40 V, 2.0 A, Low V_{CE(sat)} NPN Transistor

ON Semiconductor's e^2 PowerEdge family of low $V_{CE(sat)}$ transistors are miniature surface mount devices featuring ultra low saturation voltage ($V_{CE(sat)}$) and high current gain capability. These are designed for use in low voltage, high speed switching applications where affordable efficient energy control is important.

Typical applications are DC–DC converters and power management in portable and battery powered products such as cellular and cordless phones, PDAs, computers, printers, digital cameras and MP3 players. Other applications are low voltage motor controls in mass storage products such as disc drives and tape drives. In the automotive industry they can be used in air bag deployment and in the instrument cluster. The high current gain allows e²PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

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



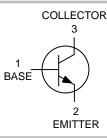
ON Semiconductor®

www.onsemi.com

40 VOLTS, 2.0 AMPS NPN LOW $V_{CE(sat)}$ TRANSISTOR EQUIVALENT $R_{DS(on)}$ 44 m Ω



SOT-23 (TO-236) CASE 318 STYLE 6



MARKING DIAGRAM



VB = Specific Device Code*

M = Date Code*

■ = Pb-Free Package

(Note: Microdot may be in either location)

*Specific Device Code, Date Code or overbar orientation and/or location may vary depending upon manufacturing location. This is a representation only and actual devices may not match this drawing exactly.

ORDERING INFORMATION

Device	Package	Shipping [†]
NSS40201LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
NSV40201LT1G	SOT-23 (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 Specification Brochure, BRD8011/D.

MAXIMUM RATINGS $(T_A = 25^{\circ}C)$

Rating Collector-Emitter Voltage	Symbol	Max	Unit	
Collector-Emitter Voltage	V _{CEO}	40	Vdc	
Collector-Base Voltage	V _{CBO}	40	Vdc	
Emitter-Base Voltage	V _{EBO}	6.0	Vdc	
Collector Current – Continuous	I _C	i o o		
Collector Current – Peak	I _{CM}	6.0	А	
Electrostatic Discharge	ESD	HBM Class 3B MM Class C		

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C Derate above 25°C	P _D (Note 1)	460 3.7	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R _{θJA} (Note 1)	270	°C/W
Total Device Dissipation T _A = 25°C Derate above 25°C	P _D (Note 2)	540 4.3	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R _{θJA} (Note 2)	230	°C/W
Junction and Storage Temperature Range	T _J , T _{stg}	-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-4 @ 100 mm², 1 oz. copper traces.

2. FR-4 @ 500 mm², 1 oz. copper traces.

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

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS					
Collector – Emitter Breakdown Voltage (I _C = 10 mAdc, I _B = 0)	V _{(BR)CEO}	40	_	_	Vdc
Collector – Base Breakdown Voltage $(I_C = 0.1 \text{ mAdc}, I_E = 0)$	V _(BR) CBO	40	_	_	Vdc
Emitter – Base Breakdown Voltage $(I_E = 0.1 \text{ mAdc}, I_C = 0)$	V _{(BR)EBO}	6.0	-	_	Vdc
Collector Cutoff Current (V _{CB} = 40 Vdc, I _E = 0)	I _{CBO}	-	_	0.1	μAdc
Emitter Cutoff Current (V _{EB} = 6.0 Vdc)	I _{EBO}	_	_	0.1	μAdc
ON CHARACTERISTICS	<u> </u>				
DC Current Gain (Note 3) $ \begin{array}{l} (I_C = 10 \text{ mA}, \ V_{CE} = 2.0 \ \text{V}) \\ (I_C = 500 \text{ mA}, \ V_{CE} = 2.0 \ \text{V}) \\ (I_C = 1.0 \ \text{A}, \ V_{CE} = 2.0 \ \text{V}) \\ (I_C = 2.0 \ \text{A}, \ V_{CE} = 2.0 \ \text{V}) \end{array} $	h _{FE}	200 200 180 180	- 370 - -	- - - -	
Collector – Emitter Saturation Voltage (Note 3) $ \begin{pmatrix} I_C = 0.1 \text{ A}, I_B = 0.010 \text{ A} \end{pmatrix} $ $ \begin{pmatrix} I_C = 1.0 \text{ A}, I_B = 0.100 \text{ A} \end{pmatrix} $ $ \begin{pmatrix} I_C = 1.0 \text{ A}, I_B = 0.010 \text{ A} \end{pmatrix} $ $ \begin{pmatrix} I_C = 1.0 \text{ A}, I_B = 0.010 \text{ A} \end{pmatrix} $ $ \begin{pmatrix} I_C = 2.0 \text{ A}, I_B = 0.200 \text{ A} \end{pmatrix} $	V _{CE(sat)}	- - - -	0.006 0.044 0.085 0.082	0.011 0.060 0.115 0.115	V
Base – Emitter Saturation Voltage (Note 3) (I _C = 1.0 A, I _B = 10 mA)	V _{BE(sat)}	_	0.760	0.900	V
Base – Emitter Turn–on Voltage (Note 3) (I _C = 1.0 A, V _{CE} = 2.0 V)	V _{BE(on)}	_	0.760	0.900	V
Cutoff Frequency (I _C = 100 mA, V _{CE} = 5.0 V, f = 100 MHz)	f _T	150	_	_	MHz
Input Capacitance (V _{EB} = 0.5 V, f = 1.0 MHz)	Cibo	-	_	450	pF
Output Capacitance (V _{CB} = 3.0 V, f = 1.0 MHz)	Cobo	_	_	45	pF
SWITCHING CHARACTERISTICS					
Delay ($V_{CC} = 30 \text{ V}, I_{C} = 750 \text{ mA}, I_{B1} = 15 \text{ mA}$)	t _d	-	_	100	ns
Rise (V _{CC} = 30 V, I _C = 750 mA, I _{B1} = 15 mA)	t _r	_	_	100	ns
Storage ($V_{CC} = 30 \text{ V}, I_{C} = 750 \text{ mA}, I_{B1} = 15 \text{ mA}$)	t _s	-	_	750	ns
Fall ($V_{CC} = 30 \text{ V}, I_C = 750 \text{ mA}, I_{B1} = 15 \text{ mA}$)	t _f	_	_	110	ns

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.

3. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle ≤ 2%.

TYPICAL CHARACTERISTICS

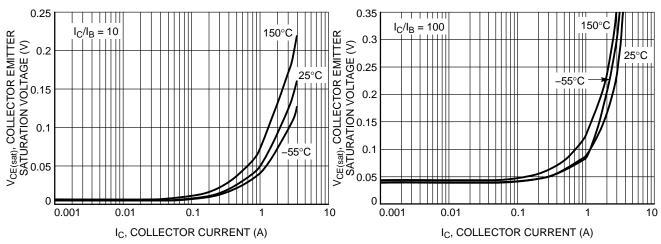


Figure 1. Collector Emitter Saturation Voltage vs. Collector Current

Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

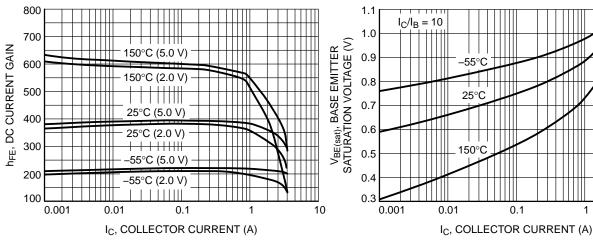


Figure 3. DC Current Gain vs. Collector Current

Figure 4. Base Emitter Saturation Voltage vs. **Collector Current**

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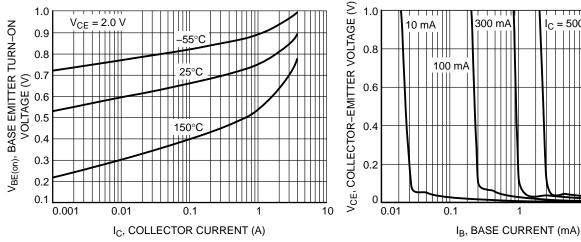


Figure 5. Base Emitter Turn-On Voltage vs. **Collector Current**

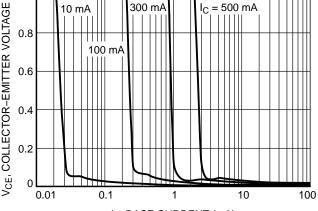


Figure 6. Saturation Region

TYPICAL CHARACTERISTICS

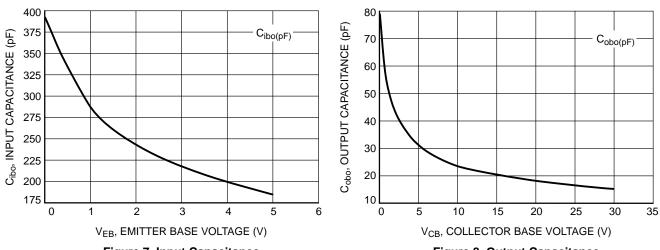


Figure 7. Input Capacitance

Figure 8. Output Capacitance

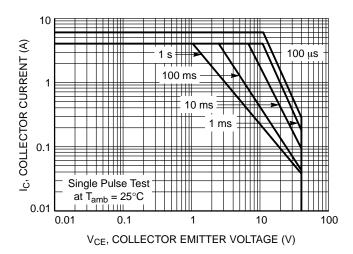
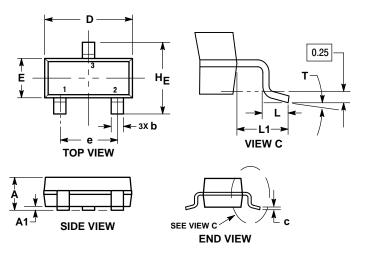


Figure 9. Safe Operating Area

PACKAGE DIMENSIONS

SOT-23 (TO-236) CASE 318-08 **ISSUE AR**



- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994. CONTROLLING DIMENSION: MILLIMETERS. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF
- THE BASE MATERIAL.

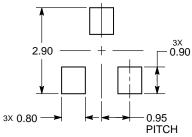
 DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH,
 PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
С	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
е	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
HE	2.10	2.40	2.64	0.083	0.094	0.104
Т	0°		10°	0°		10°

STYLE 6:

- PIN 1. BASE
 - **EMITTER** COLLECTOR

RECOMMENDED SOLDERING FOOTPRINT*



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.

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