0.008
D	1.90	2.10	0.075	0.083
E	1.15	1.35	0.045	0.053
е	0.0	65	0.026	
HE	2.00	2.20	0.079	0.087
L1	0.20	0.50	0.008	0.020
Lp	0.25	0.55	0.010	0.022
Q	0.10	0.30	0.004	0.012
Х	_	0.10		0.004
У	_	0.10	_	0.004

DIM	MILIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
b2	-	0.40	_	0.016
e1	1.55		0.0	061
l1	_	0.65	_	0.026

Dimension in mm / inches

● **Dimensions** (Unit: mm)





Pattern of terminal position areas [Not a recommended pattern of soldering pads]

DIM	MILIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
Α	1.00	1.30	0.039	0.051
A1	0.00	0.10	0.000	0.004
A3	0.5	25	0.0	10
b	0.25	0.40	0.010	0.016
С	0.09	0.25	0.004	0.010
D	2.80	3.00	0.110	0.118
Е	1.50	1.80	0.059	0.071
е	0.95		0.0	37
HE	2.60	3.00	0.102	0.118
L1	0.30	0.60	0.012	0.024
Lp	0.40	0.70	0.016	0.028
Q	0.20	0.30	0.008	0.012
х	_	0.20		0.008
У	_	0.10	_	0.004

DIM	MILIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
b2		0.60	-	0.024
e1	2.10		0.0)83
l1	_	0.90	_	0.035

Dimension in mm / inches

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