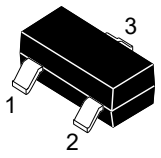
HI-SINCERITY
MICROELECTRONICS CORP.

HMBT4401XLT1G

General Purpose Transistor NPN Silicon

Features

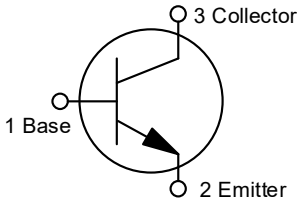
- RoHS Compliant and Halogen Free



SOT-23 (TO-236)

Ordering Information

Device	Marking	Shipping
HMBT4401XLT1G	2X	3000/Tape & Reel



Maximum Ratings (T_A=25°C)

Parameter	Symbol	Limits	Units
Collector-Emitter Voltage	V_{CEO}	40	Vdc
Collector-Base Voltage	V_{CBO}	60	Vdc
Emitter-Base Voltage	V_{EBO}	6	Vdc
Collector Current-Continuous	I_C	600	mAdc

Thermal Characteristics

Parameter	Symbol	Limits	Units
Total Device Dissipation FR-5 Board*1, T_A=25°C	P_D	225	mW
Total Device Dissipation, Derate above 25°C	P_D	1.8	mW/°C
Thermal Resistance, Junction to Ambient*1	$R_{\Theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate*2, T_A=25°C	P_D	300	mW
Total Device Dissipation, Derate above 25°C	P_D	2.4	mW/°C
Thermal Resistance, Junction to Ambient*2	$R_{\Theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	°C

*1 FR-5=1.0x0.75x0.062 in
*2 Alumina=0.4x0.3x0.024 in. 99.5% alumina.

Electrical Characteristics (T_A=25°C)

Off Characteristics

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector-Emitter Breakdown Voltage (I_C=1.0mAdc, I_B=0)	$V_{(BR)CEO}$	40	-	-	V
Collector-Base Breakdown Voltage (I_C=0.1mAdc, I_E=0)	$V_{(BR)CBO}$	60	-	-	V
Emitter-Base Breakdown Voltage (I_E=0.1mAdc, I_C=0)	$V_{(BR)EBO}$	6	-	-	V
Collector Cutoff Current (V_{CE}=35Vdc, $V_{EB(off)}$=0.4Vdc)	I_{CEX}	-	-	0.1	uA
Base Cutoff Current (V_{CE}=35Vdc, $V_{EB(off)}$=0.4Vdc)	I_{BEV}	-	-	0.1	uA

On Characteristics

Characteristic	Symbol	Min.	Typ.	Max.	Unit
DC Current Gain (I_C=0.1mAdc, V_{CE}=1.0Vdc)	hFE	20	-	-	-
DC Current Gain (I_C=1.0mAdc, V_{CE}=1.0Vdc)	hFE	40	-	-	-
DC Current Gain (I_C=10mAdc, V_{CE}=1.0Vdc)	hFE	80	-	-	-
DC Current Gain (I_C=150mAdc, V_{CE}=1.0Vdc)	hFE	100	-	300	-
DC Current Gain (I_C=500mAdc, V_{CE}=2.0Vdc)	hFE	40	-	-	-
Collector-Emitter Saturation Voltage*3 (I_C=150mAdc, I_B=15mAdc)	$V_{CE(sat)}$	-	-	0.4	V
Collector-Emitter Saturation Voltage*3 (I_C=500mAdc, I_B=50mAdc)	$V_{CE(sat)}$	-	-	0.75	V
Base-Emitter Saturation Voltage (I_C=150mAdc, I_B=15mAdc)	$V_{BE(sat)}$	0.75	-	0.95	V
Base-Emitter Saturation Voltage (I_C=500mAdc, I_B=50mAdc)	$V_{BE(sat)}$	-	-	1.2	V

Small Signal Characteristics

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Current Gain Bandwidth Product (I_C=20mAdc, V_{CE}=20Vdc, f=100MHz)	f_T	250	-	-	MHz
Collector Base Capacitance (V_{CB}=5.0Vdc, I_E=0, f=1.0MHz)	C_{cb}	-	-	6.5	pF
Emitter Base Capacitance (V_{EB}=0.5Vdc, I_C=0, f=1.0MHz)	C_{eb}	-	-	30	pF
Input Impedance (V_{CE}=10Vdc, I_C=1.0mAdc, f=1.0 kHz)	h_{ie}	1	-	15	KΩ
Voltage Feedback Ratio (V_{CE}=10Vdc, I_C=1.0mAdc, f=1.0kHz)	h_{re}	0.1	-	8	$X10^{-4}$
Small Signal Current Gain (V_{CE}=10Vdc, I_C=1.0mAdc, f=1.0 kHz)	h_{fe}	40	-	500	
Output Admittance (V_{CE}=10Vdc, I_C=1.0mAdc, f=1.0kHz)	h_{oe}	1	-	30	umhos

Switching Characteristics

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Delay Time (V_{CC}=30Vdc, V_{EB}=2.0Vdc, I_C=150mAdc, I_{B1}=15mAdc)	t_d	-	-	15	nS
Rise Time (V_{CC}=30Vdc, V_{EB}=2.0Vdc, I_C=150mAdc, I_{B1}=15mAdc)	t_r	-	-	20	nS
Storage Time (V_{CC}=30Vdc, I_C=150mAdc, I_{B1}=I_{B2}=15mAdc)	t_s	-	-	225	
Fall Time (V_{CC}=30Vdc, I_C=150mAdc, I_{B1}=I_{B2}=15mAdc)	t_f	-	-	30	

*3 Pulse Test: Pulse Width<300 μs, Duty Cycle<2.0%

Electrical Characteristics Curves

Switching Time Equivalent Test Circuits

Figure 1. Turn–On Time

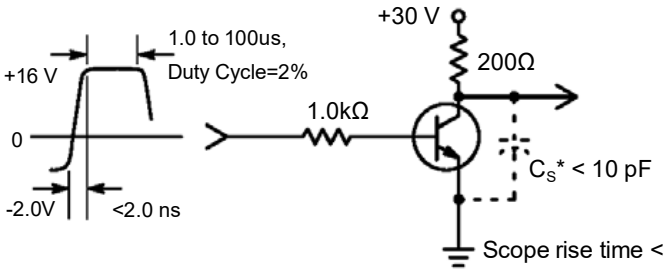
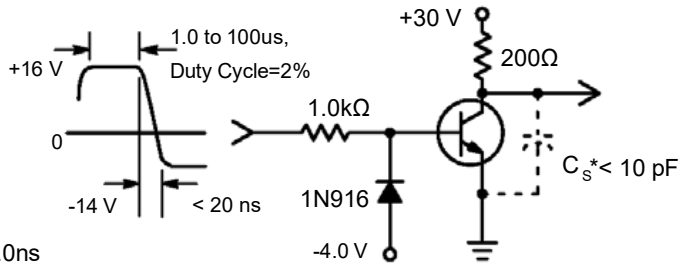


Figure 2. Turn–Off Time



*Total shunt capacitance of test jig connectors, and oscilloscope

Figure 3. DC Current Gain

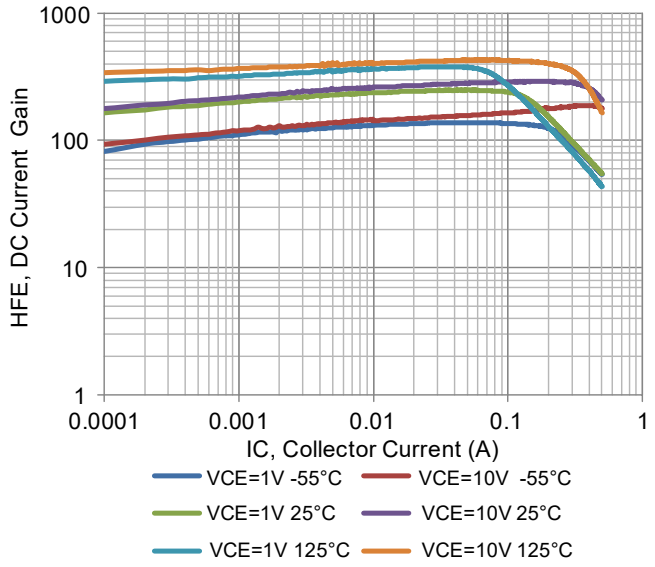


Figure 4. Collector Saturation Region

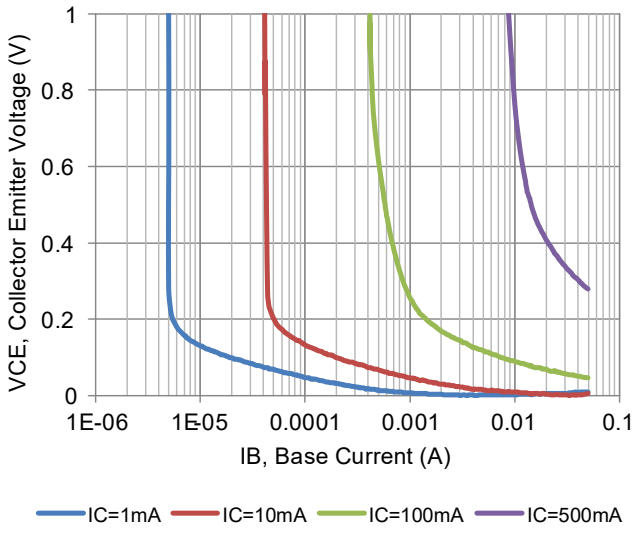


Figure 5. "On" Voltage

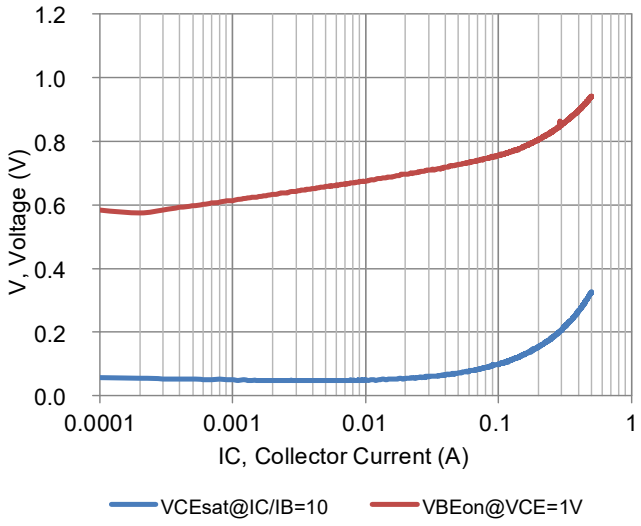
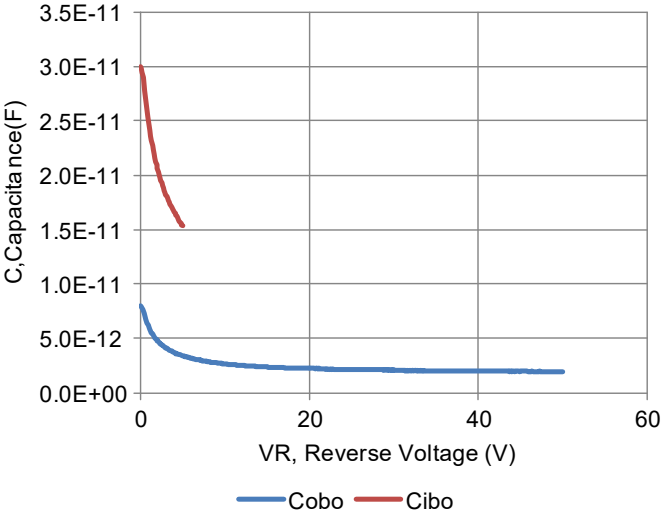


Figure 6. Capacitance



Electrical Characteristics Curves

Figure 7. Collector Emitter Saturation Voltage vs. Collector Current

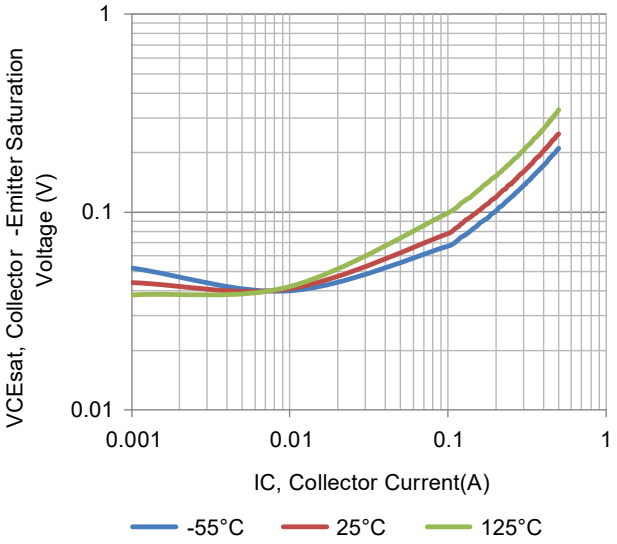


Figure 8. Base Emitter Saturation Voltage vs. Collector Current

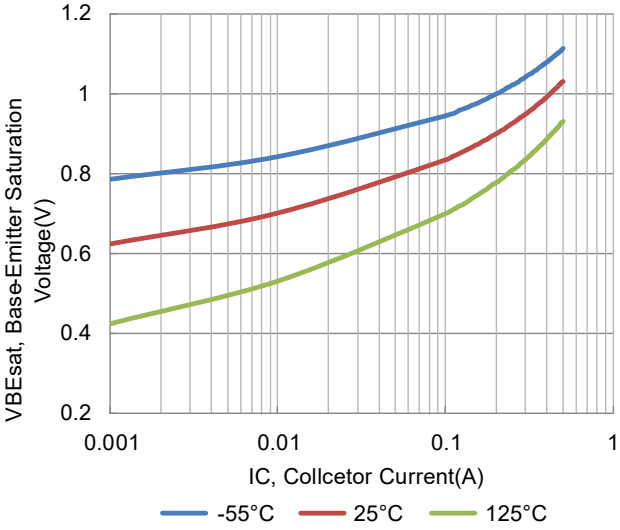
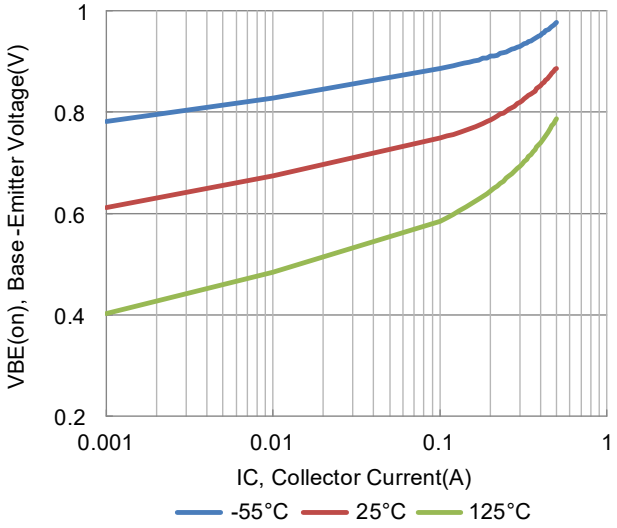
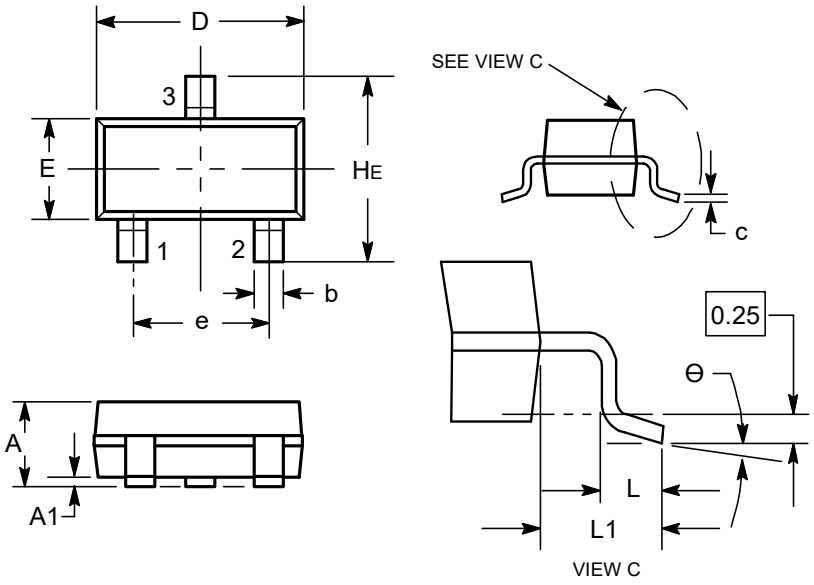


Figure 9. Base Emitter Voltage vs. Collector Current



Package Dimension



DIM	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.89	1	1.11	0.035	0.04	0.044
A1	0.01	0.06	0.1	0.001	0.002	0.004
b	0.37	0.44	0.5	0.015	0.018	0.02
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.9	3.04	0.11	0.114	0.12
E	1.20	1.3	1.4	0.047	0.051	0.055
e	1.78	1.9	2.04	0.07	0.075	0.081
L	0.10	0.2	0.3	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
H_E	2.10	2.4	2.64	0.083	0.094	0.104
θ	0^O	-	10^O	0^O	-	10^O

Notes:
1. Dimensioning and tolerancing per ansi Y14.5m, 1982.
2. Controlling Dimension: Millimeter.
3. Maximum lead thickness includes lead finish. Minimum lead thickness is the minimum thickness of base material.
4. Dimensions d and e do not include mold flash, protrusions or gate burrs.

Soldering Footprint