Power Switch – PP20S76

Features

- Typical 55 mΩ On Resistance
- 4 A peak Current
- Wide Supply Voltage Range for VIN from 4.5 V to 24 V
- Adjustable Over Current Threshold
- Adjustable Input Over Voltage Threshold
- Programmable Soft Start Time
- Output Discharge when Device Disabled
- Power-OK Output to Control Next Stage Switch
- Reverse Voltage Blocking when Switch OFF
- Package: DFN3x3-12L
- Halogen Free and Green Device (RoHS Compilation)
- UL Listed File No. E536062

Applications

- USB Power Management
- USB type-A Vbus power
- High-Side Power Protection Switches
- Notebook and Desktop Computers

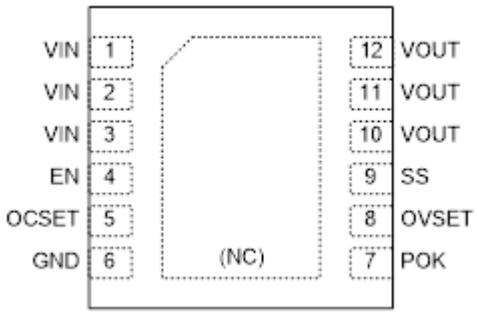
General Description

The PP20S76 is a low $R_{DS(ON)}$, up to 4 A eFuse with 26 V high voltage rating. The programmable current limit to protect the power source from over current or short circuit conditions. The device is controlled by an on/off input, which is capable of interfacing directly with low-voltage control signals. In PP20S76, an option 2 kΩ on-chip load resistor is added for output fast discharge when switch is turned off.

Other features include a power-OK (POK) output that signals when the output voltage is ready.

PIN Configuration

Top View



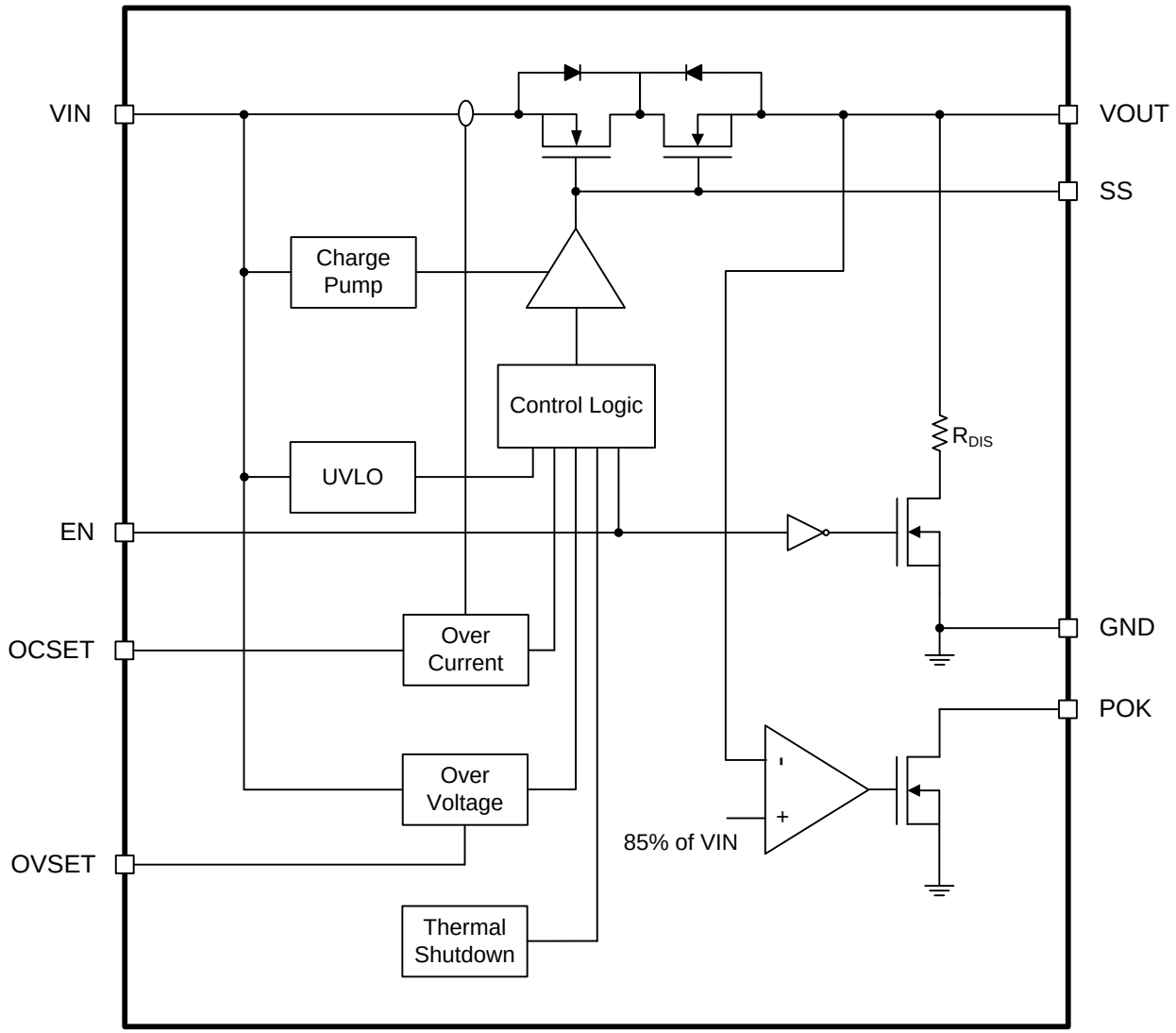
DFN3x3-12L

PIN Description

NO	NAME	Description
1, 2, 3	VIN	Input Voltage. Bypass this input with a ceramic capacitor to GND.
4	EN	Active high switch control input. Do not leave floating.
5	OCSET	Over current threshold setting pin. The pin cannot be left floating.
6	GND	Ground.
7	POK	Active-high open-drain output. Goes high when VOUT reaches 85 % of its value.
8	OVSET	Over voltage threshold setting pin. The pin can be left floating.
9	SS	Switch output slew rate control. The pin can be left floating. The capacitance less than 1nF is recommended and should be rated for a minimum of 25 V for desired rise time performance.
10, 11, 12	VOUT	Switch output.
Exposed Pad	NC	Do not connect to any power or ground plane. Recommend to tie a floated pad to alleviate thermal stress.

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Function Block Diagram



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Application information & Circuit

◆ Over Current Setting

The suggested range of R_{OC} is from 38 kΩ to 150 kΩ and OCSET pin cannot be left unconnected. The traces routing the R_{OC} resistor must be close to OCSET pin as possible and reference back to the GND pin. Ensure that current flow from other parts of the board does not impact the ground potential between the resistor and the GND pin.

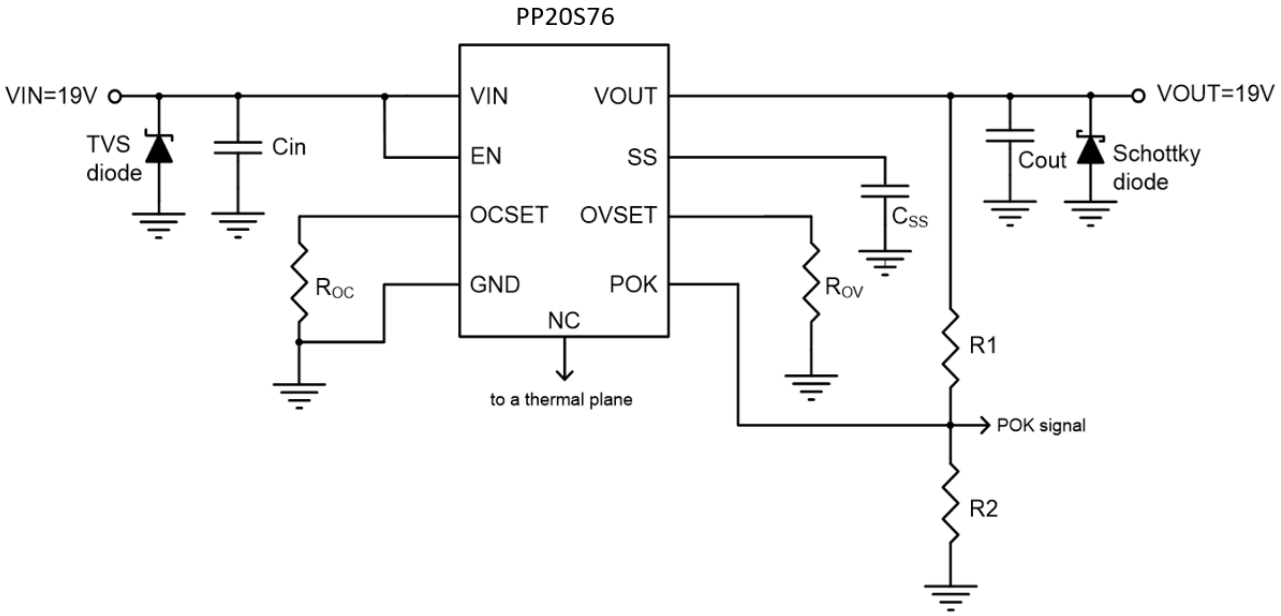
◆ Over Voltage Setting

The PP20S76 monitors input voltage internally. If VIN exceed the over voltage setting threshold, power MOS will turn off immediately. The suggested range of R_{OV} is from 75 kΩ to 300 kΩ. Let the OVSET pin float if not use.

V_{OV_IN} (V) = 0.08 * R_{OV} (kΩ)

◆ Layout Guide

Do not connect any power or ground plane to the NC pin (exposed pad).Tie a floated pad to NC pin (exposed pad) to alleviate thermal stress.



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Electrical Characteristics

◆ DC characteristics:

Absolute Maximum Ratings

PARAMETER		SYMBOL	RATINGS	UNIT
VIN to GND Voltage		V_{IN}	-0.3 ~ 26	V
VOUT to GND Voltage		V_{OUT}	-0.3 ~ 26	V
EN, SS to GND Voltage		V_{EN}, V_{SS}	-0.3 ~ 26	V
OCSET, OVSET, POK to GND Voltage		V_{OCSET}, V_{OVSET}, V_{POK}	-0.3 ~ 7	V
Power dissipation ,T_A = 25 °C		P_D	1.47	W
Thermal Resistance, Junction to Ambient		$R\theta_{JA}$	68	°C/W
Thermal Resistance, Junction to Case		$R\theta_{JC}$	6	°C/W
Maximum Junction Temperature		T_J	150	°C
Storage Temperature		T_S	-65 ~ 150	°C
Maximum Lead Soldering Temperature (10 Seconds)		T_L	260	°C
Electrostatic Discharge	HBM (Human Body Model), MIL-STD-883G MTHD 3015.7		±2000	V
	MM (Machine Model), JEDEC EIA / JESD22-A115		±200	V

Note: If ICs are stressed beyond the limits listed in the “Absolute Maximum Ratings”, they may be permanently destroyed. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

◆ Recommended Operating Conditions

VIN Input Voltage ---------- 4.5 V ~ 24 V

Continue Output Current ---------- 3 A

Ambient Temperature Range ---------- -40 °C ~ 85 °C

Junction Temperature Range ---------- -40 °C ~ 125 °C

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◆ Electrical characteristics:

Unless otherwise specified, these specifications apply over V_{IN} = V_{EN} = 4.5 V to 24 V, R_{OCSET} = 38 kΩ, R_{OVSET} open, C_{IN} = 1 µF, C_{OUT} = 0.1 µF and T_A = 25°C.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Quiescent Supply Current	I_{IN1}	V_{IN} = V_{EN} = 20 V, no load		220	300	µA
	I_{IN2}	V_{IN} = V_{EN} = 5 V, no load		150	220	uA
Shutdown Input Current	I_{SD}	witch off		1	5	µA
UVLO Threshold	V_{UVLO_H}	V_{IN} rising		4.3		V
	V_{UVLO_L}	V_{IN} falling		4.1		V
On Resistance	R_{DS_ON1}	V_{IN} = 20 V, I_{OUT} = 1 A		55	66	mΩ
	R_{DS_ON2}	V_{IN} = 5 V, I_{OUT} = 1 A		58	70	mΩ
VOUT Shutdown Discharge Resistance	R_{DIS}	V_{EN}=0V, function option		2	2.5	kΩ
Over Current Threshold	I_{OC1}	R_{OC} = 150 k	0.6	1.1	1.6	A
	I_{OC2}	R_{OC} = 100 k	1.2	1.6	2.0	A
	I_{OC3}	R_{OC} = 56 k	2.2	2.9	3.6	A
VOUT Rise Time VOUT Rise Time	I_{OC4}	R_{OC} = 38 k	3.2	4	4.8	A
	t_{R1}	V_{IN} = 20 V, R_{LOAD} = 33 Ω, C_{SS} float, C_{OUT} = 0.1 uF		1		ms
OVSET Current	t_{R2}	V_{IN} = 5 V, R_{LOAD} = 10 Ω, C_{SS} float, C_{OUT} = 0.1 uF		0.3		ms
OVSET Current	I_{OVSET}		4.5	5	5.5	uA
SS Current	I_{SS}		16	22	28	uA
EN Logic High Voltage	V_{EN_H}	Enable	1.2			V
EN Logic Low Voltage	V_{EN_L}	Disable			0.4	V
EN Leakage Current	I_{EN}				1	µA
POK Output Low Voltage	V_{POK_L}	I_{POK} = 1 Ma			100	mV
POK OFF-state Leakage Current	I_{POK}	V_{POK} = 5.5 V			1	µA
POK Rising and Falling Deglitch Note1	t_{DEG}			5		µs
Thermal Shutdown Threshold 1	T_{SD}			135		°C
	T_{HYS}	Hysteresis		20		°C

Note
1. Design guarantee.

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◆ Typical Performance Characteristics

Fig 1 - UVLO vs. Temperature

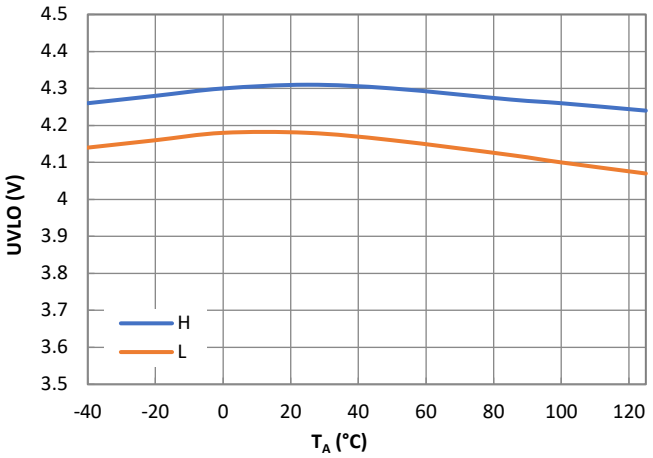


Fig 2 - Quiescent Current vs. Temperature

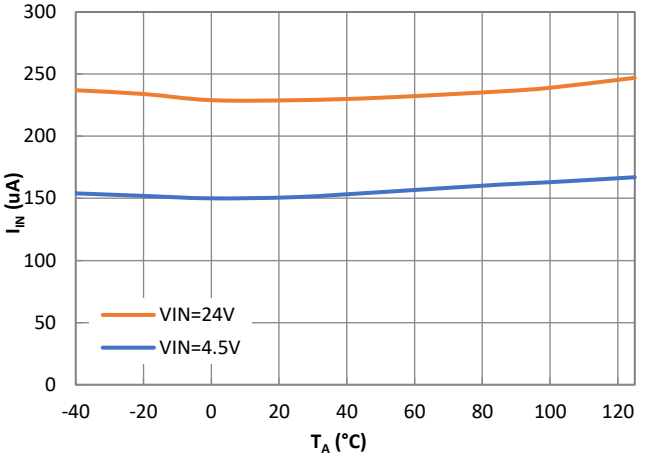


Fig 3 – OVSET Current vs. Temperature

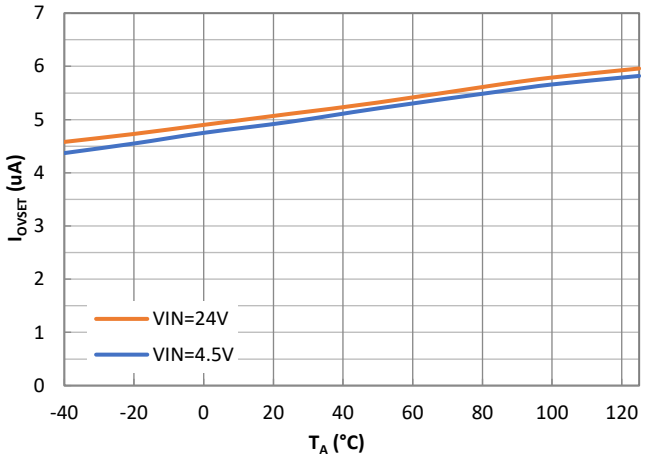


Fig 4 – SS Current vs. Temperature

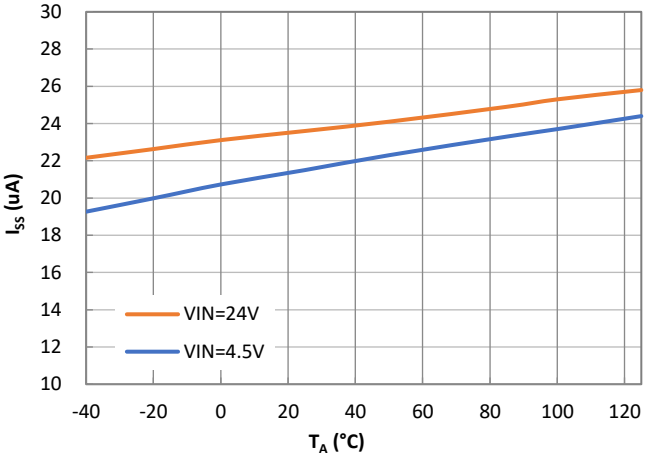
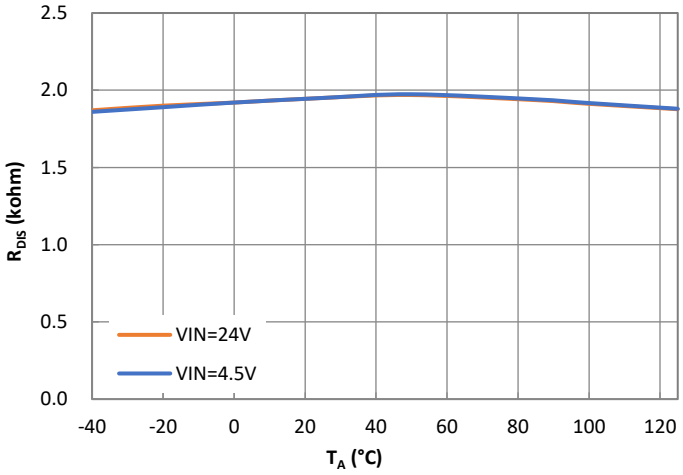


Fig 5 – VOUT Discharge Resistance vs. Temperature



Power Switch – PP20S76

Part Number Code

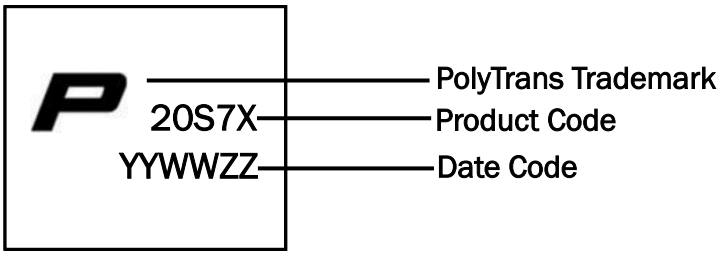
PP 20S76 A OTR

- OTR: Assembly Type (OTR: DFN 3x3-12L)
- A: Serial Number (A~D)
- 20S76: Series Code (20S76 belongs to Load Switch and Power Switch)
- PP: Power Switch Series

Ordering Information

P/N	Over current Response	OUT Discharge Resistor	Top Side Marking
PP20S76AOTR	HICCUP Mode	YES	20S7A YYWWZZ
PP20S76BOTR	HICCUP Mode	NO	20S7B YYWWZZ
PP20S76COTR	LATCH_OFF Mode	YES	20S7C YYWWZZ
PP20S76DOTR	LATCH_OFF Mode	NO	20S7D YYWWZZ

Marking Definition



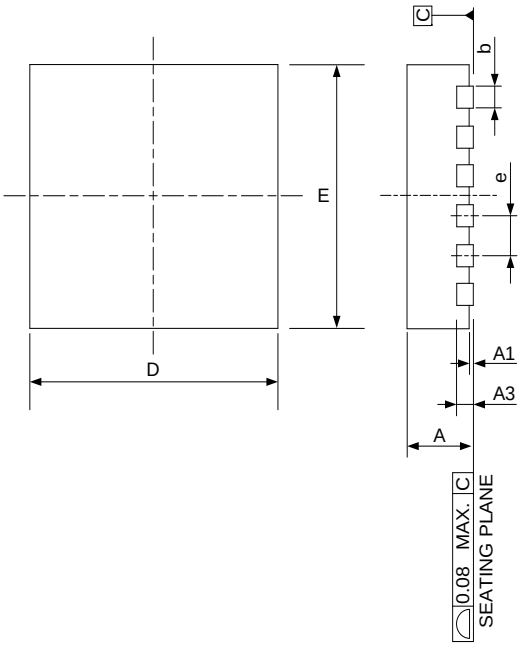
Topside Marking Rule:

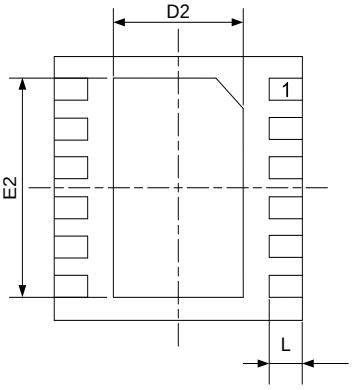
YY：Year 2022→22、2023→23; WW：Week 01~53; ZZ：Series Code

Power Switch – PP20S76

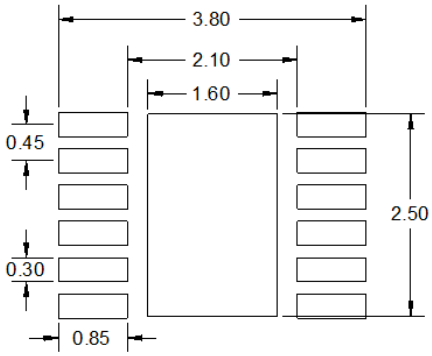
Package Dimension

◆ DFN 3x3 mm²–12L





Recommended Pad Layout

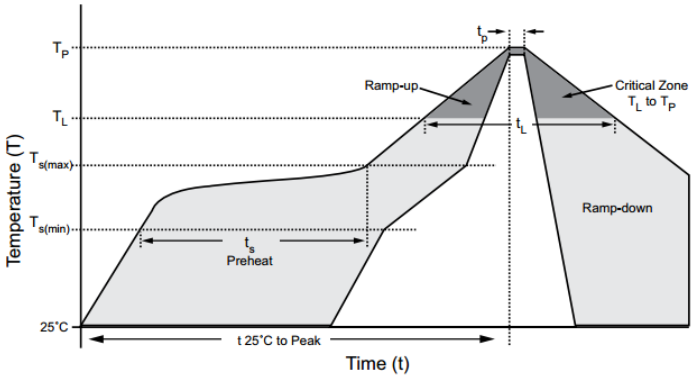


SYMBOLS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	0.80	0.028	0.031
A1	0.00	0.05	0.000	0.002
A3	0.20 REF		0.008 REF	
b	0.15	0.28	0.006	0.011
D	3.00 BSC		0.118 BSC	
D2	1.30	1.80	0.051	0.071
E	3.00 BSC		0.118 BSC	
E2	2.20	2.70	0.087	0.106
e	0.45 BSC		0.018 BSC	
L	0.30	0.50	0.012	0.020

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Lead Free Reflow Soldering Recommendations

Preheat - Temperature Min (T_{s_min}) - Temperature Max (T_{s_max}) - Time (T_{s_min} to T_{s_max}) - Average Ramp-Up Rate	 150 °C 200 °C 60-180 seconds 1~3 °C/second
Peak Temperature	260 °C max.
Time within 5 °C of actual Peak Temperature (t_p)	40 seconds max.
Ramp-Down Rate	6 °C /second max.
Time 25 °C to Peak Temperature	8 minutes max.



Note: If the soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

Packaging Information

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
PP20S76X Series	DFN 3x3-12	3000	Tape & Reel – 12 mm tape/13" reel	EIA STD RS-481

Taping and Reel Specification

