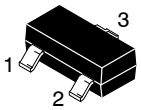
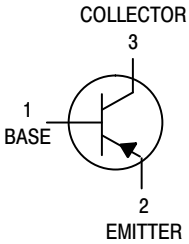
High Voltage Transistor

PNP Silicon

MMBT6520L, NSVMMBT6520L



SOT−23 (TO−236)
CASE 318
STYLE 6



Features

- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS

Symbol	Rating	Value	Unit
V_{CEO}	Collector−Emitter Voltage	−350	Vdc
V_{CBO}	Collector−Base Voltage	−350	Vdc
V_{EBO}	Emitter−Base Voltage	−5.0	Vdc
I_B	Base Current	−250	mA
I_C	Collector Current − Continuous	−500	mAdc

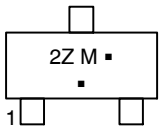
THERMAL CHARACTERISTICS

Symbol	Characteristic	Max	Unit
P_D	Total Device Dissipation FR−5 Board, (Note 1) T_A = 25°C Derate above 25°C	225 1.8	mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient	556	°C/W
P_D	Total Device Dissipation Alumina Substrate, (Note 2) T_A = 25°C Derate above 25°C	300 2.4	mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient	417	°C/W
T_J, T_{stg}	Junction and Storage Temperature	−55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR−5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

MARKING DIAGRAM



2Z = Device Code
M = Date Code*
▪ = Pb−Free Package
(Note: Microdot may be in either location)
*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
MMBT6520LT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel
NSVMMBT6520LT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel

DISCONTINUED (Note 1)

MMBT6520LT3G	SOT−23 (Pb−Free)	10,000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

1. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

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ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Characteristic	Min	Max	Unit
OFF CHARACTERISTICS				
$V_{(BR)CEO}$	Collector−Emitter Breakdown Voltage (I_C = −1.0 mA)	−350	–	Vdc
$V_{(BR)CBO}$	Collector−Base Breakdown Voltage (I_C = −100 μA)	−350	–	Vdc
$V_{(BR)EBO}$	Emitter−Base Breakdown Voltage (I_E = −10 μA)	−5.0	–	Vdc
I_{CBO}	Collector Cutoff Current (V_{CB} = −250 V)	–	−50	nA
I_{EBO}	Emitter Cutoff Current (V_{EB} = −4.0 V)	–	−50	nA
ON CHARACTERISTICS				
h_{FE}	DC Current Gain			–
	(I_C = −1.0 mA, V_{CE} = −10 V)	20	–	
	(I_C = −10 mA, V_{CE} = −10 V)	30	–	
	(I_C = −30 mA, V_{CE} = −10 V)	30	200	
	(I_C = −50 mA, V_{CE} = −10 V)	20	200	
	(I_C = −100 mA, V_{CE} = −10 V)	15	–	
$V_{CE(sat)}$	Collector−Emitter Saturation Voltage			Vdc
	(I_C = −10 mA, I_B = −1.0 mA)	–	−0.30	
	(I_C = −20 mA, I_B = −2.0 mA)	–	−0.35	
	(I_C = −30 mA, I_B = −3.0 mA)	–	−0.50	
	(I_C = −50 mA, I_B = −5.0 mA)	–	−1.0	
$V_{BE(sat)}$	Base−Emitter Saturation Voltage			Vdc
	(I_C = −10 mA, I_B = −1.0 mA)	–	−0.75	
	(I_C = −20 mA, I_B = −2.0 mA)	–	−0.85	
	(I_C = −30 mA, I_B = −3.0 mA)	–	−0.90	
$V_{BE(on)}$	Base−Emitter On Voltage (I_C = −100 mA, V_{CE} = −10 V)	–	−2.0	Vdc
SMALL−SIGNAL CHARACTERISTICS				
f_T	Current−Gain – Bandwidth Product (I_C = −10 mA, V_{CE} = −20 V, f = 20 MHz)	40	200	MHz
C_{cb}	Collector−Base Capacitance (V_{CB}= −20 V, f = 1.0 MHz)	–	6.0	pF
C_{eb}	Emitter−Base Capacitance (V_{EB}= −0.5 V, f = 1.0 MHz)	–	100	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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TYPICAL CHARACTERISTICS

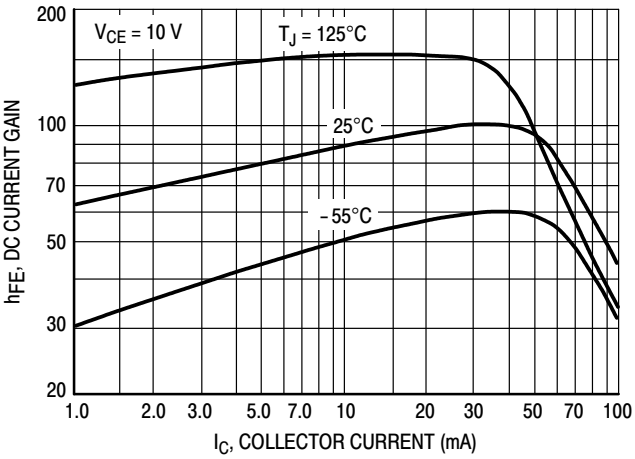

Figure 1. DC Current Gain

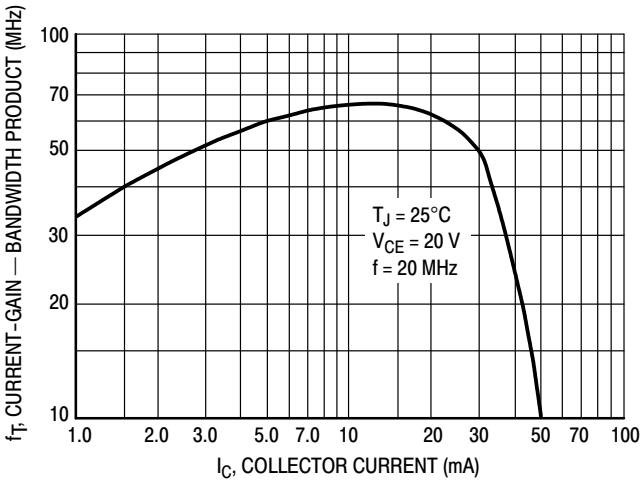

Figure 2. Current−Gain — Bandwidth Product

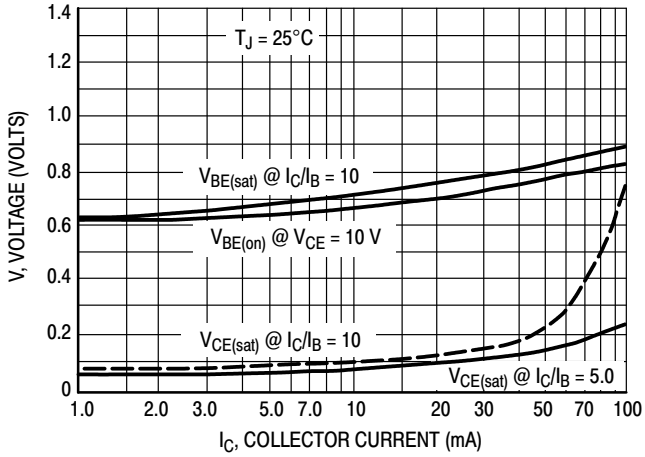

Figure 3. “On” Voltages

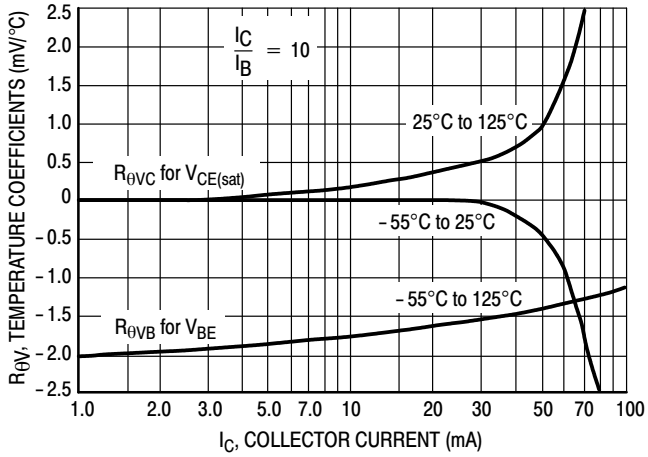

Figure 4. Temperature Coefficients

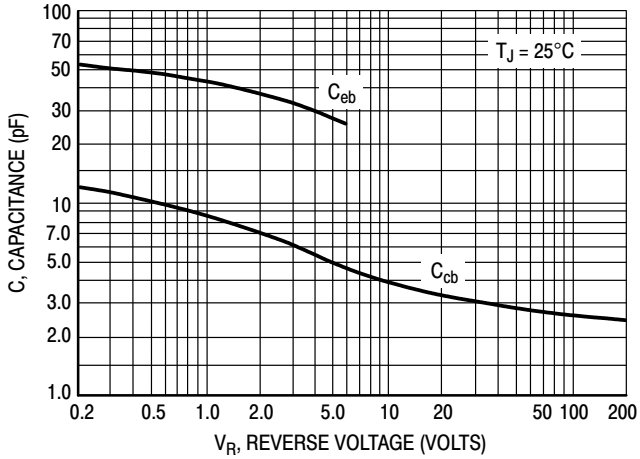

Figure 5. Capacitance

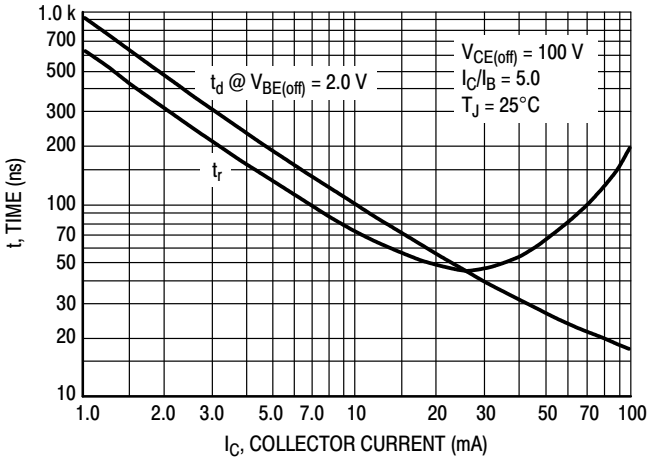

Figure 6. Turn−On Time

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TYPICAL CHARACTERISTICS (continued)

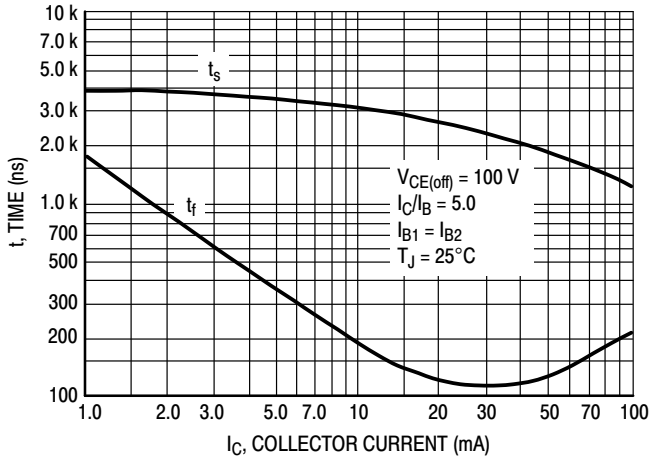

Figure 7. Turn−Off Time

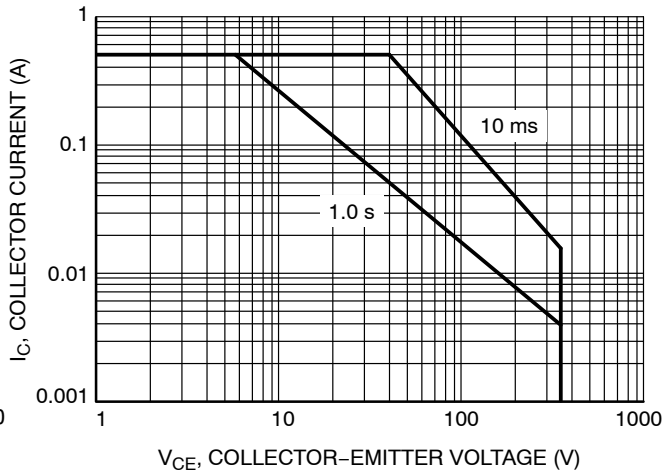

Figure 8. Safe Operating Area

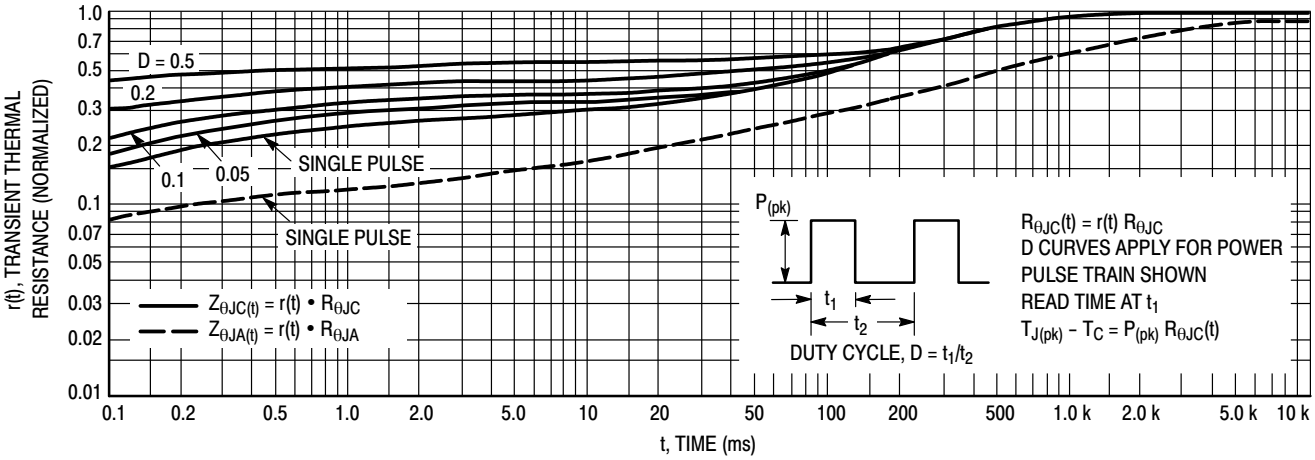

Figure 9. Thermal Response

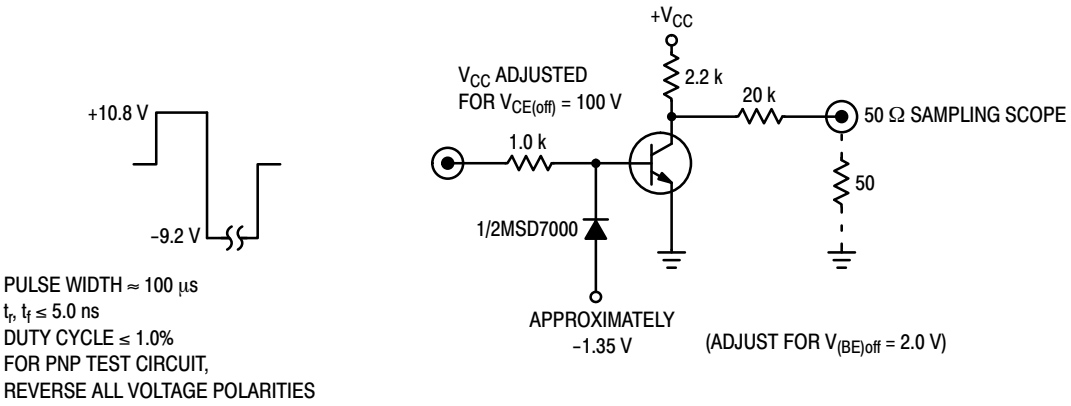

Figure 10. Switching Time Test Circuit

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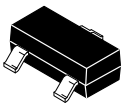
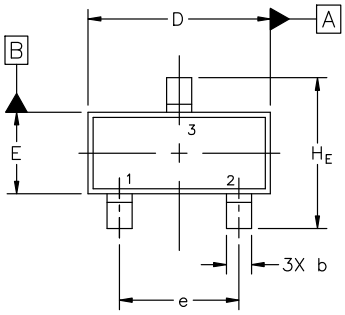


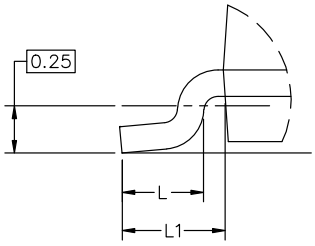
SCALE 4:1

SOT−23 (TO−236) 2.90x1.30x1.00 1.90P
CASE 318
ISSUE AU

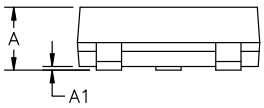
DATE 14 AUG 2024



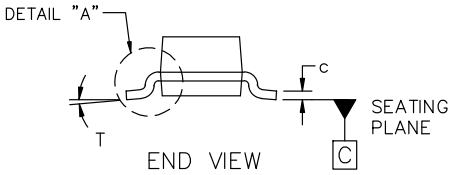
TOP VIEW



DETAIL "A"
Scale 3:1



SIDE VIEW

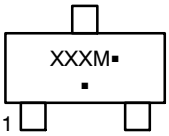


END VIEW

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
H_E	2.10	2.40	2.64
T	0°	−−−	10°

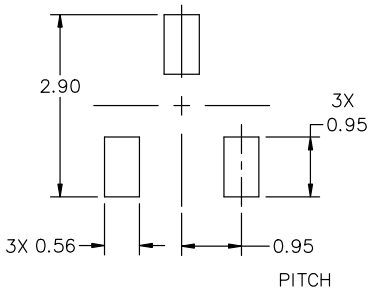
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



RECOMMENDED
MOUNTING FOOTPRINT

* For additional information on our Pb−Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

STYLES ON PAGE 2

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DESCRIPTION:	**SOT−23 (TO−236) 2.90x1.30x1.00 1.90P**	**PAGE 1 OF 2**

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CASE 318
ISSUE AU

DATE 14 AUG 2024

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE−ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE−ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

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