MBT35200MT1

High Current Surface Mount PNP Silicon Switching Transistor for Load Management in Portable Applications

ON Semiconductor®

http://onsemi.com

35 VOLTS
2.0 AMPS
PNP TRANSISTOR

CASE 318G
TSOP–6
STYLE 6

Features

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

MAXIMUM RATINGS (T_A = 25°C)

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	V_{CEO}	−35	Vdc
Collector-Base Voltage	V_{CBO}	−55	Vdc
Emitter-Base Voltage	V_{EBO}	−5.0	Vdc
Collector Current – Continuous	I_C	−2.0	Adc
Collector Current – Peak	I_{CM}	−5.0	A
Electrostatic Discharge	ESD	HBM Class 3 MM Class C	

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D (Note 1)	625 5.0	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$ (Note 1)	200	°C/W
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D (Note 2)	1.0 8.0	W mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$ (Note 2)	120	°C/W
Thermal Resistance, Junction−to−Lead #1	$R_{\theta JL}$	80	°C/W
Total Device Dissipation (Single Pulse < 10 sec.)	$P_{Dsingle}$ (Notes 2 & 3)	1.75	W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.
1. FR−4 @ Minimum Pad
2. FR−4 @ 1.0 X 1.0 inch Pad
3. ref: Figure 9

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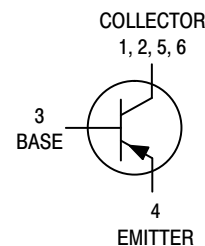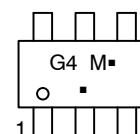

COLLECTOR
1, 2, 5, 6

3
BASE

4
EMITTER

MARKING DIAGRAM

G4 M▪

1

G4 = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping[†]
MBT35200MT1G	TSOP−6 (Pb−Free)	3,000 / Tape & Reel
SMBT35200MT1G	TSOP−6 (Pb−Free)	3,000 / Tape & Reel

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

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

Characteristic	Symbol	Min	Typical	Max	Unit
OFF CHARACTERISTICS					
Collector – Emitter Breakdown Voltage (I_C = –10 mAdc, I_B = 0)	$V_{(BR)CEO}$	–35	–45	–	Vdc
Collector – Base Breakdown Voltage (I_C = –0.1 mAdc, I_E = 0)	$V_{(BR)CBO}$	–55	–65	–	Vdc
Emitter – Base Breakdown Voltage (I_E = –0.1 mAdc, I_C = 0)	$V_{(BR)EBO}$	–5.0	–7.0	–	Vdc
Collector Cutoff Current (V_{CB} = –35 Vdc, I_E = 0)	I_{CBO}	–	–0.03	–0.1	µAdc
Collector–Emitter Cutoff Current (V_{CES} = –35 Vdc)	I_{CES}	–	–0.03	–0.1	µAdc
Emitter Cutoff Current (V_{EB} = –4.0 Vdc)	I_{EBO}	–	–0.01	–0.1	µAdc
ON CHARACTERISTICS					
DC Current Gain (Note 1) (I_C = –1.0 A, V_{CE} = –1.5 V) (I_C = –1.5 A, V_{CE} = –1.5 V) (I_C = –2.0 A, V_{CE} = –3.0 V)	h_{FE}	100 100 100	200 200 200	– 400 –	
Collector – Emitter Saturation Voltage (Note 1) (I_C = –0.8 A, I_B = –0.008 A) (I_C = –1.2 A, I_B = –0.012 A) (I_C = –2.0 A, I_B = –0.02 A)	$V_{CE(sat)}$	– – –	–0.125 –0.175 –0.260	–0.15 –0.20 –0.31	V
Base – Emitter Saturation Voltage (Note 1) (I_C = –1.2 A, I_B = –0.012 A)	$V_{BE(sat)}$	–	–0.68	–0.85	V
Base – Emitter Turn–on Voltage (Note 1) (I_C = –2.0 A, V_{CE} = –3.0 V)	$V_{BE(on)}$	–	–0.81	–0.875	V
Cutoff Frequency (I_C = –100 mA, V_{CE} = –5.0 V, f = 100 MHz)	f_T	100	–	–	MHz
Input Capacitance (V_{EB} = –0.5 V, f = 1.0 MHz)	Cibo	–	600	650	pF
Output Capacitance (V_{CB} = –3.0 V, f = 1.0 MHz)	Cobo	–	85	100	pF
Turn–on Time (V_{CC} = –10 V, I_{B1} = –100 mA, I_C = –1 A, R_L = 3 Ω)	t_{on}	–	35	–	nS
Turn–off Time (V_{CC} = –10 V, I_{B1} = I_{B2} = –100 mA, I_C = 1 A, R_L = 3 Ω)	t_{off}	–	225	–	nS

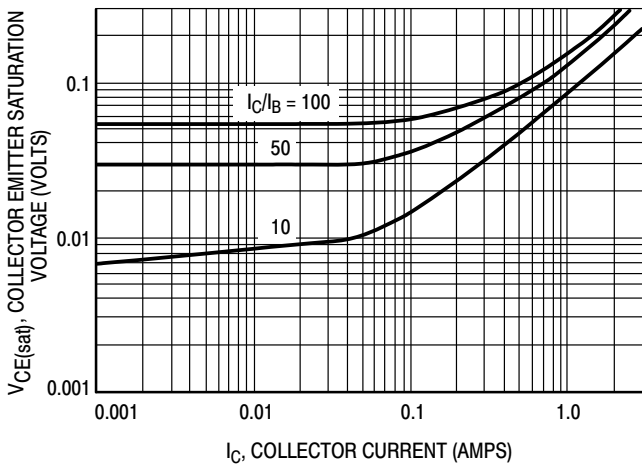1. Pulsed Condition: Pulse Width = 300 µsec, Duty Cycle ≤ 2%

Figure 1. Collector Emitter Saturation Voltage
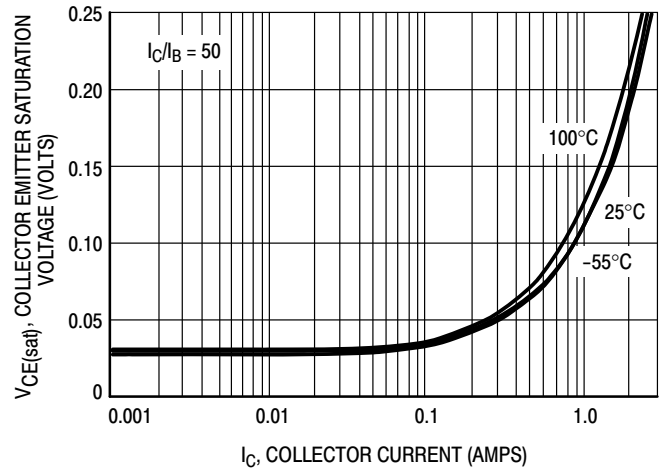versus Collector Current

Figure 2. Collector Emitter Saturation Voltage
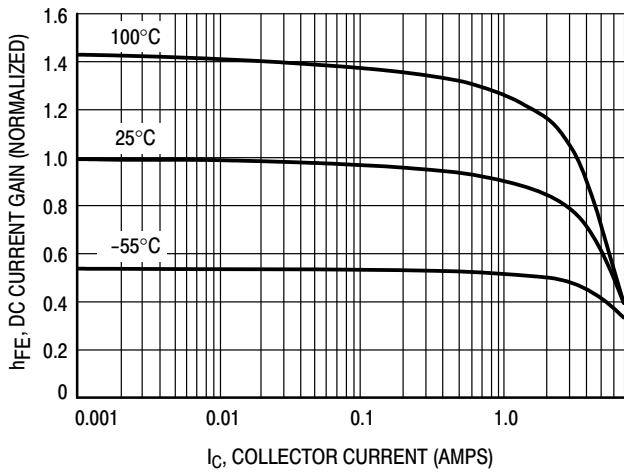versus Collector Current

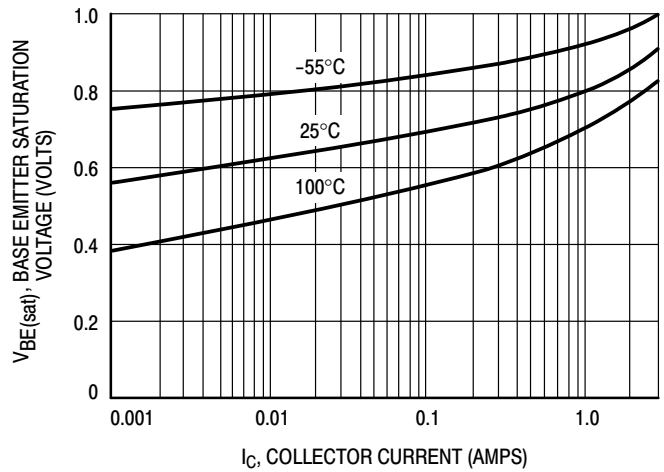Figure 3. DC Current Gain versus
Collector Current

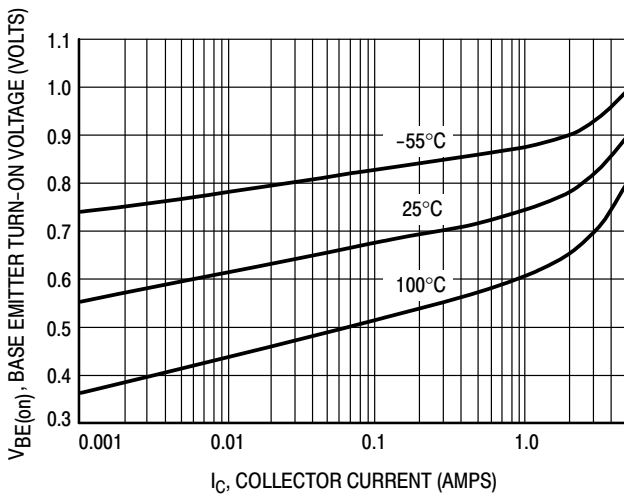Figure 4. Base Emitter Saturation Voltage
versus Collector Current

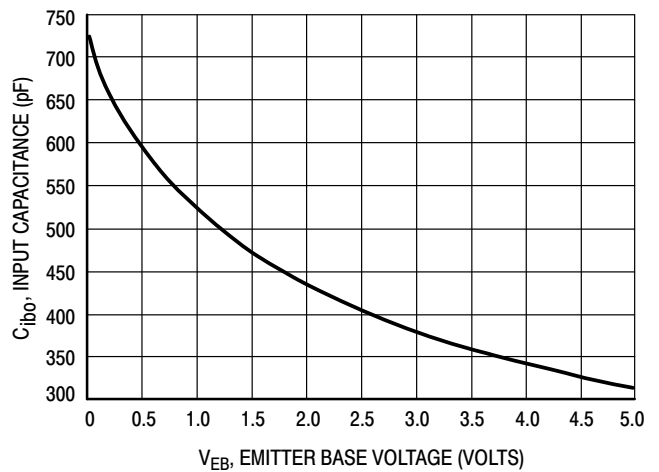Figure 5. Base Emitter Turn−On Voltage
versus Collector Current

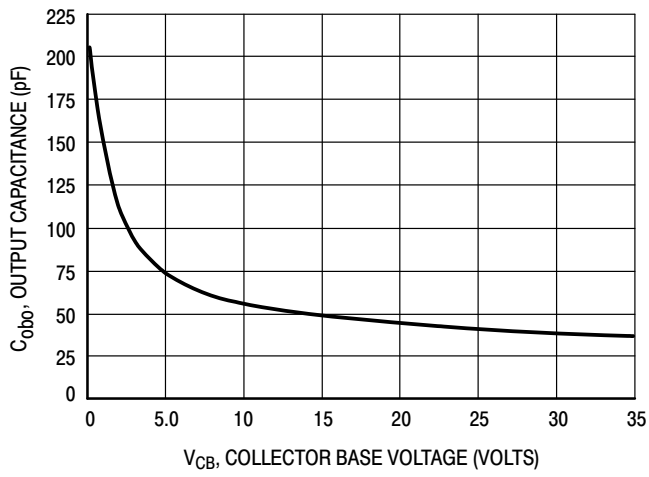
Figure 6. Input Capacitance
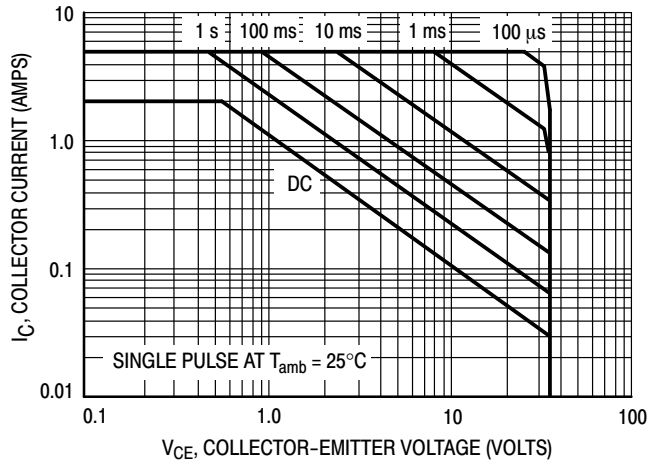
MBT35200MT1

Figure 7. Output Capacitance

x-axis: V_{CB}, COLLECTOR BASE VOLTAGE (VOLTS)
y-axis: C_{obo}, OUTPUT CAPACITANCE (pF)

Figure 8. Safe Operating Area

1 s   100 ms   10 ms   1 ms   100 μs

DC

SINGLE PULSE AT T_{amb} = 25°C

x-axis: V_{CE}, COLLECTOR−EMITTER VOLTAGE (VOLTS)
y-axis: I_C, COLLECTOR CURRENT (AMPS)

D = 0.5
0.2
0.1
0.05
0.02
0.01

SINGLE PULSE

x-axis: t, TIME (sec)
y-axis: r(t), NORMALIZED TRANSIENT THERMAL RESISTANCE
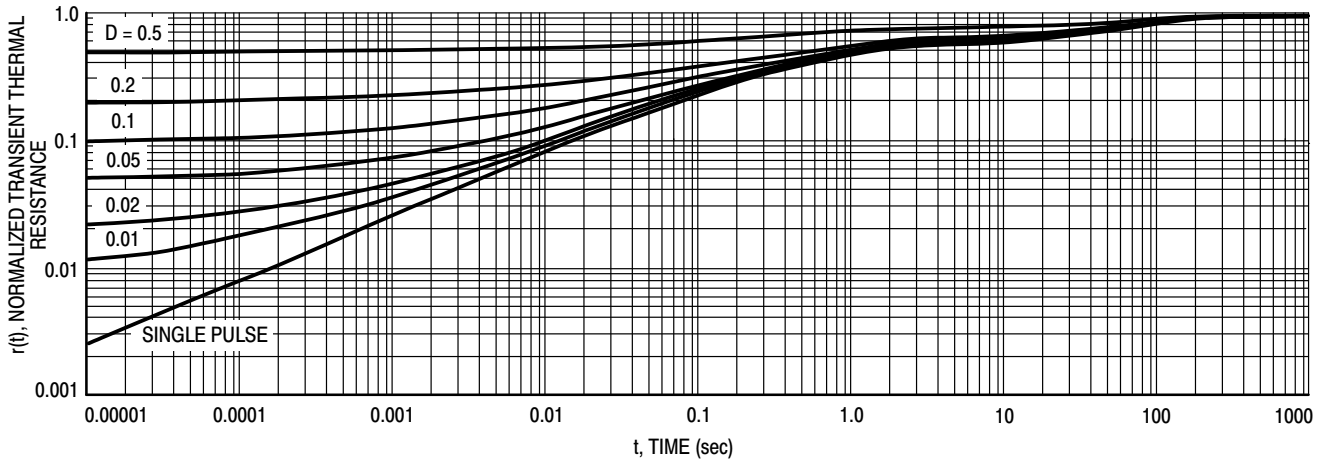
Figure 9. Normalized Thermal Response

TSOP−6
CASE 318G−02
ISSUE V

DATE 12 JUN 2012

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SCALE 2:1

DETAIL Z
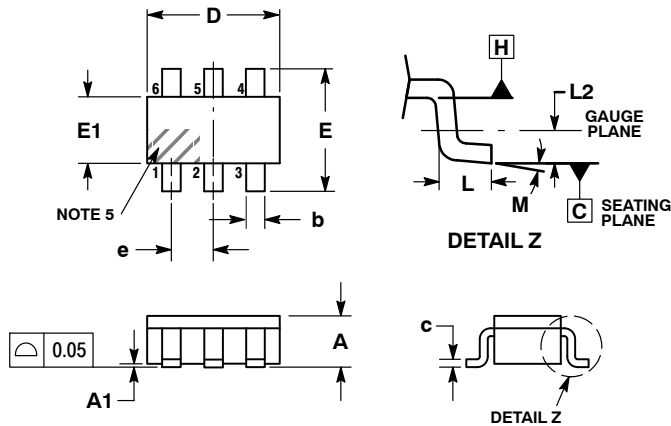
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	−	10°

STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

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

STYLE 3:
PIN 1. ENABLE
2. N/C
3. R BOOST
4. Vz
5. V in
6. V out

STYLE 4:
PIN 1. N/C
2. V in
3. NOT USED
4. GROUND
5. ENABLE
6. LOAD

STYLE 5:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

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

STYLE 7:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. N/C
5. COLLECTOR
6. EMITTER

STYLE 8:
PIN 1. Vbus
2. D(in)
3. D(in)+
4. D(out)+
5. D(out)
6. GND

STYLE 9:
PIN 1. LOW VOLTAGE GATE
2. DRAIN
3. SOURCE
4. DRAIN
5. DRAIN
6. HIGH VOLTAGE GATE

STYLE 10:
PIN 1. D(OUT)+
2. GND
3. D(OUT)−
4. D(IN)−
5. VBUS
6. D(IN)+

STYLE 11:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1/GATE 2

STYLE 12:
PIN 1. I/O
2. GROUND
3. I/O
4. I/O
5. VCC
6. I/O

STYLE 13:
PIN 1. GATE 1
2. SOURCE 2
3. GATE 2
4. DRAIN 2
5. SOURCE 1
6. DRAIN 1

STYLE 14:
PIN 1. ANODE
2. SOURCE
3. GATE
4. CATHODE/DRAIN
5. CATHODE/DRAIN
6. CATHODE/DRAIN

STYLE 15:
PIN 1. ANODE
2. SOURCE
3. GATE
4. DRAIN
5. N/C
6. CATHODE

STYLE 16:
PIN 1. ANODE/CATHODE
2. BASE
3. EMITTER
4. COLLECTOR
5. ANODE
6. CATHODE

STYLE 17:
PIN 1. EMITTER
2. BASE
3. ANODE/CATHODE
4. ANODE
5. CATHODE
6. COLLECTOR

RECOMMENDED SOLDERING FOOTPRINT*

6X 0.60

3.20

6X 0.95

0.95 PITCH
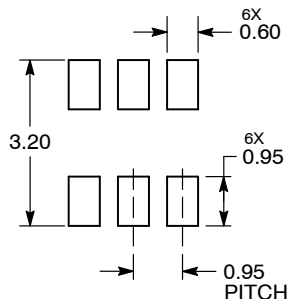
DIMENSIONS: MILLIMETERS

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

GENERIC MARKING DIAGRAM*

XXXAYW■

1

XXX M■

1

IC
XXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
■ = Pb−Free Package

STANDARD
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.

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