Low $V_{CE(sat)}$ NPN Transistor
60 V, 2 A

NSS60201SMT

onsemi's e²PowerEdge 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 LED lightning, power management…etc. 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
- NSV60201SMTWTBG − Wettable Flanks Device
- 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}	60	Vdc
Collector−Base Voltage	V_{CBO}	60	Vdc
Emitter−Base Voltage	V_{EBO}	6	Vdc
Collector Current − Continuous	I_C	2	A
Collector Current − Peak	I_{CM}	3	A

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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction−to−Ambient (Note 2)	$R_{\theta JA}$	69	°C/W
Total Power Dissipation @ T_A = 25°C (Note 2)	P_D	1.8	W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

2. Per JESD51−7 with 100 mm² pad area and 2 oz. Cu.

60 Volt, 2 Amp
NPN Low $V_{CE(sat)}$ Transistor

MARKING DIAGRAM



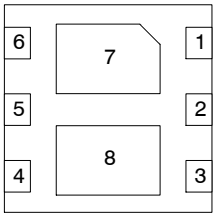
WDFN6
CASE 506AN

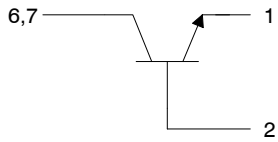


AQ = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

PIN CONNECTIONS





(Pins 3,4,5,8 are not connected)

ORDERING INFORMATION

Device	Package	Shipping†
NSS60201SMTTBG	WDFN6 (Pb−Free)	3000 / Tape & Reel

DISCONTINUED (Note 1)

NSV60201SMTWTBG	WDFN6 (Pb−Free)	3000 / 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.

1. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on www.onsemi.com.

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Table 1. ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage (I_C = 10 mA, I_B = 0)	$V_{(BR)CEO}$	60	–	–	V
Collector−Base Breakdown Voltage (Ic = 0.1 mA, I_E = 0)	$V_{(BR)CBO}$	80	–	–	V
Emitter−Base Breakdown Voltage (I_E = 0.1 mA, I_C = 0)	$V_{(BR)EBO}$	6	–	–	V
Collector Cutoff Current (V_{CB} = 60 V, I_E = 0)	I_{CBO}	–	–	100	nA
Emitter Cutoff Current (V_{BE} = 5.0 V)	I_{EBO}	–	–	100	nA
ON CHARACTERISTICS					
DC Current Gain (Note 3)	h_{FE}				–
(I_C = 100 mA, V_{CE} = 2.0 V)		150	250	–	
(I_C = 500 mA, V_{CE} = 2.0 V)		120	240	–	
(I_C = 1 A, V_{CE} = 2.0 V)		90	180	–	
(I_C = 2 A, V_{CE} = 2.0 V		35	55	–	
Collector−Emitter Saturation Voltage (Note 3)	$V_{CE(sat)}$				V
(I_C = 500 mA, I_B = 50 mA)		–	0.063	0.100	
(I_C = 1 A, I_B = 50 mA)		–	0.130	0.200	
(I_C = 1 A, I_B = 100 mA)		–	0.115	0.180	
(I_C = 2 A, I_B = 200 mA)		–	–	0.250	
Base − Emitter Saturation Voltage (Note 3)	$V_{BE(sat)}$				V
(I_C = 500 mA, I_B = 50 mA)		–	–	1.0	
(I_C = 1 A, I_B = 50 mA)		–	–	1.0	
(I_C = 1 A, I_B = 100 mA)		–	–	1.1	
		–	–	1.5	
Base−Emitter Turn−on Voltage (Note 3) (I_C = 500 mA, V_{CE} = 2 V)	$V_{BE(on)}$	–	–	0.9	V
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 10 V, f = 1.0 MHz)	C_{obo}	–	10	–	pF
Cutoff Frequency (I_C = 50 mA, V_{CE} = 2.0 V, f = 100 MHz)	f_T	–	180	–	MHz
SWITCHING TIMES					
Delay Time (V_{CC} = 10 V, I_C = 0.5 A, I_{B1} = 25 mA, I_{B2} = −25 mA)	t_d	–	13	–	ns
Rise Time (V_{CC} = 10 V, I_C = 0.5 A, I_{B1} = 25 mA, I_{B2} = −25 mA)	t_r	–	18	–	ns
Storage Time (V_{CC} = 10 V, I_C = 0.5 A, I_{B1} = 25 mA, I_{B2} = −25 mA)	t_s	–	700	–	ns
Fall Time (V_{CC} = 10 V, I_C = 0.5 A, I_{B1} = 25 mA, I_{B2} = −25 mA)	t_f	–	80	–	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. Pulse Condition: Pulse Width = 300 μsec, Duty Cycle ≤ 2%

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TYPICAL CHARACTERISTICS

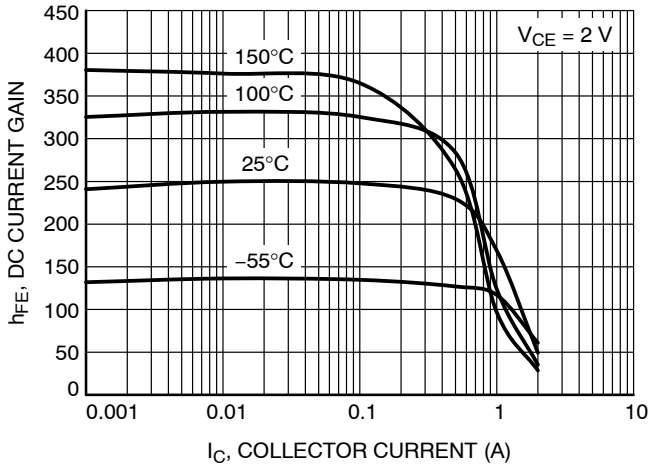


Figure 1. DC Current Gain

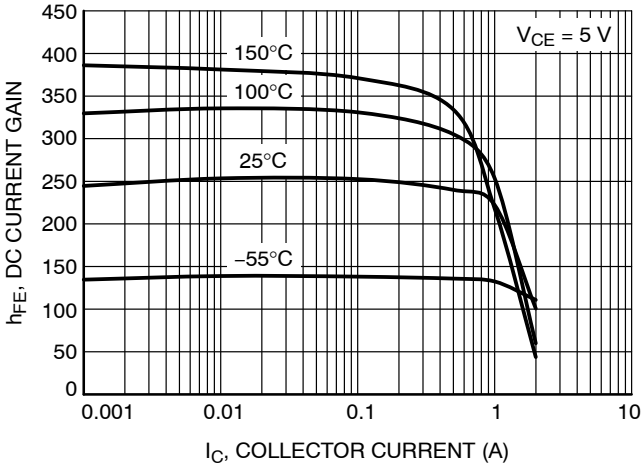


Figure 2. DC Current Gain

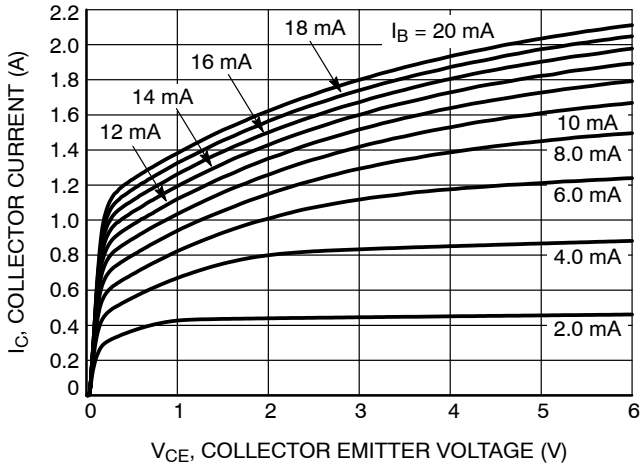


Figure 3. Collector Current as a Function of Collector Emitter Voltage

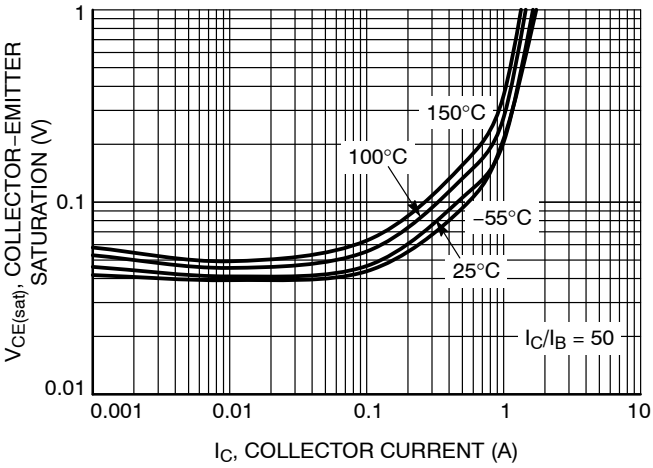


Figure 4. Collector−Emitter Saturation Voltage

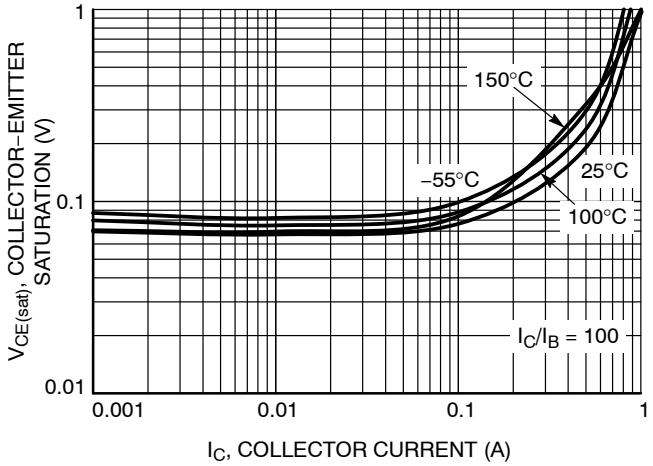


Figure 5. Collector−Emitter Saturation Voltage

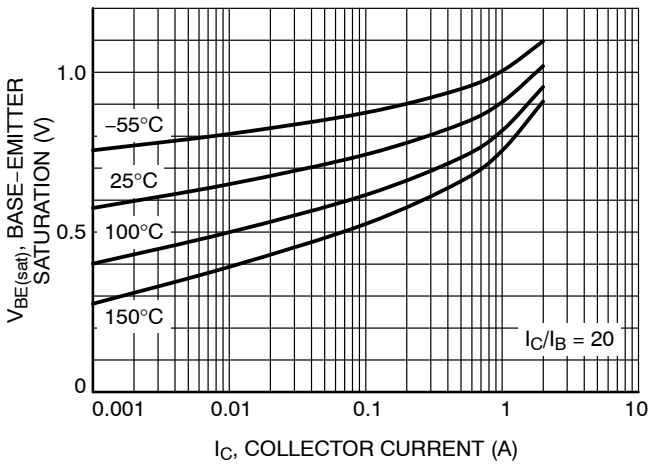


Figure 6. Base−Emitter Saturation Voltage

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TYPICAL CHARACTERISTICS

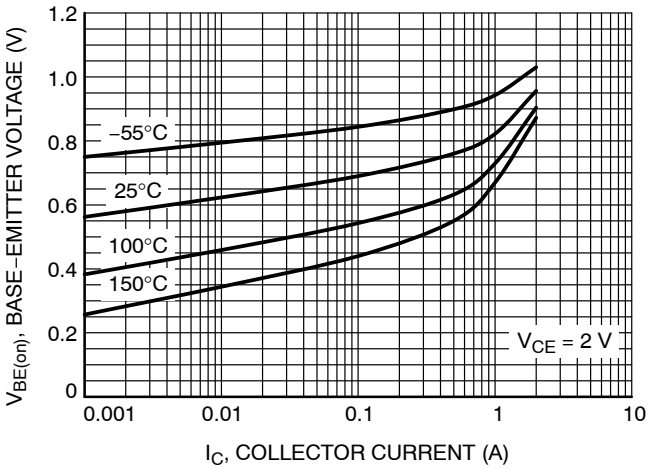


Figure 7. Base−Emitter “ON” Voltage

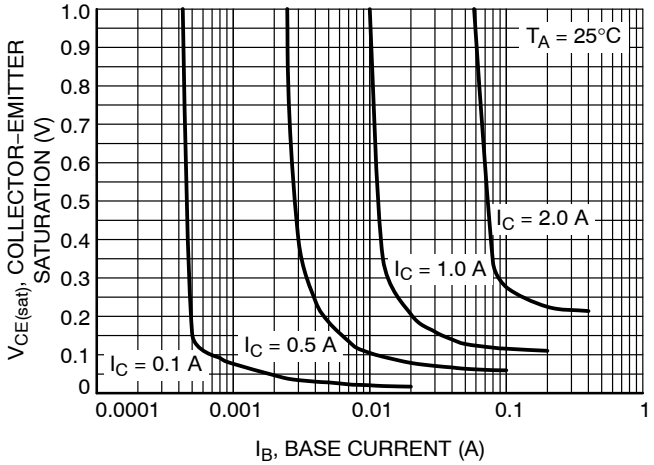


Figure 8. Collector Saturation Region

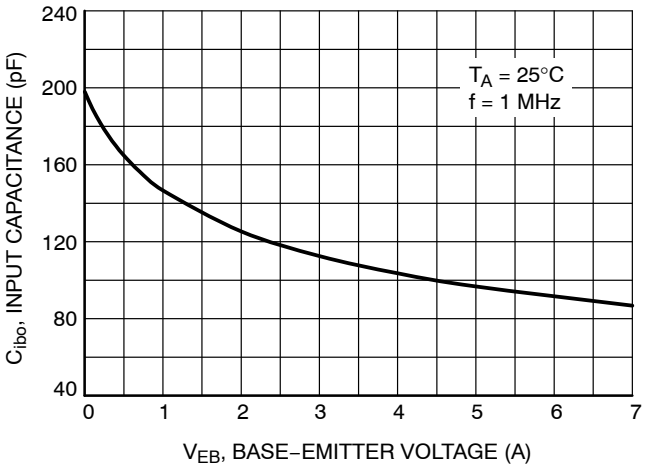


Figure 9. Input Capacitance

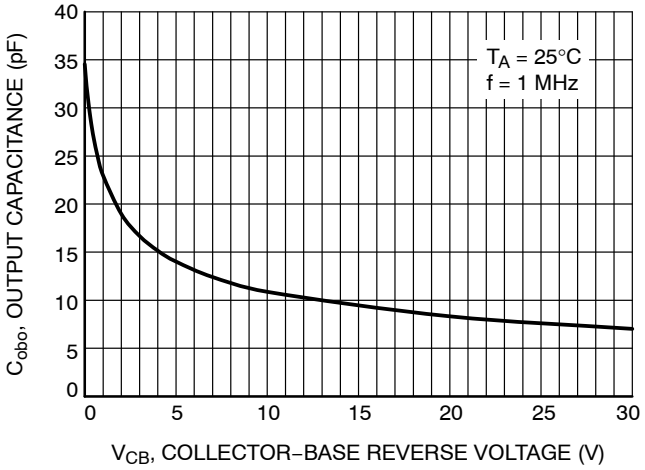


Figure 10. Output Capacitance

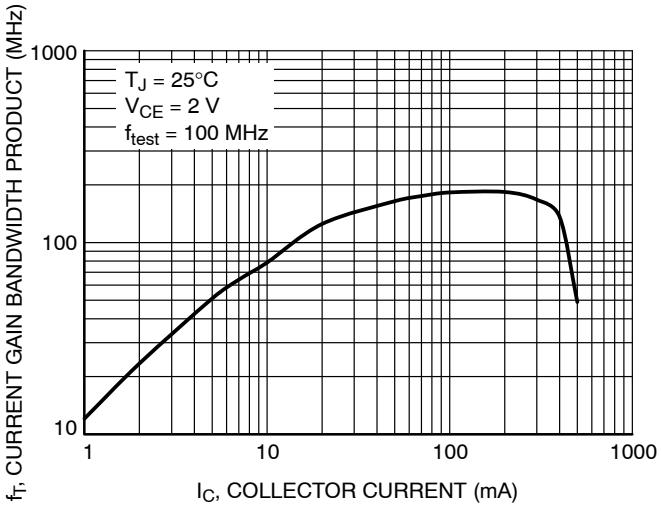


Figure 11. f_T, Current Gain Bandwidth Product

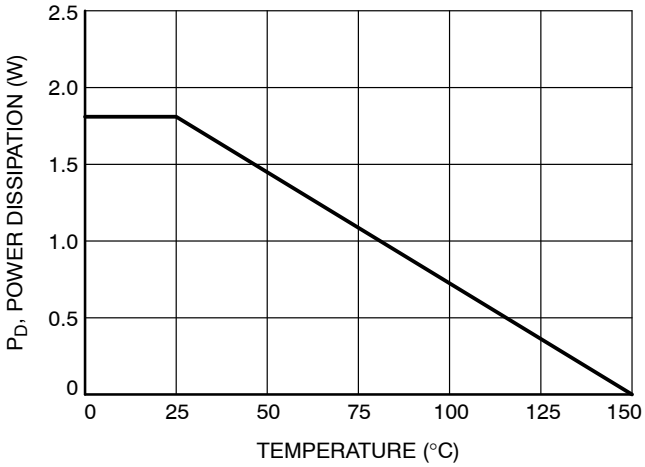


Figure 12. Power Derating

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TYPICAL CHARACTERISTICS

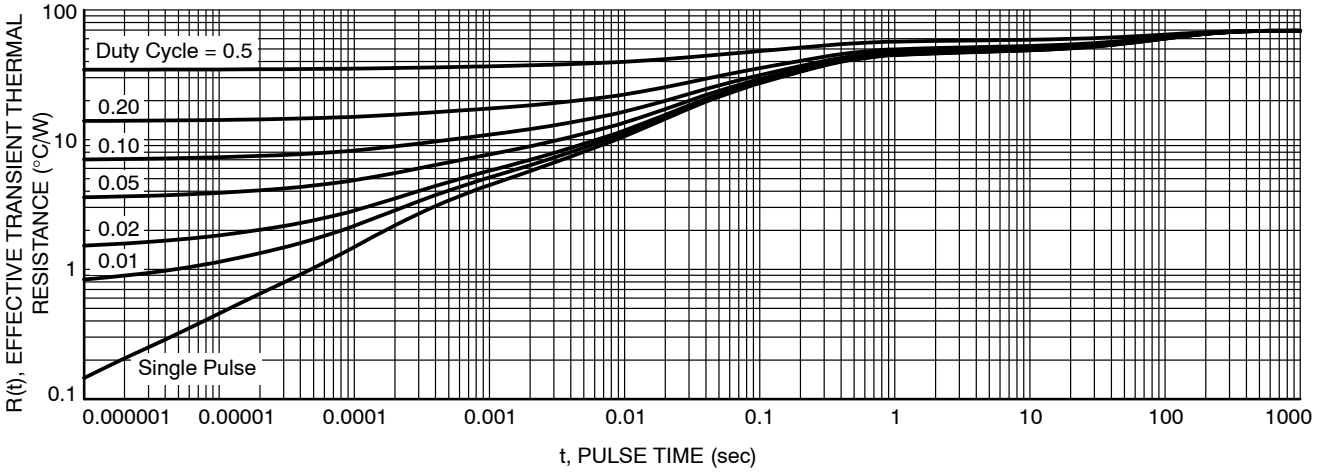
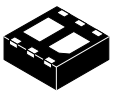


Figure 13. Thermal Resistance by Transistor

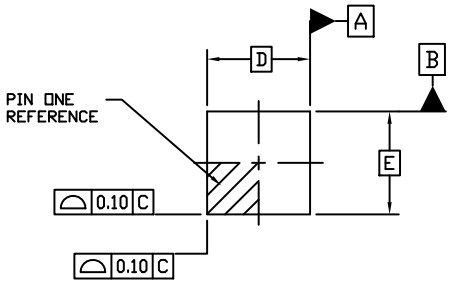
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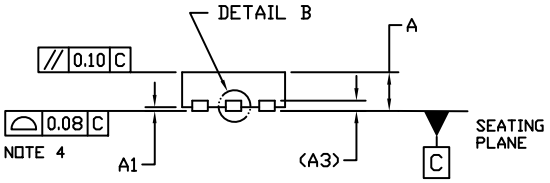
TOP VIEW



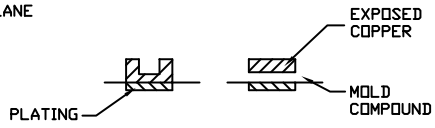
DETAIL A
OPTIONAL CONSTRUCTIONS

NOTES:

1. DIMENSIONING AND TOLERANCING PER. ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.

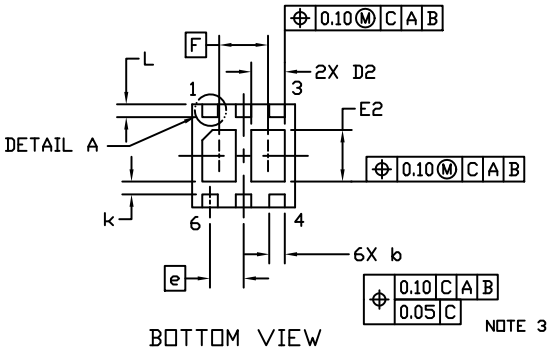


SIDE VIEW

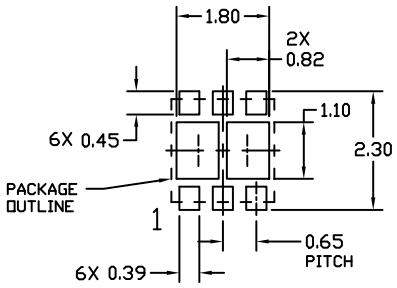


DETAIL B
OPTIONAL CONSTRUCTIONS

DIM	MILLIMETERS	
	MIN.	MAX.
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.25	0.35
D	2.00 BSC	
D2	0.57	0.77
E	2.00 BSC	
E2	0.90	1.10
e	0.65 BSC	
F	0.95 BSC	
k	0.25 REF	
L	0.20	0.30
L1	---	0.10



BOTTOM VIEW



RECOMMENDED
MOUNTING FOOTPRINT
SOLDERMASK DEFINED

GENERIC
MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code

*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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DESCRIPTION:	**WDFN6 2x2, 0.65P**		**PAGE 1 OF 1**

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