THOMSON SEMICONDUCTORS

TL071
TL071A
TL071B

LOW NOISE J-FET INPUT SINGLE OP-AMPs

The TL071, TL071A and TL071B are high speed J-FET input operational amplifiers incorporating well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

The devices feature high slew rate, low input bias and, offset current, and low voltage temperature coefficient.

- Low power consumption
- Wide common-mode and differential voltage range
- Low input bias and offset current
- Low noise $V_n = 18$ nV/$\sqrt{Hz}$(typ)
- Output short-circuit protection
- High input impedance J-FET input stage
- Low harmonic distortion : 0.01% (typ)
- Internal frequency compensation
- Latch up free operation
- High slew rate : 13 V/μs (typ)

ORDERING INFORMATION

Hi-Rel versions available - Consult our LINEAR data book.

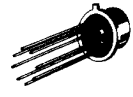
PART NUMBER	TEMPERATURE RANGE	PACKAGE			
		DP	H	FP	GC
TL071M	−55°C to +125°C		●		●
TL071I	−25°C to + 85°C	●			
TL071C	0°C to + 70°C	●		●	
TL071AC	0°C to + 70°C	●			
TL071BC	0°C to + 70°C	●			

Examples : TL071MH, TL071IDP

LOW NOISE J-FET INPUT SINGLE OP-AMPs

CASES

CB-11



H SUFFIX
METAL CAN

CB-98

DP SUFFIX
PLASTIC PACKAGE

CB-342

FP SUFFIX
PLASTIC MICROPACKAGE

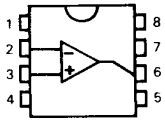
CB-705

GC SUFFIX
TRICECOP (LCC)

PIN ASSIGNMENTS

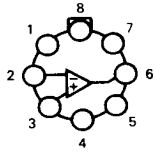
(Top views)

CB-98
CB-342

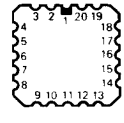


1 - Offset null
2 - Inverting input
3 - Non-inverting input
4 - V_{CC}^-
5 - Offset null
6 - Output
7 - V_{CC}^+
8 - NC

CB-11



CB-705



1 - NC
2 - Offset null
3 - NC
4 - NC
5 - Inverting input
6 - NC
7 - Non-inverting input
8 - NC
9 - NC
10 - V_{CC}^-
11 - NC
12 - Offset null
13 - NC
14 - NC
15 - Output
16 - NC
17 - V_{CC}^+
18 - NC
19 - NC
20 - NC

THOMSON SEMICONDUCTORS
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THOMSON COMPONENTS

MAXIMUM RATINGS

Rating	Symbol	TL071M	TL071I	TL071C	Unit
Supply voltage (Note 1)	V_{CC}	± 18	± 18	± 18	V
Differential input voltage (Note 2)	V_{ID}	± 30	± 30	± 30	V
Input voltage (Note 3)	V_I	± 15	± 15	± 15	V
Output short-circuit duration (Note 4)	—	Indefinite	Indefinite	Indefinite	—
Power dissipation	P_{tot}	680	680	680	mW
Operating free-air temperature range	T_{oper}	− 55 to + 125	− 25 to + 85	0 to + 70	°C

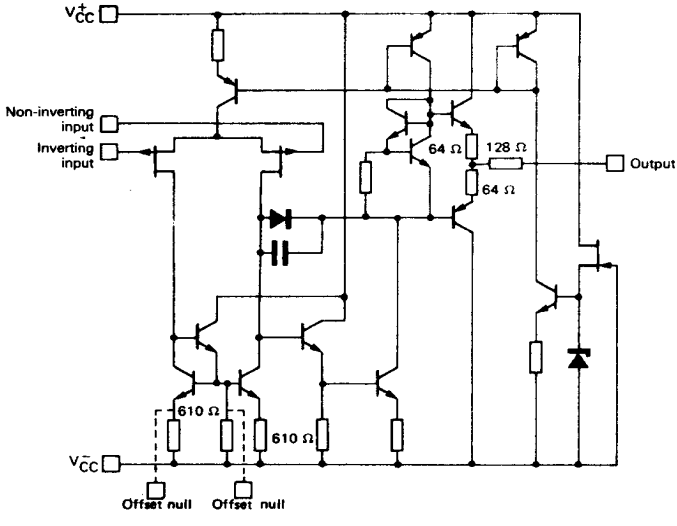
Note 1 : All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V_{CC}^+ and V_{CC}^-.

Note 2 : Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.

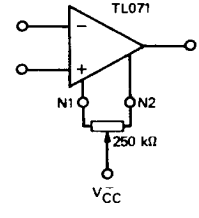
Note 3 : The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.

Note 4 : The output may be shorted to ground or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

SCHEMATIC DIAGRAM



INPUT OFFSET VOLTAGE NULL CIRCUIT



CASE	Offset null	Inverting input	Non-inverting input	V_{CC}^-	V_{CC}^+	Output	N.C
CB-98, CB-342 CB-11	1, 5	2	3	4	7	6	8
CB-706	2, 12	5	7	10	17	15	*

* **CB-706** : Other pins are not conected

ELECTRICAL CHARACTERISTICS

TL071M : $-55°C \leq T_{amb} \leq +125°C$
TL071I : $-25°C \leq T_{amb} \leq +85°C$
TL071C : $0°C \leq T_{amb} \leq +70°C$
$V_{CC} = \pm 15$ V
Test conditions : all characteristics are specified under open-loop conditions unless otherwise specified.

Characteristic	Symbol	TL071M			TL071I			TL071C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input offset voltage ($R_S = 50\ \Omega$) $T_{amb} = +25°C$ $T_{min} \leq T_{amb} \leq T_{max}$	V_{IO}	– –	3 –	6 9	– –	3 –	6 9	– –	3 –	10 13	mV
Temperature coefficient of input offset voltage ($R_S = 50\ \Omega$)	αV_{IO}	–	10	–	–	10	–	–	10	–	µV/°C
Input offset current* $T_{amb} = +25°C$ $T_{min} \leq T_{amb} \leq T_{max}$	I_{IO}	– –	5 –	50 20	– –	5 –	50 10	– –	5 –	50 2	pA nA
Input bias current* $T_{amb} = +25°C$ $T_{min} \leq T_{amb} \leq T_{max}$	I_{IB}	– –	30 –	200 50	– –	30 –	200 20	– –	30 –	200 7	pA nA
Input common-mode voltage range ($T_{amb} = +25°C$)	V_I	± 11	± 12	–	± 11	± 12	–	± 10	± 11	–	V
Output voltage swing : $T_{amb} = +25°C$, $R_L = 10\ k\Omega$ $T_{min} \leq T_{amb} \leq T_{max}$, $R_L \geq 10\ k\Omega$ $R_L \geq 2\ k\Omega$	V_{OPP}	24 24 20	27 – 24	– – –	24 24 20	27 – 24	– – –	24 24 20	27 – 24	– – –	V
Large signal voltage gain ($R_L \geq 2\ k\Omega$, $V_O = \pm 10$ V) $T_{amb} = +25°C$ $T_{min} \leq T_{amb} \leq T_{max}$	A_{VD}	35 20	200 –	– –	50 25	200 –	– –	25 15	200 –	– –	V/mV
Small signal bandwidth ($T_{amb} = +25°C$)	GW_R	–	3	–	–	3	–	–	3	–	MHz
Input resistance ($T_{amb} = +25°C$)	R_I	–	10^{12}	–	–	10^{12}	–	–	10^{12}	–	Ω
Common-mode rejection ratio ($R_S \leq 10\ k\Omega$; $T_{amb} = +25°C$)	CMR	80	86	–	80	86	–	70	76	–	dB
Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$) $R_S \leq 10\ k\Omega$; $T_{amb} = +25°C$	SVR	80	86	–	80	86	–	70	76	–	dB
Supply current (per amplifier) ($T_{amb} = +25°C$)	I_{CC}	–	1.4	2.5	–	1.4	2.5	–	1.4	2.5	mA

* Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive. Pulse techniques must be used that will maintain the junction temperature as close to the ambient temperature as is possible.

ELECTRICAL CHARACTERISTICS

$V_{CC} = \pm 15$ V, $T_{amb} = +25°C$

Characteristic	Symbol	TL071M			TL071I,C			Unit
		Min	Typ	Max	Min	Typ	Max	
Slew rate ($e_I = 10$ V ; $R_L = 2\ k\Omega$; $C_L = 100$ pF ; $A_V = 1$)	S_{VO}	10	13	–	–	13	–	V/µs
Rise time ($e_I = 20$ mV ; $R_L = 2\ k\Omega$; $C_L = 100$ pF ; $A_V = 1$)	t_r	–	0.1	–	–	0.1	–	µs
Overshoot factor ($e_I = 20$ mV ; $R_L = 2\ k\Omega$; $C_L = 100$ pF ; $A_V = 1$)	K_{OV}	–	10	–	–	10	–	%
Equivalent input noise voltage $f = 1$ kHz, $R_S = 100\ \Omega$ $f = 10$ Hz to 10 kHz	V_n	– –	18 4	– –	– –	18 4	– –	$nV/\sqrt{Hz}$ µV
Equivalent input noise current ($R_S = 100\ \Omega$, $f = 1$ kHz)	I_n	–	0.01	–	–	0.01	–	$pA/\sqrt{Hz}$
Total harmonic distortion ($V_{O(rms)} = 10$ V, $R_S = 1\ k\Omega$, $R_L \geq 2\ k\Omega$, $f = 1$ kHz)	THD	–	0.01	–	–	0.01	–	%

ELECTRICAL CHARACTERISTICS

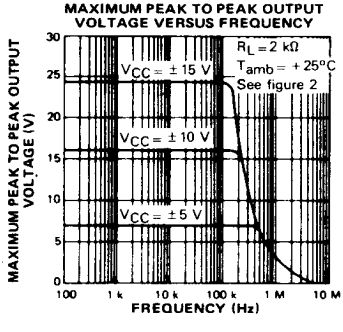
TL071C : $0°C \leq T_{amb} \leq +70°C$

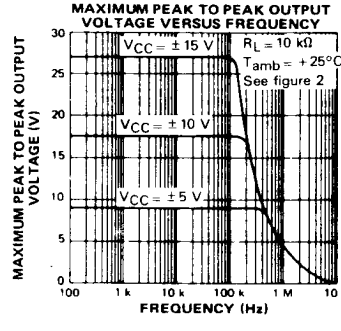
$V_{CC} = \pm 15$ V

Test conditions : all characteristics are specified under open-loop conditions unless otherwise specified.

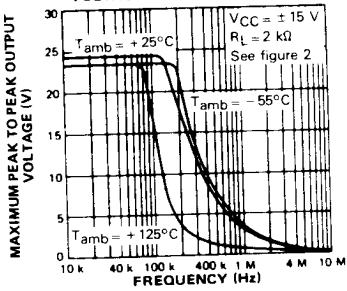
Characteristic	Symbol	TL071C			TL071AC			TL071BC			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input offset voltage ($R_S = 50\ \Omega$) $T_{amb} = +25°C$ $T_{min} \leq T_{amb} \leq T_{max}$	V_{IO}	– –	3 –	10 13	– –	3 –	6 7.5	– –	2 –	3 5	mV
Temperature coefficient of input offset voltage ($R_S = 50\ \Omega$)	αV_{IO}	–	10	–	–	10	–	–	10	–	µV/°C
Input offset current* $T_{amb} = +25°C$ $T_{min} \leq T_{amb} \leq T_{max}$	I_{IO}	– –	5 –	50 2	– –	5 –	50 2	– –	5 –	50 2	pA nA
Input bias current* $T_{amb} = +25°C$ $T_{min} \leq T_{amb} \leq T_{max}$	I_{IB}	– –	30 –	200 7	– –	30 –	200 7	– –	30 –	200 7	pA nA
Input common-mode voltage range ($T_{amb} = +25°C$)	V_I	± 10	± 11	–	± 11	± 12	–	± 11	± 12	–	V
Output voltage swing $T_{amb} = +25°C$, $R_L = 10\ k\Omega$ $T_{min} \leq T_{amb} \leq T_{max}$, $R_L \geq 10\ k\Omega$ $R_L \geq 2\ k\Omega$	V_{OPP}	24 24 20	27 – 24	– – –	24 24 20	27 – 24	– – –	24 24 20	27 – 24	– – –	V
Large signal voltage gain ($R_L \geq 2\ k\Omega$, $V_O = \pm 10$ V) $T_{amb} = +25°C$ $T_{min} \leq T_{amb} \leq T_{max}$	A_{VD}	25 15	200 –	– –	50 25	200 –	– –	50 25	200 –	– –	V/mV
Small signal bandwidth ($T_{amb} = +25°C$)	GW_R	–	3	–	–	3	–	-	3	–	MHz
Input resistance ($T_{amb} = +25°C$)	R_I	–	10^{12}	–	–	10^{12}	–	–	10^{12}	–	Ω
Common-mode rejection ratio ($R_S \leq 10\ k\Omega$; $T_{amb} = +25°C$)	CMR	70	76	–	80	86	–	80	86	–	dB
Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$) $R_S \leq 10\ k\Omega$; $T_{amb} = +25°C$	SVR	70	76	–	80	86	–	80	86	–	dB
Supply current (per amplifier) ($T_{amb} = +25°C$)	I_{CC}	–	1.4	2.5	–	1.4	2.5	–	1.4	2.5	mA

* Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive. Pulse techniques must be used that will maintain the junction temperature as close to the ambient temperature as is possible.

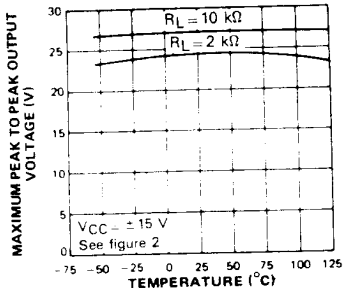




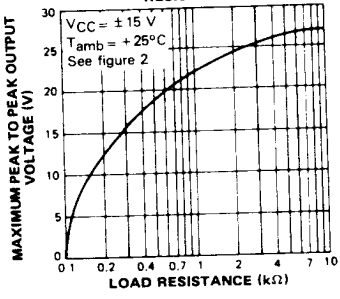
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREQUENCY



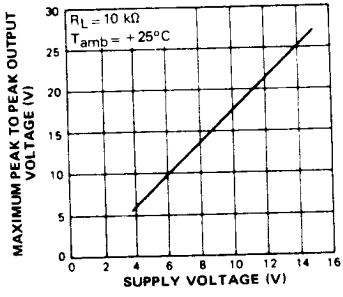
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS FREE-AIR TEMP.



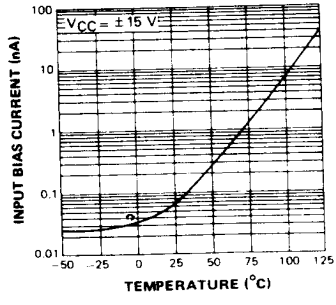
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE



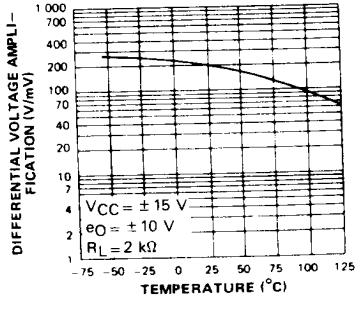
MAXIMUM PEAK TO PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE



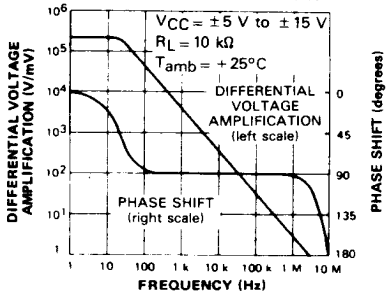
INPUT BIAS CURRENT VERSUS FREE-AIR TEMPERATURE



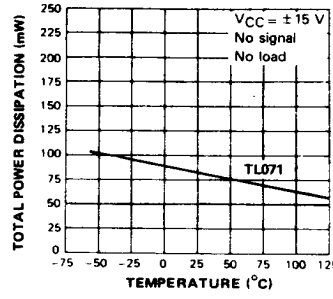
LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE-AIR TEMPERATURE



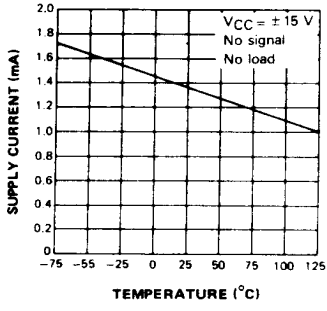
LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY



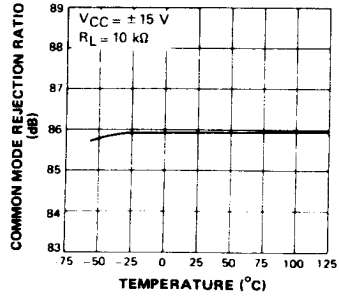
TOTAL POWER DISSIPATION VERSUS FREE-AIR TEMPERATURE



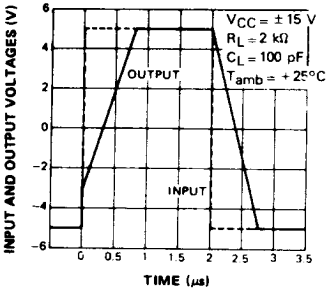
SUPPLY CURRENT PER AMPLIFIER VERSUS FREE-AIR TEMPERATURE



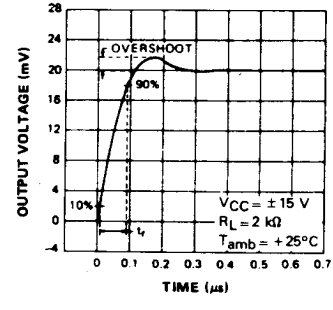
COMMON MODE REJECTION RATIO VERSUS FREE-AIR TEMPERATURE



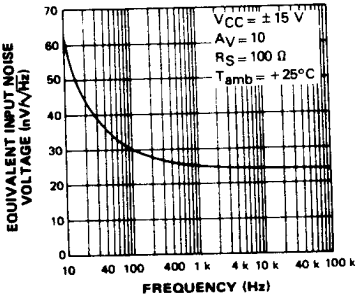
VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



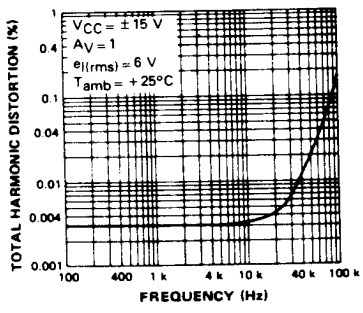
OUTPUT VOLTAGE VERSUS TIME



EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY

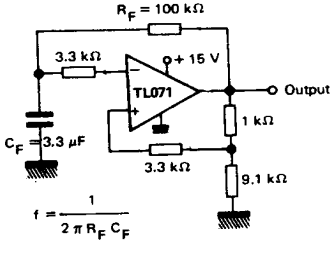


TOTAL HARMONIC DISTORTION VERSUS FREQUENCY

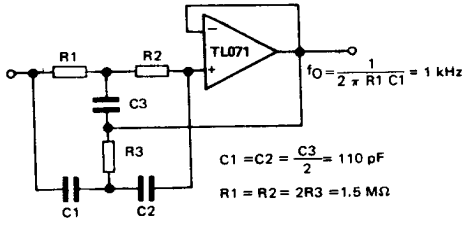


TYPICAL APPLICATIONS

(0.5 Hz) SQUARE WAVE OSCILLATOR



HIGH Q NOTCH FILTER



PARAMETER MEASUREMENT INFORMATION

Fig. 1 : VOLTAGE FOLLOWER

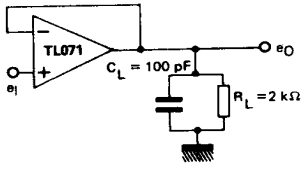
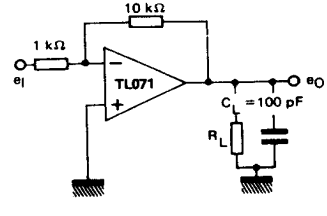
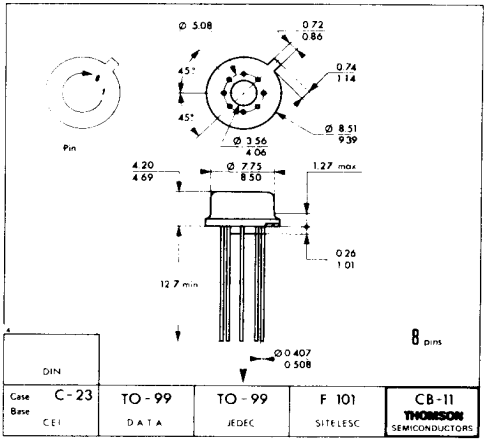
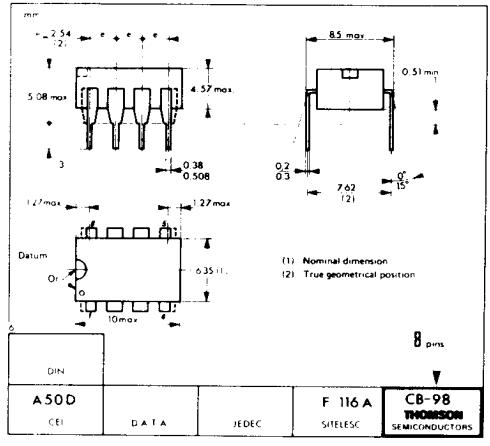
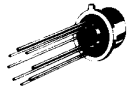


Fig. 2 : GAIN-OF-10 INVERTING AMPLIFIER



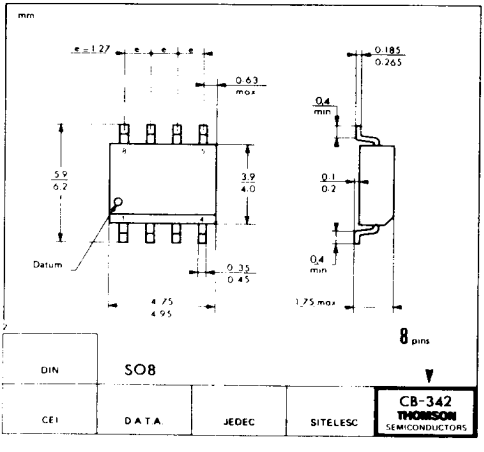




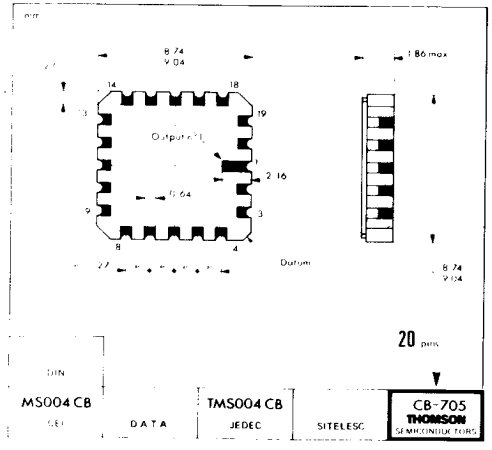


CB-11
H SUFFIX
METAL CAN

CB-98
DP SUFFIX
PLASTIC PACKAGE



CB-342
FP SUFFIX
PLASTIC
MICROPACKAGE



CB-705
GC SUFFIX
TRICECOP (LCC)

These specifications are subject to change without notice.
Please inquire with our sales offices about the availability of the different packages