

# Small Signal Transistors



Reference Guide

*STMicroelectronics*  
*More Intelligent Solutions*



# New Small Signal Transistors In Plastic Packages



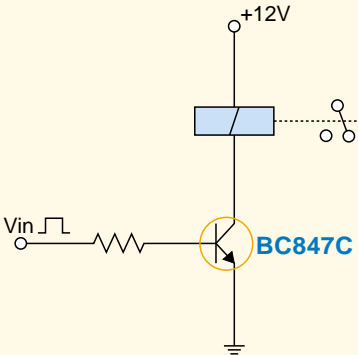
In response to the continuous market demand, ST is enlarging its product portfolio of small signal transistors.

Already present in metal-can packages (TO-18, TO-39), Small Signal Transistors are now being introduced in the small SMD plastic packages such as SOT-223, SOT-89, SOT23-3L, SOT-323 and the through-hole TO-92. ST's small signal transistors are offered with the latest silicon planar technology that ensures high reliability and fast switching performance. The product range consists of a wide range of well known industry standard part numbers.

## APPLICATION HINTS

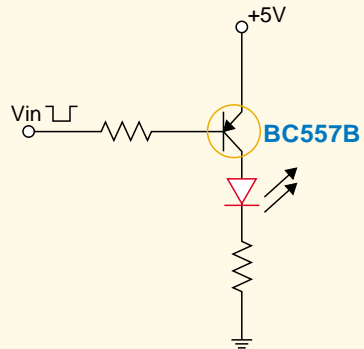
Small signal transistors are widely used in all segments and for several applications in almost all equipment.

- On/off switches for general use
- LED diode driver
- Relay driver
- Audio mute function
- RGB coils driver and Scavem circuits
- Bias supply circuits
- Infrared diode amplifier
- Timer circuits
- High voltage 'A' class preamplifier
- Telecom wireline interface circuits



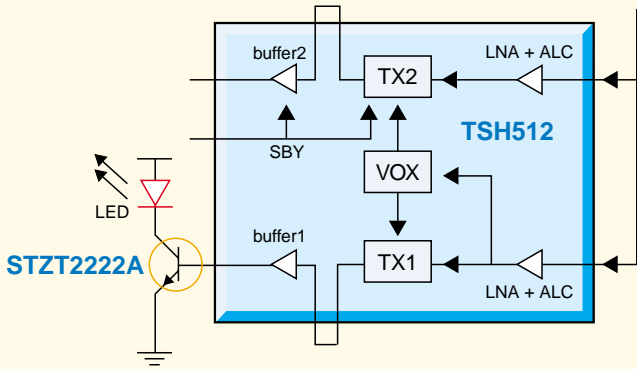
### Driver For Relay

High gain transistor used to drive 100mA relay. Due to the high gain characteristic the transistor will switch on with just  $I_B=300\mu A$ .

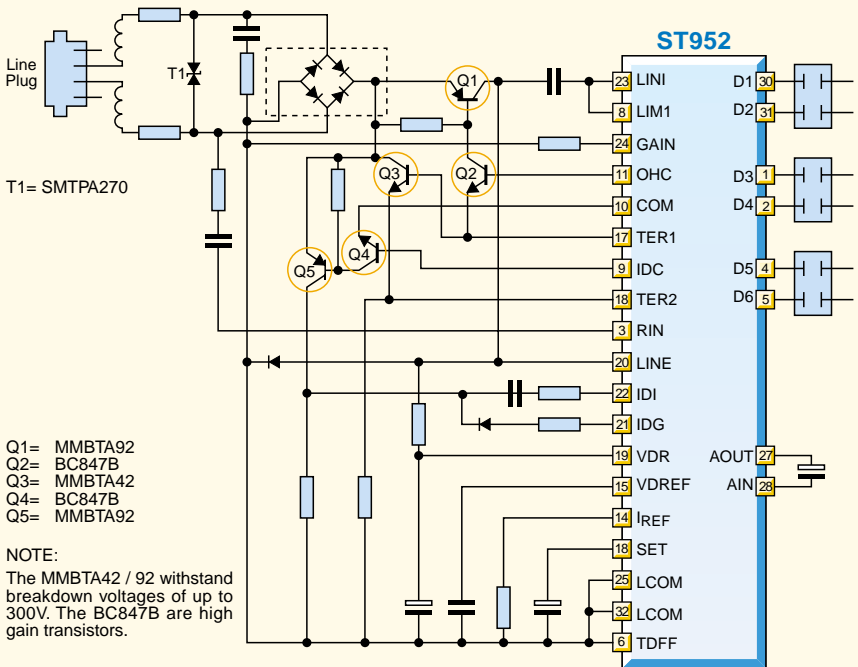


### Driver For LED

High gain transistor used to drive 20mA LED. Due to the high gain characteristic the transistor will switch on with just  $I_B=100\mu A$ .



*Infrared transmitter for hi-fi audio wireless communication*



*Modem line interface*

# SMALL SIGNAL TRANSISTORS PRODUCT RANGE

## TO-92



P/N	Polarity	P <sub>tot</sub> (W)	I <sub>C</sub> (mA)	V <sub>CEO</sub> (V)	V <sub>CBO</sub> (V)	H <sub>FE</sub> min	H <sub>FE</sub> max	HFE @		V <sub>CE(sat)</sub> max (V)	V <sub>CE(sat)</sub> @	
								I <sub>C</sub> (mA)	V <sub>CE</sub> (V)		I <sub>C</sub> (mA)	I <sub>B</sub> (mA)
2N3904	NPN	0.625	200	40	60	100	300	10	1	0.2	50	5
2N3906	PNP	0.625	200	40	40	100	300	10	1	0.2	50	5
BC327-25	PNP	0.625	500	45	50	160	400	100	1	0.7	500	50
BC327-40	PNP	0.625	500	45	50	250	600	100	1	0.7	500	50
BC337-25	NPN	0.625	500	45	50	160	400	100	1	0.7	500	50
BC337-40	NPN	0.625	500	45	50	250	600	100	1	0.7	500	50
BC547B	NPN	0.5	100	45	50	200	450	2	5	0.6	100	5
BC547C	NPN	0.5	100	45	50	420	800	2	5	0.6	100	5
BC557B	PNP	0.5	100	45	50	220	475	2	5	0.65	100	5
BF420	NPN	0.83	100	300	300	50	-	25	20	0.6	30	5
BF421	PNP	0.83	100	300	300	50	-	25	20	0.6	30	5
PN2222A	NPN	0.5	600	40	75	100	300	150	10	1	500	50
PN2907A	PNP	0.5	600	60	60	100	300	150	10	1.6	500	50
STPSA42	NPN	0.625	300	300	300	40	-	10	10	0.5	20	2
STPSA92	PNP	0.625	300	300	300	40	-	10	10	0.5	20	2

## SOT-23



P/N	Polarity	P <sub>tot</sub> (W)	I <sub>C</sub> (mA)	V <sub>CEO</sub> (V)	V <sub>CBO</sub> (V)	H <sub>FE</sub> min	H <sub>FE</sub> max	HFE @		V <sub>CE(sat)</sub> max (V)	V <sub>CE(sat)</sub> @	
								I <sub>C</sub> (mA)	V <sub>CE</sub> (V)		I <sub>C</sub> (mA)	I <sub>B</sub> (mA)
BC807-25	PNP	0.25	500	45	50	160	400	100	1	0.7	500	50
BC807-40	PNP	0.25	500	45	50	250	600	100	1	0.7	500	50
BC817-25	NPN	0.25	500	45	50	160	400	100	1	0.7	500	50
BC817-40	NPN	0.25	500	45	50	250	600	100	1	0.7	500	50
BC847B	NPN	0.25	100	45	50	200	450	2	5	0.6	100	5
BC847C	NPN	0.25	100	45	50	420	800	2	5	0.6	100	5
BC857B	PNP	0.25	100	45	50	220	475	2	5	0.65	100	5
BCX17	PNP	0.25	500	45	50	100	600	100	1	0.62	500	50
BCX19	NPN	0.25	500	45	50	100	600	100	1	0.62	500	50
MMBT3904	NPN	0.35	200	40	60	100	300	10	1	0.2	50	5
MMBT3906	PNP	0.35	200	40	40	100	300	10	1	0.2	50	5
MMBTA42	NPN	0.35	300	300	300	40	-	10	10	0.5	20	2
MMBTA92	PNP	0.35	300	300	300	40	-	10	10	0.5	20	2
SO2222A	NPN	0.35	600	40	75	100	300	150	10	1	500	50
SO2907A	PNP	0.35	600	60	60	100	300	150	10	1.6	500	50
SO642	NPN	0.31	100	300	300	40	-	10	10	0.5	20	2
SO692	PNP	0.31	100	300	300	40	-	10	10	0.5	20	2

## SOT-223



P/N	Polarity	P <sub>tot</sub> (W)	I <sub>C</sub> (mA)	V <sub>CEO</sub> (V)	V <sub>CBO</sub> (V)	H <sub>FE</sub> min	H <sub>FE</sub> max	HFE @		V <sub>CE(sat)</sub> max (V)	V <sub>CE(sat)</sub> @	
								I <sub>C</sub> (mA)	V <sub>CE</sub> (V)		I <sub>C</sub> (mA)	I <sub>B</sub> (mA)
BCP52-16	PNP	1.4	1000	60	60	100	250	150	2	0.5	500	50
BCP53-16	PNP	1.4	1000	80	100	100	250	150	2	0.5	500	50
BCP55-16	NPN	1.4	1000	60	60	100	250	150	2	0.5	500	50
BCP56-16	NPN	1.4	1000	80	100	100	250	150	2	0.5	500	50
BF720	NPN	1.4	100	300	300	50	-	25	20	0.6	30	5
BF721	PNP	1.4	100	300	300	50	-	25	20	0.6	30	5
PZT3904	NPN	1	200	40	60	100	300	10	1	0.2	50	5
PZT3906	PNP	1	200	40	40	100	300	10	1	0.2	50	5
STZT222A	NPN	1.3	800	40	75	100	300	150	10	1	500	50
STZT2907A	PNP	1.3	800	60	60	100	300	150	10	1.6	500	50
STZTA42	NPN	1.5	300	300	300	40	-	10	10	0.5	20	2
STZTA92	PNP	1.5	300	300	300	40	-	10	10	0.5	20	2a

## SOT-89



P/N	Polarity	P <sub>tot</sub> (W)	I <sub>C</sub> (mA)	V <sub>CEO</sub> (V)	V <sub>CBO</sub> (V)	H <sub>FE</sub> min	H <sub>FE</sub> max	HFE @		V <sub>CE(sat)</sub> max (V)	V <sub>CE(sat)</sub> @	
								I <sub>C</sub> (mA)	V <sub>CE</sub> (V)		I <sub>C</sub> (mA)	I <sub>B</sub> (mA)
BF620	NPN	1.2	100	300	300	50	-	25	20	0.6	30	5
BF621	PNP	1.2	100	300	300	50	-	25	20	0.6	30	5
STF2222A	NPN	1.2	600	40	75	100	300	150	10	1	500	50
STF2907A	PNP	1.2	600	60	60	100	300	150	10	1.6	500	50
STF42	NPN	1.3	200	300	300	50	-	25	20	0.5	20	2
STF92	PNP	1.3	200	300	300	50	-	25	20	0.5	20	2

## SOT-323



P/N	Polarity	P <sub>tot</sub> (W)	I <sub>C</sub> (mA)	V <sub>CEO</sub> (V)	V <sub>CBO</sub> (V)	H <sub>FE</sub> min	H <sub>FE</sub> max	HFE @		V <sub>CE(sat)</sub> max (V)	V <sub>CE(sat)</sub> @	
								I <sub>C</sub> (mA)	V <sub>CE</sub> (V)		I <sub>C</sub> (mA)	I <sub>B</sub> (mA)
BC847BW	NPN	0.2	100	45	50	200	450	2	5	0.6	100	5
BC847CW	NPN	0.2	100	45	50	420	800	2	5	0.6	100	5
BC857BW	PNP	0.2	100	45	50	220	475	2	5	0.65	100	5
SO2222AW	NPN	0.2	600	40	75	100	300	150	10	1	500	50
SO2907AW	PNP	0.2	600	60	60	100	300	150	10	1.6	500	50

## T0-18



P/N	Polarity	P <sub>tot</sub> (W)	I <sub>C</sub> (mA)	V <sub>CEO</sub> (V)	V <sub>CBO</sub> (V)	H <sub>FE</sub> min	H <sub>FE</sub> max	HFE @		V <sub>CE(sat)</sub> max (V)	V <sub>CE(sat)</sub> @	
								I <sub>C</sub> (mA)	V <sub>CE</sub> (V)		I <sub>C</sub> (mA)	I <sub>B</sub> (mA)
2N2222A	NPN	1.8	800	40	75	40	120	150	10	0.3	150	15
2N2907A	PNP	1.8	600	60	60	40	120	150	10	0.4	150	15
2N720A	NPN	1.8	500	80	120	40	120	150	10	1.2	50	5
BC107	NPN	0.75	100	45	50	110	450	2	5	0.6	100	5
BC107B	NPN	0.75	100	45	50	200	450	2	5	0.6	100	5
BC177	PNP	0.75	100	45	50	125	500	2	5	0.2	100	5
BC177B	PNP	0.75	100	45	50	240	500	2	5	0.2	100	5
BC394	NPN	1.4	100	180	180	30	100	10	10	0.3	10	1
BCY59IX	NPN	1	200	45	45	250	460	2	5	0.7	100	2.5
BCY59VIII	NPN	1	200	45	45	180	310	2	5	0.7	100	2.5
BCY59X	NPN	1	200	45	45	380	630	2	5	0.7	100	2.5
BCY79IX	PNP	1	200	45	45	250	460	2	5	0.8	100	2.5
BCY79VIII	PNP	1	200	45	45	180	310	2	5	0.8	100	2.5
BCY79X	PNP	1	200	45	45	380	630	2	5	0.8	100	2.5

## T0-39



P/N	Polarity	P <sub>tot</sub> (W)	I <sub>C</sub> (mA)	V <sub>CEO</sub> (V)	V <sub>CBO</sub> (V)	H <sub>FE</sub> min	H <sub>FE</sub> max	HFE @		V <sub>CE(sat)</sub> max (V)	V <sub>CE(sat)</sub> @	
								I <sub>C</sub> (mA)	V <sub>CE</sub> (V)		I <sub>C</sub> (mA)	I <sub>B</sub> (mA)
2N1711	NPN	3	500	50	75	40	120	150	10	1.5	150	15
2N1893	PNP	3	500	100	120	40	120	150	10	0.5	150	15
2N2102	NPN	5	1000	65	120	40	120	150	10	0.5	150	15
2N2219A	NPN	3	800	30	60	100	300	150	10	0.4	150	15
2N2905A	PNP	3	600	40	60	40	120	150	10	0.4	150	15
2N3019	NPN	5	1000	80	140	100	300	150	10	0.2	150	15
2N4033	PNP	4	1000	80	80	100	300	100	5	0.15	150	15
2N5320	NPN	10	2000	75	100	30	130	500	4	0.5	500	50
2N5322	PNP	10	2000	75	100	30	130	500	4	0.7	500	50
BC141-16	NPN	3.7	1000	60	100	100	250	100	1	0.35	500	50
BC161-16	PNP	3.7	1000	60	60	100	250	100	1	0.35	500	50

# CROSS REFERENCE

Industry Standard	ST Nearest	ST Replacement
2N3904		2N3904
2N3906		2N3906
2N4401		PN2222A
2N4403		PN2907A
2PB709AR	BC857B (2)	
2PD601	BC847B (2)	
2PD602	SO2222A (2)	
2SA1015	2N3906 (1)	
2SA1037	BC857B (2)	
2SA1767		BF421
2SA1774	BC857BW (2)	
2SA673	PN2907A (1)	
2SA733	BC557B (1)	
2SB1132		STF2907A
2SB647	STX817 (3)	
2SB709AR	BC857B (2)	
2SC1213	BC337-25 (1)	
2SC1573A		BF420
2SC1623		BC847B
2SC1815	2N3904 (1)	
2SC2411K		SO2222A
2SC2412K	BC847B (2)	
2SC4081		BC847BW
2SC4097		SO2222AW
2SC4617	BC847BW (2)	
2SC945	BC547B (1)	
2SD1664	STF715 (3)	
2SD601A	BC847B (2)	
2SD601AR	BC847B (2)	
2SD667	STX715 (1)	
BC237		BC547B
BC237B		BC547B
BC307		BC557B
BC307B		BC557B
BC327		BC327-25
BC327A	BC327-25	
BC327-16		BC327-25
BC327-25		BC327-25
BC327-40		BC327-40

Industry Standard	ST Nearest	ST Replacement
BC328		BC327-25
BC328-16		BC327-25
BC328-25		BC327-25
BC328-40		BC327-40
BC337		BC337-25
BC337A	BC337-25	
BC337-16		BC337-25
BC337-25		BC337-25
BC337-40		BC337-40
BC338		BC337-25
BC338-16		BC337-25
BC338-25		BC337-25
BC338-40		BC337-40
BC547		BC547B
BC547A	BC547B	
BC547B		BC547B
BC547C		BC547C
BC548		BC547B
BC548A	BC547B	
BC548B		BC547B
BC548C		BC547C
BC549		BC547B
BC549B		BC547B
BC549C		BC547C
BC550		BC547B
BC550B		BC547B
BC550C		BC547C
BC557		BC557B
BC557A	BC557B	
BC557B		BC557B
BC557C	BC557B	
BC558		BC557B
BC558A	BC557B	
BC558B		BC557B
BC558C	BC557B	
BC559		BC557B
BC559A	BC557B	
BC559B		BC557B
BC559C	BC557B	

(1) Different PIN OUT (2) Similar Package (3) Medium Power Transistor



# CROSS REFERENCE

Industry Standard	ST Nearest	ST Replacement
BC560B	BC557B	
BC560C	BC557B	
BC807	BC807-25	
BC807-16	BC807-25	
BC807-25		BC807-25
BC807-40		BC807-40
BC807W	SO2907AW	
BC807-16W	SO2907AW	
BC807-25W	SO2907AW	
BC807-40W	SO2907AW	
BC808	BC807-25	
BC808-16	BC807-25	
BC808-25		BC807-25
BC808-40		BC807-40
BC808W	SO2907AW	
BC808-16W	SO2907AW	
BC808-25W	SO2907AW	
BC808-40W	SO2907AW	
BC817	BC817-25	
BC817-16	BC817-25	
BC817-25		BC817-25
BC817-40		BC817-40
BC817W	SO2222AW	
BC817-16W	SO2222AW	
BC817-25W	SO2222AW	
BC817-40W	SO2222AW	
BC818	BC817-25	
BC818-16	BC817-25	
BC818-25	BC817-25	
BC818-40	BC817-40	
BC818W	SO2222AW	
BC818-16W	SO2222AW	
BC818-25W	SO2222AW	
BC818-40W	SO2222AW	
BC847	BC847B	
BC847A	BC847B	
BC847B		BC847B
BC847C		BC847C
BC847AT	BC847B (2)	
BC847BT	BC847B (2)	
BC847CT	BC847C (2)	
BC847W	BC847BW	
BC847AW	BC847BW	
BC847BW		BC847BW
BC847CW		BC847CW
BC848	BC847B	
BC848A	BC847B	
BC848B	BC847B	
BC848C	BC847C	
BC848AT	BC847B (2)	
BC848BT	BC847B (2)	
BC848CT	BC847C (2)	
BC848W	BC847BW	
BC848AW	BC847BW	
BC848BW	BC847BW	
BC848CW	BC847CW	
BC849	BC847B	
BC849B	BC847B	

Industry Standard	ST Nearest	ST Replacement
BC850B		BC847B
BC850C		BC847C
BC850W		BC847BW
BC850BW		BC847BW
BC850CW		BC847CW
BC857		BC857B
BC857A	BC857B	
BC857B		BC857B
BC857C	BC857B	
BC857W		BC857BW
BC857AW	BC857BW	
BC857BW		BC857BW
BC857CW	BC857BW	
BC858		BC857B
BC858A	BC857B	
BC858B		BC857B
BC858C	BC857B	
BC858W		BC857BW
BC858AW	BC857BW	
BC858BW		BC857BW
BC858CW	BC857BW	
BC859		BC857B
BC859A	BC857B	
BC859B		BC857B
BC859C	BC857B	
BC859W		BC857BW
BC859AW	BC857BW	
BC859BW		BC857BW
BC859CW	BC857BW	
BC860		BC857B
BC860A	BC857B	
BC860B		BC857B
BC860C	BC857B	
BC860W		BC857BW
BC860AW	BC857BW	
BC860BW		BC857BW
BC860CW	BC857BW	
BCP51	BCP52-16	
BCP52		BCP52-16
BCP53		BCP53-16
BCP54	BCP55-16	
BCP55		BCP55-16
BCP56		BCP56-16
BCX17		BCX17
BCX18		BCX17
BCX19		BCX19
BCX51	STF2907A	
BCX52	STF2907A	
BCX53	STF817 (3)	
BCX54	STF2222A	
BCX55	STF2222A	
BCX56	STF715 (3)	
BF420		BF420
BF421		BF421
BF422		BF420
BF423		BF421
BF720		BF720
BF721		BF721

(1) Different PIN OUT (2) Similar Package (3) Medium Power Transistor

# CROSS REFERENCE

Industry Standard	ST Nearest	ST Replacement
BF722		BF720
BF723		BF721
BFN38		BF720
CZTA42		STZTA42
CZTA92		STZTA92
KSA539	2N2907A	
KSA643	2N2907A	
KSA733	2N3906	
KSC1623		BC847B
KSC815		2N3904
MMBT3094		MMBT3904
MMBT3906		MMBT3906
MMBT4401		SO2222A
MMBT4403		SO2907A
MMBTA42		MMBTA42

Industry Standard	ST Nearest	ST Replacement
MMBTA92		MMBTA92
MPSA42		STPSA42
MPSA92		STPSA92
MSB709	BC857B (2)	
PMBS3904		MMBT3904
PMBS3906		MMBT3906
PMBT3904		MMBT3904
PMBT3906		MMBT3906
PMBT6428	BC847B	
PMST6428	BC847BW	
PZTA42		STZTA42
PZTA92		STZTA92
SMBTA42		MMBTA42
SMBTA92		MMBTA92

(1) Different PIN OUT (2) Similar Package (3) Medium Power Transistor



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**Full product information at [www.st.com/smallsignal](http://www.st.com/smallsignal)**

