CA3138, CA3138A

High-Current, High-Beta N-P-N Transistor Arrays

For Industrial, Commercial, and Military Applications

Four Isolated Discrete Sealed-Junction High-Current N-P-N Transistors

Features:

- **High Current –1 A**
- **High Beta – 95 min. at I_C = 500 mA, V_{CE} = 5 V**
- **Low V_{CE}(SAT) –0.4 V max. at I_C = 500 mA, I_B = 12.5 mA**
- **Silicon Nitride Passivated**
- **Platinum Silicide Ohmic Contacts**

The RCA-CA3138 and CA3138A are high-current n-p-n transistor arrays containing four isolated (discrete) sealed-junction high-current n-p-n transistors. They are intended for high-current, high-speed switching and driver applications.

The CA3138A has all the features and characteristics of the CA3138 but is intended for applications requiring premium grade specifications — higher rating for V_{CBO} of 25 volts and limits established for I_{CEO}, I_{EBO}, and h_{FE} at 10 mA.

The CA3138 and CA3138A are supplied in a 14-lead dual-in-line plastic package and operate over the full military temperature range of –55°C to +125°C.

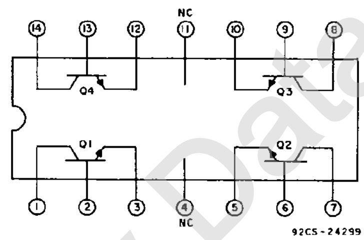

Fig. 1 – Terminal diagram (top view).

Applications:

- **High-Current LED Driver**
- **Relay and Solenoid Driver**
- **Lamp Driver**

MAXIMUM RATINGS, *Absolute-Maximum Values:*

COLLECTOR-TO-EMITTER VOLTAGE .... With Base Open (V_{CEO})	15	V
COLLECTOR-TO-BASE VOLTAGE With Emitter Open (V_{CBO})		
CA3138	20	V
CA3138A	25	V
EMITTER-TO-BASE VOLTAGE .... With Collector Open (V_{EBO})	5	V
COLLECTOR CURRENT (I_C)	1	A
POWER DISSIPATION (P_D)		
At T_A up to 25°C:		
For Each Transistor	1	W
Total Package	2	W
At T_A above 25°C derate linearly	20	mW/°C
AMBIENT TEMPERATURE RANGE.		
Operating	–55 to +125	°C
Storage	–65 to +150	°C
LEAD TEMPERATURE (DURING SOLDERING): At distance 1/16 ± 1/32 inch (1.59 ± 0.79 mm) from case for 10 seconds max.	265	°C

File Number **1131**

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ELECTRICAL CHARACTERISTICS at T_A = 25°C

Characteristic	Test Conditions	LIMITS CA3138 Min.	Typ.	Max.	CA3138A Min.	Typ.	Max.	Units
Collector-to-Emitter Sustaining Voltage, $V_{CEO}(sus)$*	I_C = 1 mA, I_B = 0	15	20	–	15	20	–	V
Collector-to-Emitter Breakdown Voltage, $V_{(BR)CES}$	I_C = 10 μA	20	55	–	25	60	–	V
Collector-to-Base Breakdown Voltage, $V_{(BR)CBO}$	I_C = 10 μA, I_E = 0	20	55	–	25	60	–	V
Emitter-to-Base Breakdown Voltage, $V_{(BR)EBO}$	I_E = 10 μA, I_C = 0	5	7.2	–	5	7.2	–	V
Base-to-Emitter Saturation Voltage, $V_{BE}(sat)$*	I_C = 500 mA, I_B = 12.5 mA	0.7	0.81	1.1	0.7	0.81	1.1	V
Collector-to-Emitter Saturation Voltage, $V_{CE}(sat)$*	I_C = 500 mA, I_B = 12.5 mA	–	0.26	0.4	–	0.26	0.4	V
Collector Cutoff Current I_{CBO}	V_{CB} = 15 V	–	0.03	1	–	0.02	0.1	μA
Collector Cutoff Current I_{CEO}	V_{CE} = 10 V	–	0.5	–	–	0.3	1.0	μA
Collector Cutoff Current I_{EBO}	V_{EB} = 4 V	–	0.01	–	–	0.01	0.1	μA
Static Forward-Current Transfer Ratio (Beta), h_{FE}*	I_C = 10 mA, V_{CE} = 5 V	–	–	–	35	140	–	
	I_C = 100 mA, V_{CE} = 5 V	80	160	450	80	160	450	
	I_C = 500 mA, V_{CE} = 5 V	95	170	500	95	170	500	
	I_C = 1 A, V_{CE} = 5 V	40	170	–	40	170	–	
Small-Signal Forward Current Transfer Ratio, h_{fe}	I_C = 50 mA, V_{CE} = 10 V, f = 100 MHz	2	–	–	2	–	–	
Collector-to-Base Capacitance, C_{CB}	V_{CB} = 10 V, I_E = 0	–	18	–	–	18	–	pF
Emitter-to-Base Capacitance, C_{EB}	V_{EB} = 0.5 V, I_C = 0	–	77	–	–	77	–	pF
Rise Time (See Test Ckt. Fig. 6), t_r	I_C = 570 mA	–	6	–	–	6	–	ns
Fall Time (See Test Ckt. Fig. 6), t_f	I_{B1} = 30 mA	–	100	–	–	100	–	ns
Delay Time (See Test Ckt. Fig. 6), t_d	I_{B2} = 0	–	7.5	–	–	7.5	–	ns
Storage Time (See Test Ckt. Fig. 6), t_s		–	850	–	–	850	–	ns

*Pulse Conditions width = 300 μs, duty cycle = 1%.

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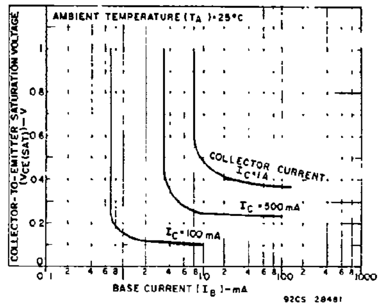

Fig. 2 – $V_{CE}(sat)$ vs I_B

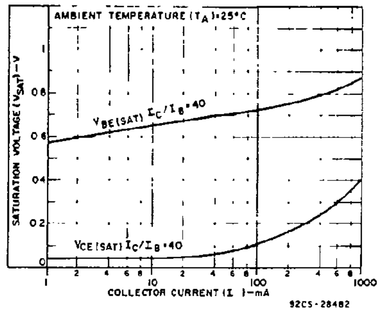

Fig. 3 – V_{sat} vs I_C

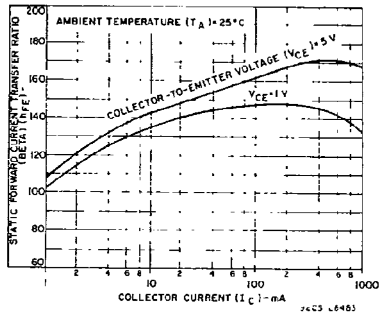

Fig. 4 – h_{FE} vs I_C

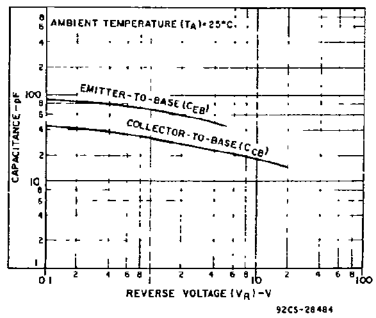

Fig. 5 – C_{CB}, C_{CE} vs V_R

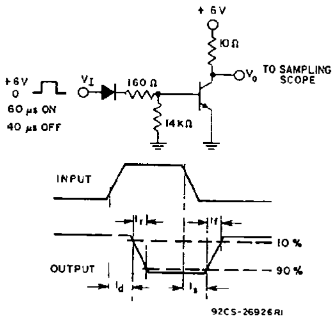

Fig. 6 – Switching time test circuit and waveforms.