20 mΩ Fast Turn On 2.5 A Integrated Power Switch with Discharge

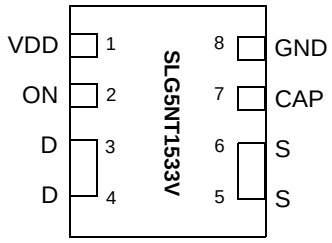
General Description

The SLG5NT1533V is a 20 mΩ 2.5 A single-channel power switch with configurable slew rate control. The device can enable fast power rail turn on with big cap loading. Internal circuit limits max inrush current to prevent device damage. The product is packaged in an ultra-small 1.0x1.6mm package.

Features

- 1.0 x 1.6 x 0.55 mm STDFN 8L package (2 fused pins for drain and 2 fused pins for source)
- Logic level ON pin capable of supporting 0.85 V CMOS Logic
- Discharged Load when off
- Fast Turn On time
  - 25 µs, Tune Cap = 0.1 nF, C_{LOAD} = 1 µF @ 100 mA
  - 95 µs, Tune Cap = 0.5 nF, C_{LOAD} = 10 µF @ 2.5 A
- Low RDS_{ON}while supporting 2.5 A
  - 20 mΩ, V_{DD} = 5 V, V_D = 1 V
  - 27.5 mΩ, V_{DD} = 3.3 V, V_D = 1 V
- Pb-Free / Halogen-Free / RoHS compliant
- Operating Temperature: -40 °C to 85°C
- Operating Voltage: 2.5 V to 5.5 V
- Power Rail Switching V_D = 0.85 V to V_D = V_{DD} - 1.5 V

Pin Configuration

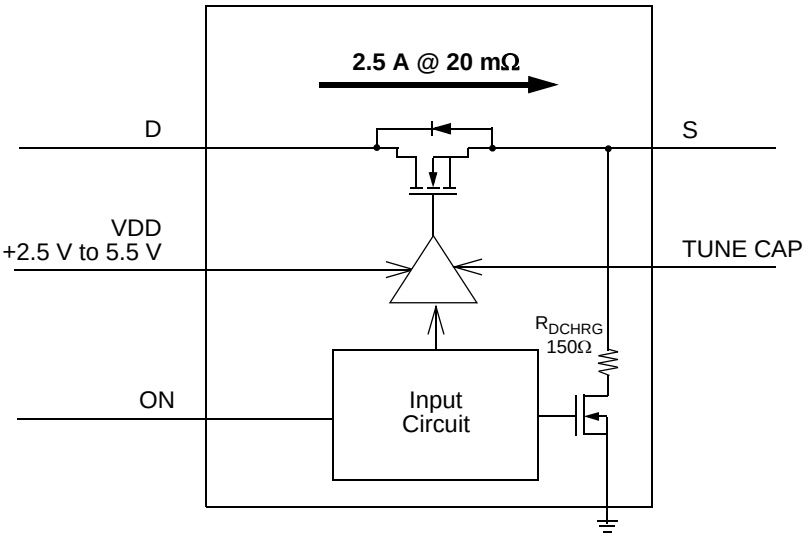


8-pin STDFN
(Top View)

Applications

- Fast Turn On/Off power rail switching with big Cap loading
- Frequent wake & sleep power cycle
- Mobile devices and portable devices

Block Diagram



Pin Description

Pin #	Pin Name	Type	Pin Description
1	VDD	PWR	VDD power for power switch control (2.5 V to 5.5 V)
2	ON	Input	Turns MOSFET ON (4 MΩ pull down resistor) CMOS input with VIL < 0.3 V, VIH > 0.85 V
3	D	MOSFET	Drain of Power MOSFET (fused with pin 4)
4	D	MOSFET	Drain of Power MOSFET (fused with pin 3)
5	S	MOSFET	Source of Power MOSFET (fused with pin 6)
6	S	MOSFET	Source of Power MOSFET (fused with pin 5)
7	CAP	CAP	Tuning Cap
8	GND	GND	Ground

Ordering Information

Part Number	Type	Production Flow
SLG5NT1533V	STDFN 8L	Industrial, -40 °C to 85 °C
SLG5NT1533VTR	STDFN 8L (Tape and Reel)	Industrial, -40 °C to 85 °C

Absolute Maximum Ratings

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Power Supply		--	--	7	V
T_S	Storage Temperature		-65	--	150	°C
ESD_{HBM}	ESD Protection	Human Body Model	2000	--	--	V
MSL	Moisture Sensitivity Level			1		
W_{DIS}	Package Power Dissipation		--	--	0.4	W
MOSFET IDS_{PK}	Peak Current from Drain to Source	For no more than 20 µs with 1% duty cycle	--	--	25.0	A
		For no more than 50 µs with 1% duty cycle	--	--	12.5	A
		For no more than 1 ms with 1% duty cycle	--	--	3.5	A

Note: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Electrical Characteristics

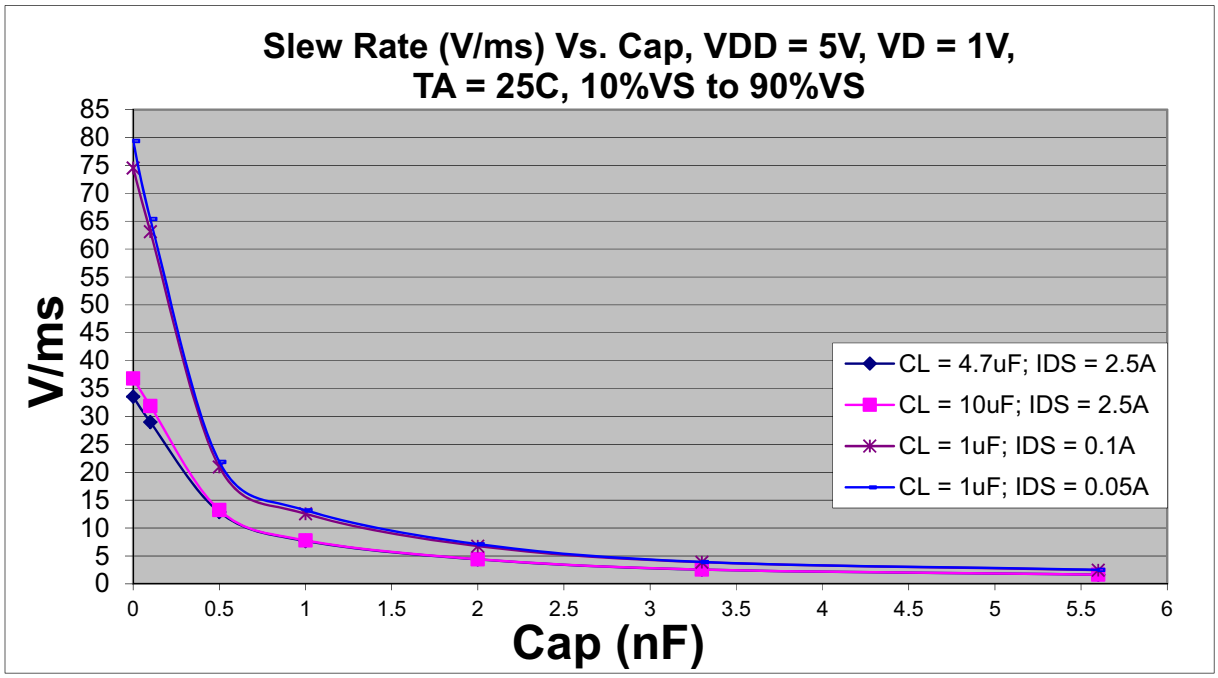
T_A = -40 °C to 85 °C (unless otherwise stated)

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Power Supply Voltage	-40 °C to 85 °C	2.5	--	5.5	V
I_{DD}	Power Supply Current (PIN 1)	when OFF	--	--	1	µA
		when ON, No load	--	--	10	µA
RDS_{ON}	Static Drain to Source ON Resistance, T_A = 25°C	V_{DD} = 5 V, V_D = 1.05 V, V_{DD} - V_D = 4.0 V, R_L = 0.5 Ω	--	20	24	mΩ
		V_{DD} = 3.3 V, V_D = 1.05 V, V_{DD} - V_D = 2.3 V, R_L = 0.5 Ω	--	27.5	31	mΩ
	Static Drain to Source ON Resistance, T_A = 70°C	V_{DD} = 5 V, V_D = 1.05 V, V_{DD} - V_D = 4.0 V, R_L = 0.5 Ω	--	23.5	27	mΩ
		V_{DD} = 3.3 V, V_D = 1.05 V, V_{DD} - V_D = 2.3 V, R_L = 0.5 Ω	--	31	35	mΩ
	Static Drain to Source ON Resistance, T_A = 85°C	V_{DD} = 5 V, V_D = 1.05 V, V_{DD} - V_D = 4.0 V, R_L = 0.5 Ω	--	24.5	28	mΩ
		V_{DD} = 3.3 V, V_D = 1.05 V, V_{DD} - V_D = 2.3 V, R_L = 0.5 Ω	--	33	37	mΩ
IDS	Operating Current	V_D = 0.85 V to 3.3 V	--	--	2.5	A
V_D	Drain Voltage		0.85	--	V_{DD} - 1.5	V
T_{ON_Delay}	ON Delay Time	50% ON to 10% V_S, Internal Logic Delay, V_{DD} = 5 V, V_D = 1.05 V, Tune Cap = 0.1 nF	--	12	15	µs
		50% ON to 10% V_S, Internal Logic Delay, V_{DD} = 5 V, V_D = 1.05 V, Tune Cap = 0.5 nF	--	32	35	µs

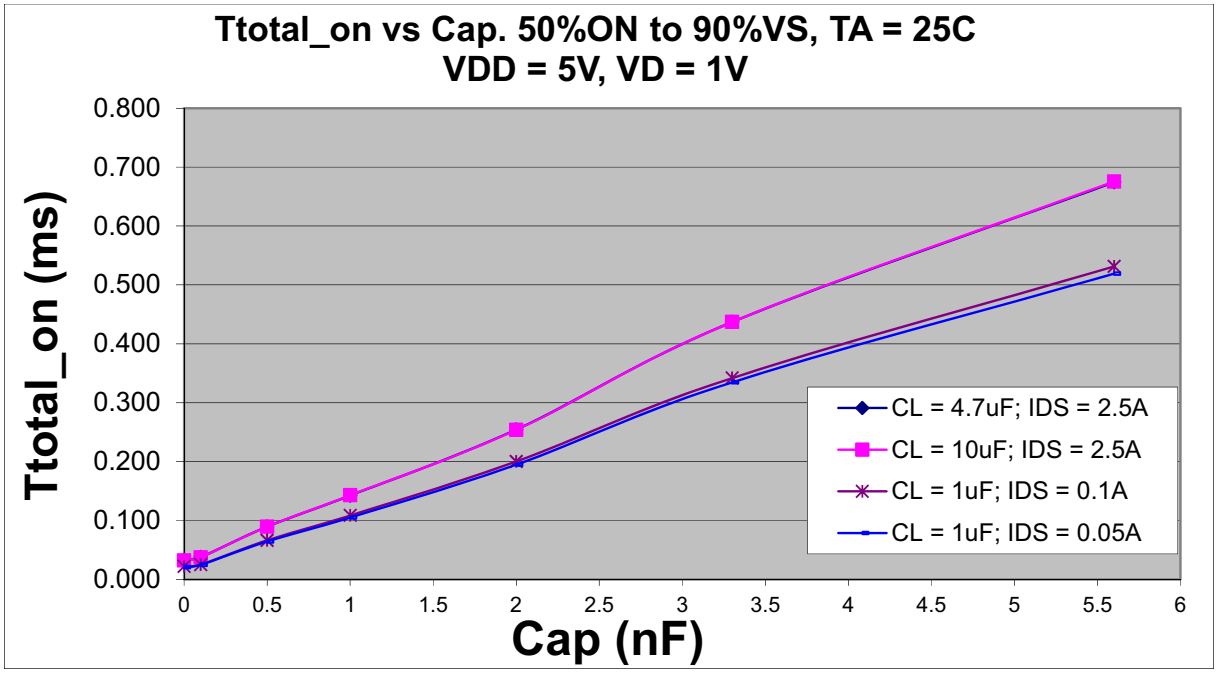
T_A = -40 °C to 85 °C (unless otherwise stated)

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
T_{Total_ON}	Total Turn On Time	50% ON to 90% V_S	Configurable			
		50% ON to 90% V_S, V_{DD} = 5 V, V_D = 1.0 V, C_L = 1 µF, Current Load = 50 mA, Tune Cap = 0.1 nF	--	32	39	µs
		50% ON to 90% V_S, V_{DD} = 5 V, V_D = 1.0 V, C_L = 1 µF, Current Load = 100 mA, Tune Cap = 0.1 nF	--	32	39	µs
		50% ON to 90% V_S, V_{DD} = 5 V, V_D = 1.0 V, C_L = 4.7 µF, Current Load = 2.5 A, Tune Cap = 0.5 nF	--	102	123	µs
		50% ON to 90% V_S, V_{DD} = 5 V, V_D = 1.0 V, C_L = 10 µF, Current Load = 2.5 A, Tune Cap = 0.5 nF	--	102	123	µs
$T_{SLEWRATE}$	Slew Rate	10% V_S to 90% V_S	Configurable			
		10% V_S to 90% V_S, V_{DD} = 5 V, V_D = 1.0 V, C_L = 1 µF, Current Load = 50 mA, Tune Cap = 0.1 nF	--	65	78	V/ms
		10% V_S to 90% V_S, V_{DD} = 5 V, V_D = 1.0 V, C_L = 1 µF, Current Load = 100 mA, Tune Cap = 0.1 nF	--	65	78	V/ms
		10% V_S to 90% V_S, V_{DD} = 5 V, V_D = 1.0 V, C_L = 4.7 µF, Current Load = 2.5 A, Tune Cap = 0.5 nF	--	13	16	V/ms
		10% V_S to 90% V_S, V_{DD} = 5 V, V_D = 1.0 V, C_L = 10 µF, Current Load = 2.5 A, Tune Cap = 0.5 nF	--	13.5	16.5	V/ms
CAP_{SOURCE}	Source Cap	Source to GND	--	--	10	µF
R_{DIS}	Discharge Resistance		100	150	300	Ω
ON_V_{IH}	High Input Voltage on ON pin		0.85	--	V_{DD}	V
ON_V_{IL}	Low Input Voltage on ON pin		-0.3	0	0.3	V
T_{OFF_Delay}	OFF Delay Time	50% ON to V_S Fall, C_L = 10 µF, R_L = 20 Ω, V_{DD} = 5 V, V_D = 1.0 V, No Tune CAP	--	120	150	µs
THERM_OFF	Thermal Protection Shutoff	Programmable, automatic shutoff temperature	--	125	--	°C
THERM_OFF_ACC	Thermal Sensor Accuracy		--	--	±20	%
THERM_DT	Thermal Disable Time	Thermal sensor disable for the ON rising edge to 100 µs. Prevent therm shutdown from inrush current	--	--	100	µs

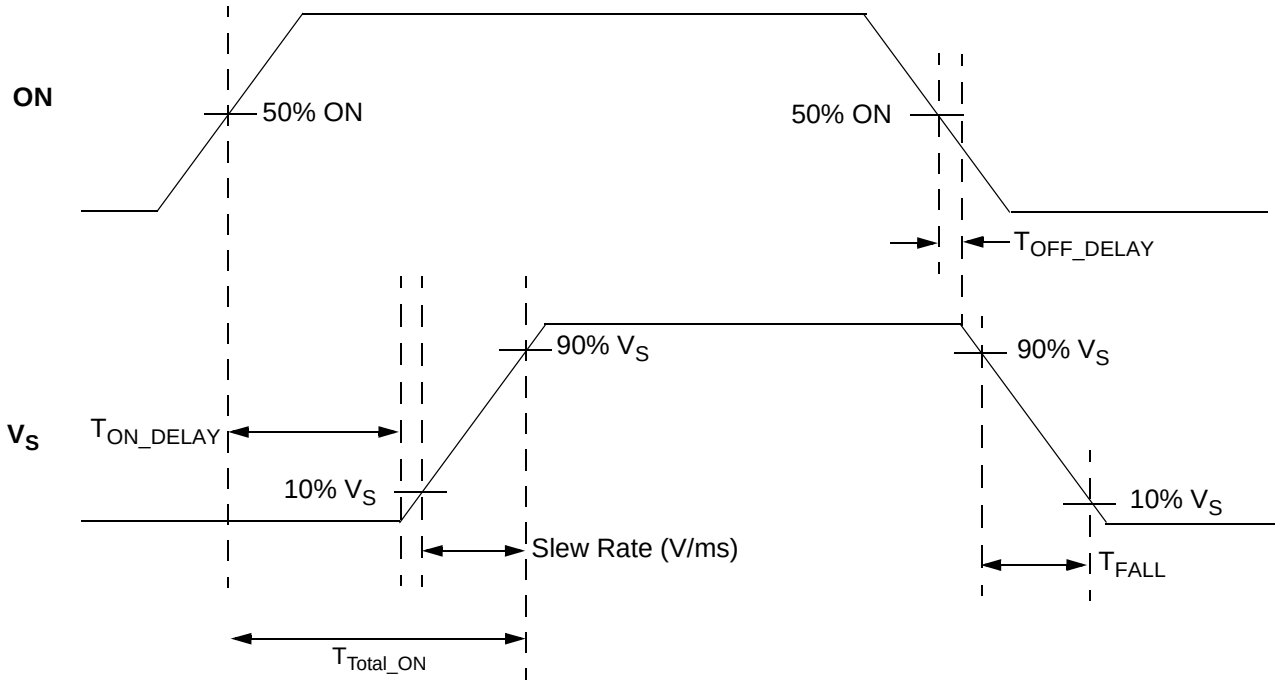
Tune Cap vs Slew Rate



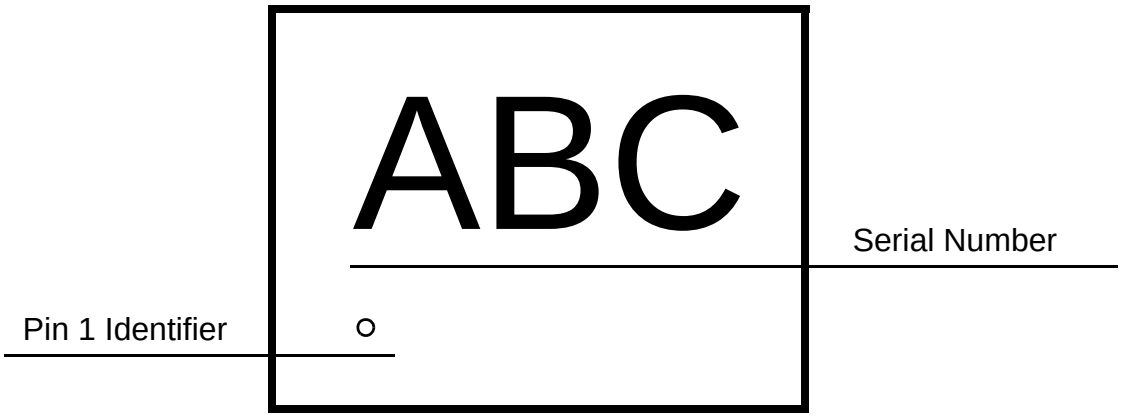
Tune Cap vs Ttotal_on



T_{Total_ON}, T_{ON_Delay} and Slew Rate Measurement

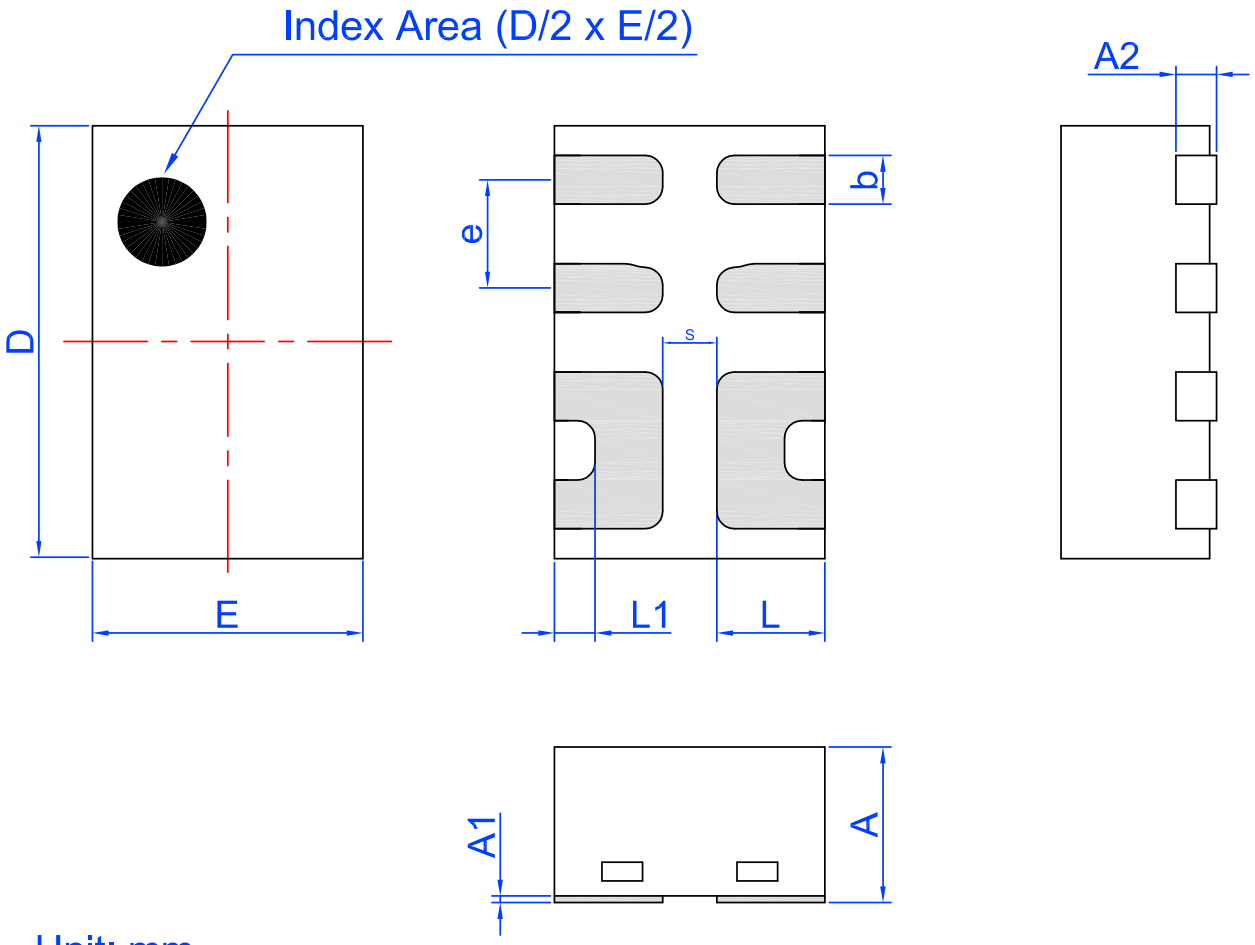


Package Top Marking System Definition



Package Drawing and Dimensions

8 Lead STDFN Package 1.0 x 1.6 mm (Fused Lead)



Unit: mm

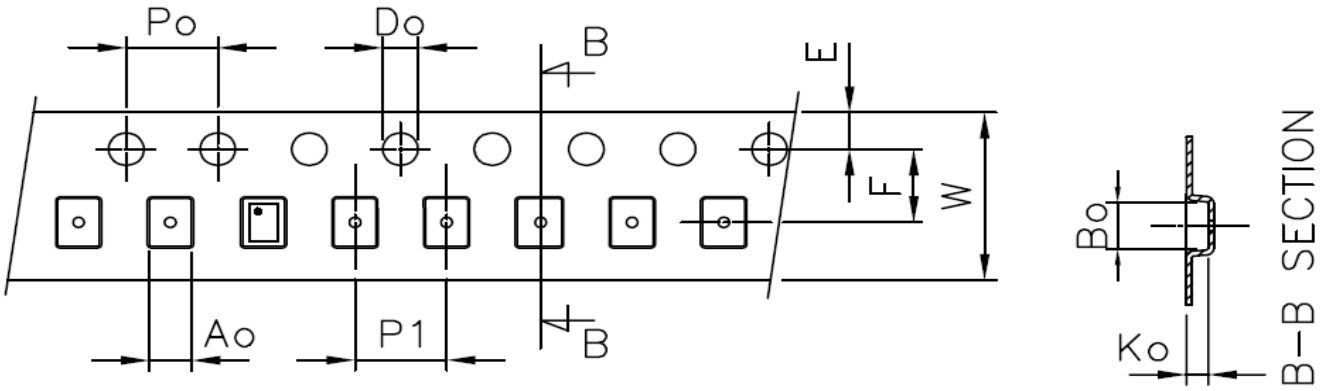
Symbol	Min	Nom.	Max	Symbol	Min	Nom.	Max
A	0.50	0.55	0.60	D	1.55	1.60	1.65
A1	0.005	-	0.060	E	0.95	1.00	1.05
A2	0.10	0.15	0.20	L	0.35	0.40	0.45
b	0.13	0.18	0.23	L1	0.10	0.15	0.20
e	0.40 BSC			S	0.2 REF		

Tape and Reel Specifications

Package Type	# of Pins	Nominal Package Size [mm]	Max Units		Reel & Hub Size [mm]	Leader (min)		Trailer (min)		Tape Width [mm]	Part Pitch [mm]
			per Reel	per Box		Pockets	Length [mm]	Pockets	Length [mm]		
STDFN 8L 1x1.6mm 0.4P FC Green	8	1.0 x 1.6 x 0.55	3,000	3,000	178 / 60	100	400	100	400	8	4

Carrier Tape Drawing and Dimensions

Package Type	Pocket BTM Length	Pocket BTM Width	Pocket Depth	Index Hole Pitch	Pocket Pitch	Index Hole Diameter	Index Hole to Tape Edge	Index Hole to Pocket Center	Tape Width
	A0	B0	K0	P0	P1	D0	E	F	W
STDFN 8L 1x1.6mm 0.4P FC Green	1.12	1.72	0.7	4	4	1.55	1.75	3.5	8



Recommended Reflow Soldering Profile

Please see IPC/JEDEC J-STD-020: latest revision for reflow profile based on package volume of 0.88 mm^3 (nominal). More information can be found at www.jedec.org.

Revision History

Date	Version	Change
8/14/2015	1.04	Add support for 0.85 VD
4/22/2015	1.03	Removed TBD from Timing Diagram
4/20/2015	1.02	Fixed Block Diagram (added Discharge Resistor)
9/15/2014	1.01	Added MSL
6/16/2014	1.0	Production release
6/12/2014	0.51	Added 2 mΩ to all RDSon max values
10/31/2013	0.5	Preliminary release
8/5/2014	0.21	Updated Ttotal_on typ and max values Updated Tslewrate typ and max values
8/1/2013	0.2	Updated Features Updated Temp Range Updated VDD max to 5.5 V Updated VD min to 0.95 V Removed charts regarding in-rush current and Ttotal_on measurement Added Tune Cap info and charts
7/24/2013	0.1	Advanced release