

Data Sheet

Type Description : Green-Mode PWM Flyback
(SSR) Controller

Product Name : EST.30xxMRS

Reversion : V1.0

Reversion Date : May, 2020

Page : 12 Pages

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General Description

EST.30xxMRS is a higher integrated PWM flyback controller. It provides several functions to enhance the efficiency to meets the criteria of global standards such as DoE Level VI and EU CoC V5 Tier-2. Meantime, it also provides excellent EMI-improved solution, and also built in complete protection.

EST.30xxMRS is a green mode controller, which implements low start-up current, green-mode power-saving. It is also built-in the leading-edge blanking (LEB) of the current sensing and feedback loop to screen the spike noise from any input signal. The internal slope compensation can limit the constant output over universal AC input range. The sawtooth over frequency function for EMI improved solution.

Meanwhile, EST.30xxMRS also provides various protection, such as, OLP (Over Load Protection) ,VDD OVP (Over Voltage Protection) , Output OLP and output OVP to prevent the circuit damage from the abnormal conditions.

EST.30xxMRS is available in SOP-7.

EST.30xxMRS works with current sensing synchronous rectifier controllers, such as EST.6002A or EST.6xxAxxA to achieve higher conversion efficiency and very compact power density.

Application

- Switching AC/DC adapter and battery charger
- ATX standby power
- Open frame switching power and CD(R)
- Set-top-boxes(STB) 384Xreplacement

Features

- ◆ Integrated 650V/ 700V/800V Start-Up Device and MOSFET
- ◆ 100KHz fix frequency mode at PWM Mode
- ◆ Very low startup current (<3 uA)
- ◆ Soft Driving for Reducing EMI Noise
- ◆ 0.5mA ultra-low operating current at light load
- ◆ Current mode control with Cycle-by-Cycle current limit
- ◆ Built-in slope and load regulation compensation
- ◆ LEB (Leading-edge blanking) on CS Pin
- ◆ UVLO (Under voltage lockout)
- ◆ Fault Protections : VDD Over Voltage, Output Short-Circuit, Over-Current, OLP (Over load protection) and Pin Fault
- ◆ Photo coupler short protection & Feedback open protection
- ◆ High voltage CMOS process with excellent ESD protection
- ◆ 250mA/-500mA driving capability
- ◆ Hazardous Substance Free
- ◆ RoHs/REACH Compliant



SOP-7L

Function and Protection Options

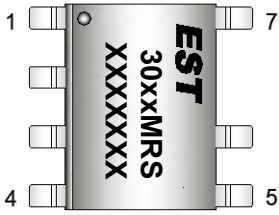
Part No.	Package	Freq.	Protection					
		KHZ	VCC OVP	OLP(65mS)	CS Open	SDSP	Line OVP	AC
EST.30xxMR	SOP-7L	100KHz	Hiccup	Hiccup	Hiccup	Hiccup	Hiccup	Hiccup

Note: EST lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. EST lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020C for MSL classification at lead-free peak reflow temperature. EST defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight)

Ordering Information

Part Number	Package	Packaging	Note
EST.30xxMRS	SOP-7L	Tape	Green

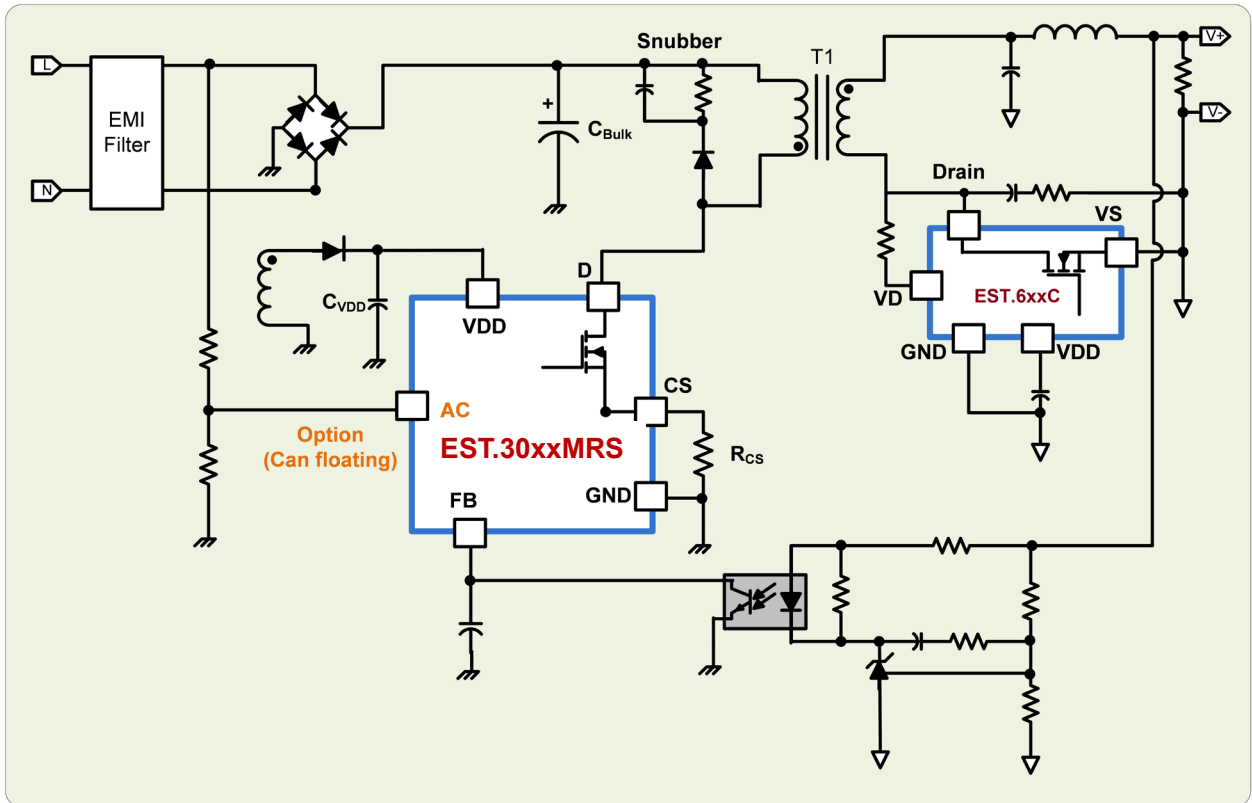
Pin Assignments and Package Type



EST: LOGO
 YY: Year code
 WW: Week code
 30xxMRS: xx= MOS Type
 XXXX: Production lot code

SOP-7	NAME	Description	Description
1	AC	Option , AC or DC	Brown in/out, which can be floating.
2	FB		Voltage input pin by connecting a photo-coupler
3	VDD		Power supply pin
4	CS		Current Sense pin, connect to sense the MOSFET current.
5,6	Drain		For start-up, the pin is also HV power MOSFET drain pin
7	GND		Ground

Application Circuit



Absolute Maximum Ratings

Parameter Symbol	Symbol	Limit Values		Unit	Remark
		Min.	Max		
Supply Voltage VDD	V _{DD}	-0.3	32	V	
AC,FB,CS Voltage	V _{AC} ,V _{FB} ,V _{CS} ,	-0.3	7	V	
Drain Voltage	V _D	700		V	
Max Junction Temperature	T _{jm}	-40	150	°C	
Operation Junction Temperature	T _j	-40	125	°C	
Operation Ambient Temperature	T _A	-25	85	°C	
Storage Temperature	T _{stg}	-55	150	°C	
Absolute Max. IDD Current @ V _{DD} =25V	I _{DD_max}	-	22	mA	SOP-7
Power Dissipation	PD	-	556	mW	
Junction-to-Ambient Thermal Resistance*	θ _{JA}	-	180	°C/W	
Junction-to-Case Thermal Resistance**	θ _{JC}	-	39	°C/W	
Lead temperature (Soldering, 10 sec)		-	260	°C	
ESD Voltage Protection	HBM	V _{ESD-HBM}	-	3.0	KV
	MM	V _{ESD-MM}	-	300	V

*1All items are tested with the standards JESD 51-2 and 51-10(DIP).

Stress beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

*2. Free standing with no heatsink; without copper clad (Measurement condition: just before junction temperature T_j, enters into OTP)

*3.Measurement on the DRAIN pin close to plastic interface

Recommended Operating Conditions

Parameter Symbol	Symbol	Limit Values		Unit	Remarks
		Min.	Max		
Supply Voltage VDD	VDD	11	25	V	
Startup Resistor Value	R _{star}	1	14	MΩ	
Ambient temperature range	T _{opr}	-40	85	°C	
Capacitance of FB pin	C _{FB}		2.2	nF	
Capacitance of CS pin	C _{CS}	47	390	pF	

DC Electrical Characteristics (VCC =15V, Ta=25°C)

Supply Voltage (VDD Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Startup Current	I _{DD-ST}		2	3	μA	V _{DD} =15V
Operating Current (with 1nF load on DRV pin)	I _{DD-OP}	0.4	0.6	0.8	mA	V _{FB} =0V
	I _{DD-OP}	1	2	2.3	mA	V _{FB} =2.5V CL=1nF
	I _{DD-OLP}	0.2	0.35	0.5	mA	Protection Current
UVLO (off)	V _{UVLO-OFF}	7.5	8	8.5	V	
UVLO (on)	V _{UVLO-ON}	16		19	V	
VDD OVP Level	V _{OVP}	26	27	28.5	V	
OVP Debounce Time	T _{OVP}		4		cycle	Guarantee by Design
VDD Simulation mode(ON)	V _{DD-HD_ON}	9.7		10.7	V	
VDD Simulation mode(OFF)	V _{DD-HD_OFF}	10.2		11.2	V	
Latch off mode release Current	I _{DD-LHOFF}			25	uA	Guarantee by Design

Voltage Feedback(FB Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Short Circuit Current	I _{zero}	0.1	0.14	0.18	mA	V _{FB} =0V
Open Loop Voltage	V _{FB-OP}	4.8	5	5.2	V	FB pin open
Over Load Protection	V _{OLP}	3.5	4	4.5	V	
Debounce Time of OLP	T _{OLP}	55	65	75	ms	
Burst mode start voltage(on)	V _{BUR_ON}	0.35	0.45	0.55	V	
Burst Mode Hysteresis	V _{BUR_HY}	0.05	0.1	0.15	V	
Green Mode Threshold	F _{th_GR}	55	60	75	KHz	V _{FB} =1.3V

Current Sensing (CS Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Leading Edge Blanking Time & Propagation Delay to Output	$T_{LEB} + T_{PD}$	400	500	600	ns	
Maximum CS Off Voltage	V_{CSTH}	0.65	0.70	0.75	V	
OCP source current	I_{OCP}	240	250	260	uA	Min. Duty
CS Over Voltage Protection	V_{CS_OVP}	0.45	0.5	0.55	V	$T = T_{off}$
OVP Leading Blanking time	T_{OVP_LEB}		2		us	Guarantee by Design
Internal Slope Compensation	$V_{SLP_LP_LEB}$		160		mV	
Short Circuit Protection Voltage	V_{SCP}		1		us	
Debounce Time of V_{SCP}	T_{SCP}		4		cycle	
Short Circuit Detection Time	T_{SCP}		100		us	

Alternating Current Detect(AC Pin):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Brown In trigger point	V_{BNI}	0.80	0.85	0.9	V	
Brown Out trigger point	V_{BNO}	0.65	0.70	0.75	V	
BNO De-bounce time	T_{BNO}	20	26.5	30	ms	

SDSP (Secondary diodes short protection):

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
SDSP CS pin level	V_{CS_SDSP}		0.85		V	
De-bounce Cycle	$T_{D_SDSP} (*)$		2		Cycle	Guarantee by Design

Timer Section:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Burst Mode Frequency	F_{Burst}	20	22.5	28	KHz	
PWM Mode Frequency	F_{PWM}	95	100	105	KHz	
Voltage stability of Frequency	F_{PSRR}	-1		+1	%	$V_{DD} = 11V \sim 25V$
Frequency Shuffling Range	F_{jitter}	+/-4	+/-6	+/-8	%	
Maximum duty cycle	D_{MAX}	75	80	85	%	
Internal Soft Startup Time	T_{SS}	6.7	8.6	10.5	mS	

On chip OTP:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
OTP Level			150		°C	
OTP exit			120		°C	

650V MOSFET (Drain Pin) :

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	Remark	Package
MOSFET Drain-source Breakdown Voltage	BV_{DSS}	VGS=0V ID=250uA	650			V		
		VGS=10V ID=0.5A		7.5	10	Ω	EST.3011MRS	SOP-7
Static drain-source on-resistance	$RDS_{(on)}$	VGS=10V ID=0.5A		4.0	5.0	Ω	EST.3013MRS	SOP-7
		VGS=10V ID=1A		2.5	3.5	Ω	EST.3015MRS	SOP-7
		VGS=10V ID=0.5A		2.4	2.8	Ω	EST.3017MRS	SOP-7
		VGS=10V ID=0.6A		1.8	2.2	Ω	EST.3019MRS	SOP-7

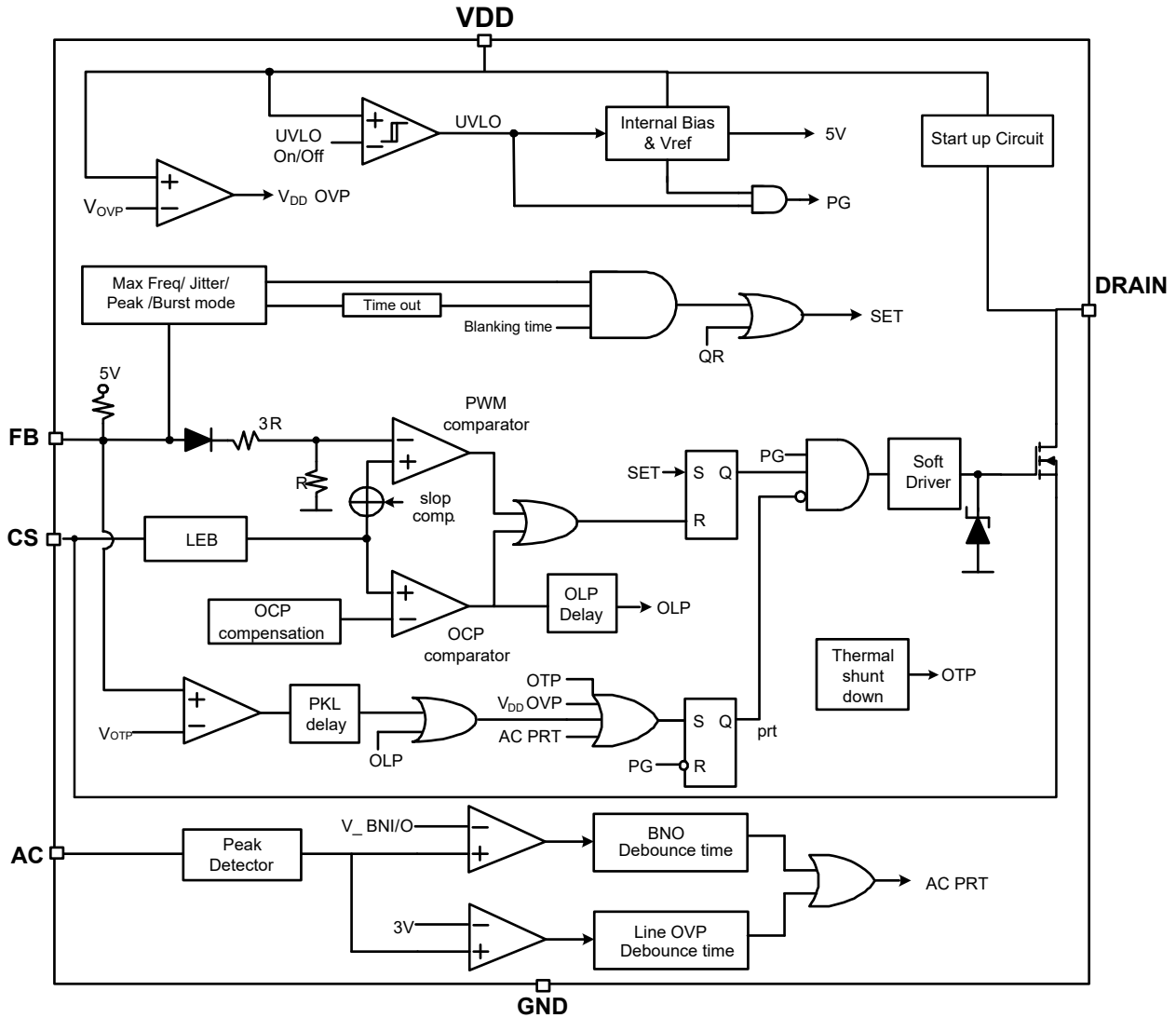
700V MOSFET (Drain Pin) :

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	Remark	Package
MOSFET Drain-source Breakdown Voltage	BV_{DSS}	VGS=0V ID=250uA	700			V		
Static drain-source on-resistance	$RDS_{(on)}$	VGS=10V ID=0.5A		13.0	14.5	Ω	EST.3021MRS	SOP-7
		VGS=10V ID=1A		4.0	5.0	Ω	EST.3025MRS	SOP-7
		VGS=10V ID=1.5A		3.6	4.2	Ω	EST.3027MRS	SOP-7
		VGS=10V ID=2.0A		2.6	3.2	Ω	EST.3029MRS	SOP-7

800V MOSFET (Drain Pin) :

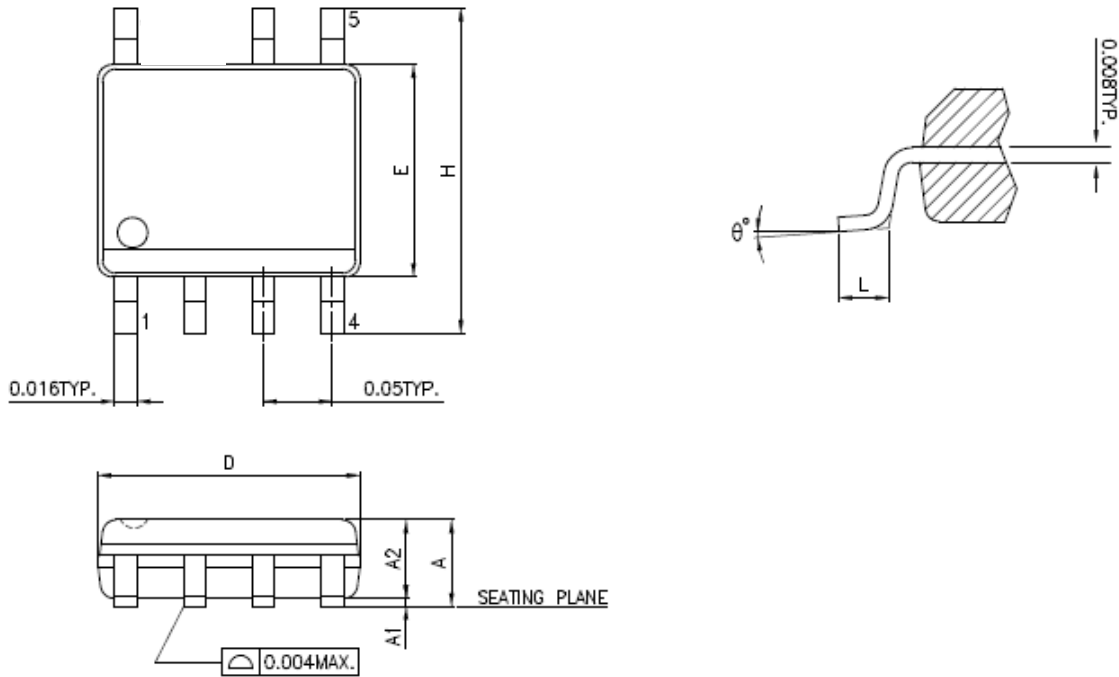
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	Remark	Package
MOSFET Drain-source Breakdown Voltage	BV_{DSS}	VGS=0V ID=250uA	800			V		
Static drain-source on-resistance	$RDS_{(on)}$	VGS=10V ID=1.5A		4.0	5.0	Ω	EST.3037MRS	SOP-7

Block Diagram
EST.30xxMRS



Package Information

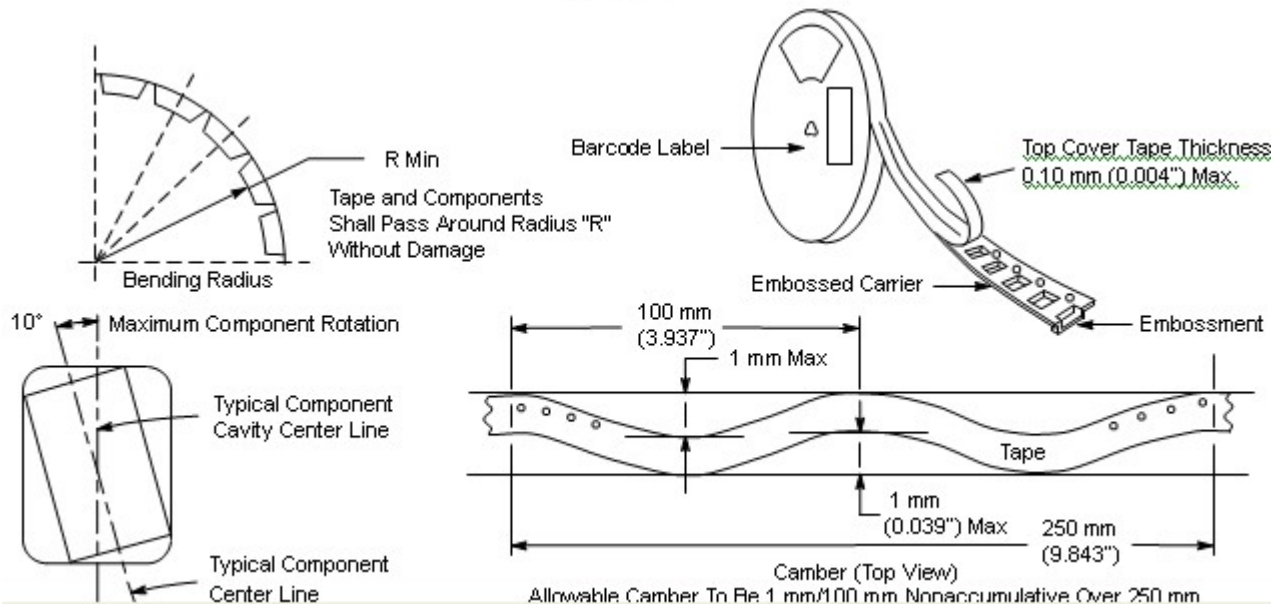
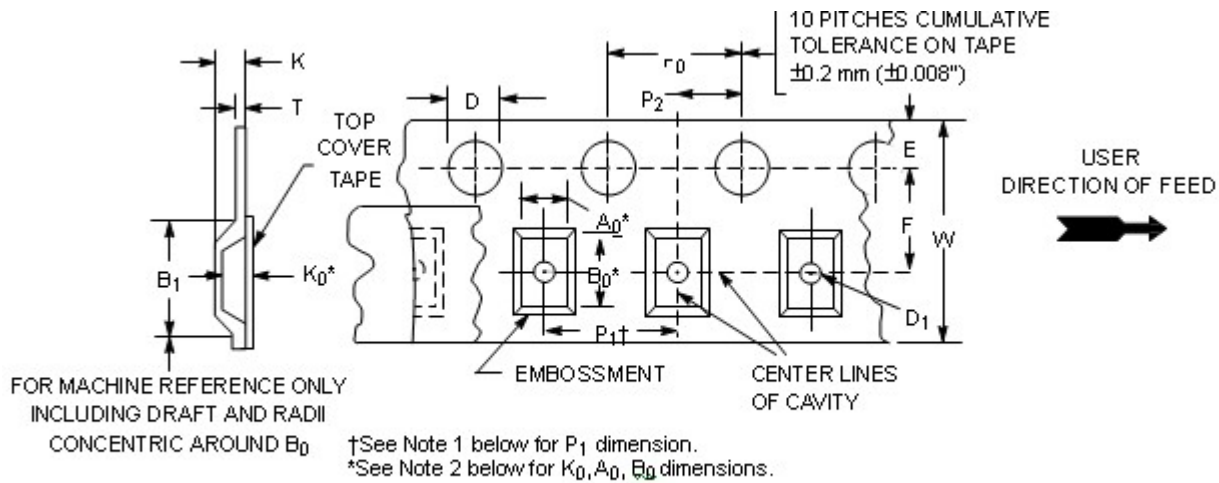
SOP-7 Package (mm)



Symbols	Dimensions In Inches			Dimensions In millimeters		
	MIN.	NOR.	MAX.	MIN.	NOR.	MAX.
A	0.050	0.061	0.072	1.270	1.549	1.829
A1	0.000	-----	0.010	0.000	-----	0.254
A2	-----	-----	0.062	-----	-----	1.575
D	0.185	0.193	0.200	4.699	4.902	5.080
E	0.147	0.154	0.160	3.734	3.912	4.064
H	0.225	0.237	0.249	5.715	6.020	6.325
L	0.013	0.033	0.053	0.330	0.838	1.346
θ	0°	4°	8°	0°	4°	8°

Embossed Tape and Reel Data Carrier Tape Specifications

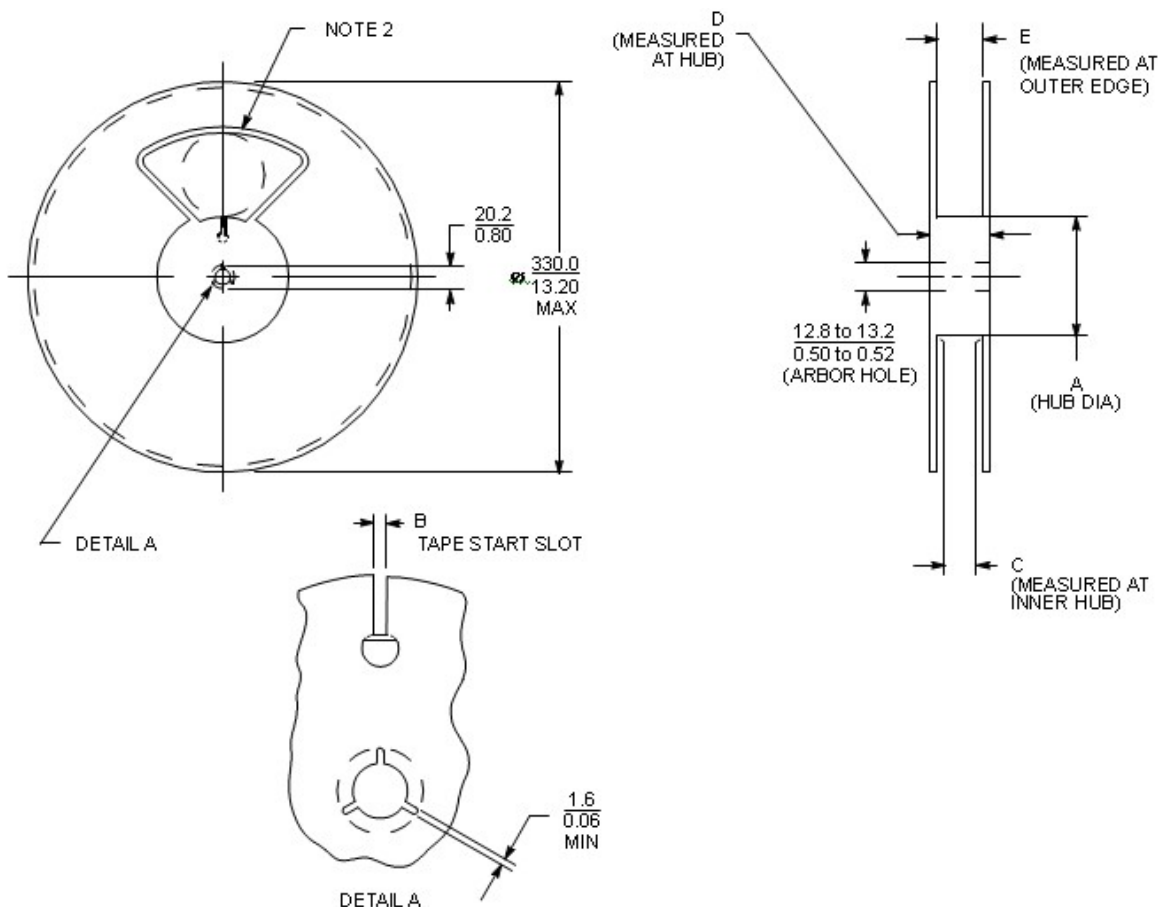
SOP-7/ Tape Reel Data



DIMENSIONS

Tape size (W)	B1 Max (Note 1)	D	D1	E	F	K	P0	P2	R Min	T Max	W Max
8 mm	4.55 mm (0.179")	1.5 + 0.1 - 0.0 (0.059 + 0.004" - 0.0)	1.0 Min (0.039") or 0.5 mm Min (0.020")	1.75 ± 0.1 (0.069 ± 0.004")	3.5 ± 0.05 (0.138 ± 0.002")	2.4 mm Max (0.094")	4.0 ± 0.1 mm (0.157 ± 0.004")	2.0 ± 0.1 mm (0.079 ± 0.002")	25 mm (0.98")	0.6 mm (0.024")	8.3 mm (0.327")
12 mm	8.2 mm (0.323")		1.5 mm Min (0.060")		5.5 ± 0.05 (0.217 ± 0.002")	6.4 mm Max (0.252")			30 mm (1.18")		12 ± 0.30 (0.470 ± 0.012")
16 mm	12.1 mm (0.476")				7.5 ± 0.10 (0.295 ± 0.004")	7.9 mm Max (0.311")					16.3 mm (0.642")
24 mm	20.1 mm (0.791")				11.5 ± 0.1 (0.453 ± 0.004")	11.9 mm Max (0.468")					24.3 mm (0.957")

Reel Dimensions



Reel Diameter	Tape Size	A		B		C		D (Max)	E (Max)
		mm (inches)		mm (inches)		mm (inches)			
		Min	Max	Min	Max	Min	Max		
178.0 (7.01)	16.0 (0.63)		50.0 (1.97)	6.5 (0.26)	7.5 (0.30)	16.4 (0.65)	18.4 (0.72)	22.4 (0.88)	19.4 (0.76)
330.0 (12.99)	12.0 (0.47)	178.0 (7.01)		4.5 (0.18)	5.5 (0.22)	12.4 (0.49)	14.4 (0.57)	18.4 (0.72)	15.4 (0.61)
330.0 (12.99)	56.0 2.20	150.0 (5.91)		10.0 (0.39)	11.0 (0.43)	56.4 (2.22)	58.4 (2.30)	62.4 (2.46)	59.4 (2.34)
330.0 (12.99)	44.0 (1.73)	100.0 (3.94)		10.0 (0.39)	11.0 (0.43)	44.4 (1.75)	46.4 (1.83)	62.4 (2.46)	47.4 (1.87)
330.0 (12.99)	32.0 (1.26)	100.0 (3.94)		10.0 (0.39)	11.0 (0.43)	32.4 (1.28)	34.4 (1.35)	38.4 (1.51)	35.4 (1.39)
330.0 (12.99)	24.0 (0.94)	60.0 (2.36)		9.5 (0.37)	10.5 (0.41)	24.4 (0.96)	26.4 (1.04)	30.4 (1.51)	27.4 (1.08)
330.0 (12.99)	16.0 (0.63)			6.5 (0.26)	7.5 (0.30)	16.4 (0.65)	18.4 (0.72)	22.4 (0.88)	19.4 (0.76)
330.0 (12.99)	12.0 (0.47)			4.5 (0.18)	5.5 (0.22)	12.4 (0.49)	14.4 (0.57)	18.4 (0.72)	15.4 (0.61)
330.0 (12.99)	8.0 (0.31)	50.0 (1.97)		2.5 (0.10)	3.5 (0.14)	8.4 (0.33)	9.9 (0.39)	14.4 (0.57)	10.9 (0.43)
178.0 (7.01)	12.0 (0.47)	50.0 (1.97)		4.5 (0.18)	5.5 (0.22)	12.4 (0.49)	14.4 (0.57)	18.4 (0.72)	15.4 (0.61)
178.0 (7.00)	8.0 (0.31)	50.0 (1.97)		2.5 (0.10)	3.5 (0.14)	8.4 (0.33)	9.9 (0.39)	14.4 (0.47)	10.9 (0.43)
330.0 (12.99)	8.0 (0.31)	50.0 (1.97)		4.0 (0.16)	5.0 (0.20)	8.4 (0.33)	9.9 (0.39)	14.4 (0.57)	10.9 (0.43)
178.0 (7.00)	8.0 (0.31)	50.0 (1.97)		4.0 (0.16)	5.0 (0.20)	8.4 (0.33)	9.9 (0.39)	14.4 (0.57)	10.9 (0.43)

Revision History

REVISION	DESCRIPTION	PAGE	DATE
Rev 1.0	First release	13	2020/05/08



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