International
IOR Rectifier

IRS2505LPBF

µPFC™ SOT-23 Boost PFC Control IC

Features

- Critical-conduction mode PFC control
- High PF and ultra-low THD
- Wide load and line range
- Regulated and programmable DC bus voltage
- No secondary winding required
- MOSFET cycle-by-cycle over-current protection
- DC bus over-voltage protection
- Low EMI gate drive
- Ultra-low start-up current
- 20.8V internal zener clamp on VCC
- Excellent ESD and latch immunity
- RoHS compliant
- 5-pin SOT-23 package

Applications

- Off-line power supply
- Electronic ballast
- LED power supply

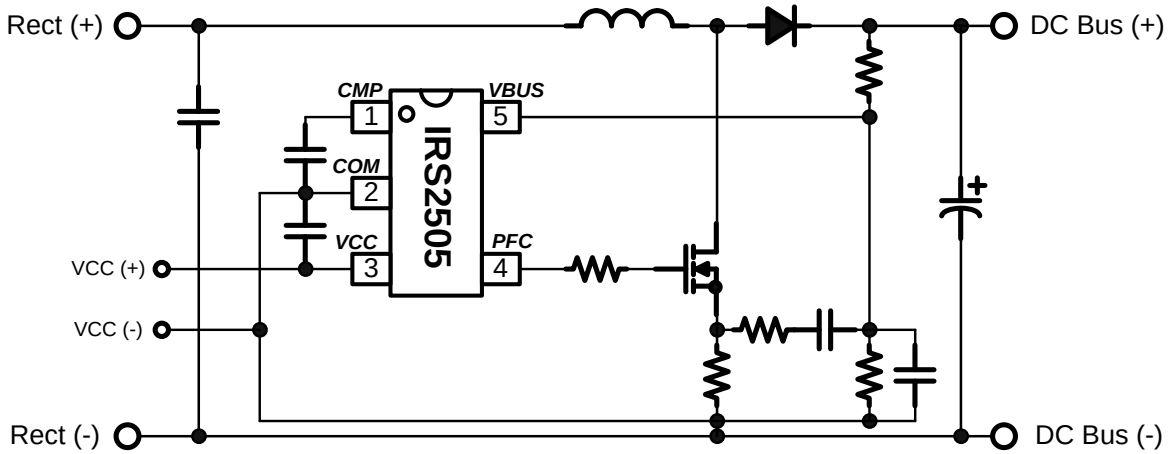
Description

The IRS2505 is a control IC for boost-type PFC circuits operating in critical-conduction mode. The IC incorporates a free-running frequency oscillator with on- and off-time control of the boost power MOSFET without the need for a secondary winding. Also included in the design is over-voltage protection of the DC bus and cycle-by-cycle over-current protection of the power MOSFET. Micro-power start-up current and an internal 20.8V zener clamp at VCC are provided to simplify the external VCC supply circuitry. ESD and latch immune CMOS technology enables a rugged monolithic IC construction.

Package Options

5 Lead SOT23

Application Diagram



Ordering Information

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRS2505LPBF	5L-SOT-23	Tape and Reel	3000	IRS2505LTRPBF

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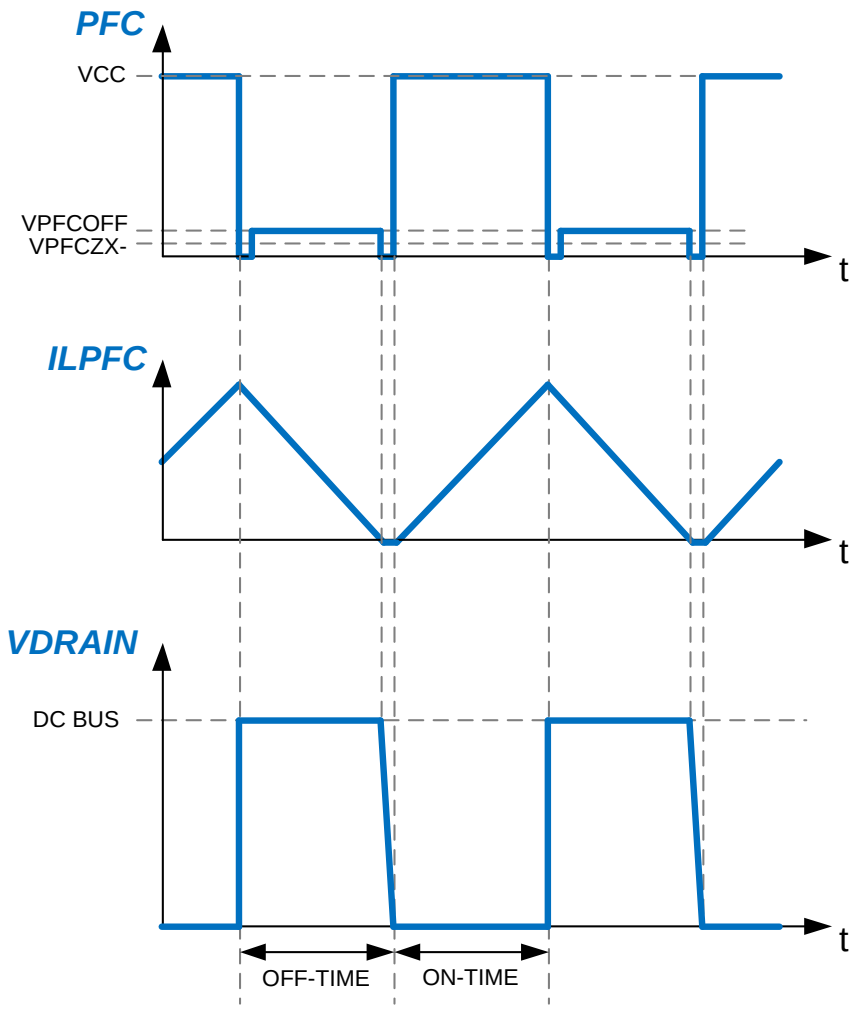
Timing Diagram



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Qualification Information†

Qualification Level		Industrial†† (per JEDEC JESD 47E)	
		Comments: This family of ICs has passed JEDEC's Industrial qualification. IR's Consumer qualification level is granted by extension of the higher Industrial level.	
Moisture Sensitivity Level		SOT-23	MSL1††† (per IPC/JEDEC J-STD-020C)
ESD	Machine Model	Class B (per JEDEC standard EIA/JESD22-A115-A)	
	Human Body Model	Class 2 (per EIA/JEDEC standard JESD22-A114-B)	
IC Latch-Up Test		Class I, Level A (per JESD78A)	
RoHS Compliant		Yes	

† Qualification standards can be found at International Rectifier's web site http://www.irf.com/

†† Higher qualification ratings may be available should the user have such requirements. Please contact your International Rectifier sales representative for further information.

††† Higher MSL ratings may be available for the specific package types listed here. Please contact your International Rectifier sales representative for further information.

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Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM, all currents are defined positive into any pin. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

Symbol	Definition		Min.	Max.	Units
VPFC	PFC pin voltage		-0.3	VCC + 0.3	V
VBUS	VBUS pin voltage		-0.3	VCC + 0.3	
ICC	VCC pin supply current†		---	25	mA
ICMP	CMP pin current††		---	1	
PD	Package power dissipation @ Ta ≤ +25 ºC	SOT-23 5L	---	250	mW
RΘja	Thermal resistance, junction to ambient	SOT-23 5L	---	191	ºC/W
Tj	Junction temperature		-55	150	ºC
Ts	Storage temperature		-55	150	
TL	Lead temperature (soldering, 10 seconds)		---	300	

† This IC contains a voltage clamp structure between the chip VCC and COM which has a nominal breakdown voltage of 20.8V. This supply pin should not be driven by a DC, low impedance power source greater than the VCLAMP specified in the Electrical Characteristics section.

†† This IC contains a voltage clamp structure between the CMP and COM which has a nominal breakdown voltage of 10.2V. This pin should not be driven by a DC, low impedance power source greater than the VZCMP specified in the Electrical Characteristics section.

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Recommended Operating Conditions

For proper operation the device should be used within the recommended conditions.

Symbol	Definition	Min.	Max.	Units
VCC	Supply voltage	VCCUV+ + 0.5V	VCLAMP	V
ICC	Supply current	0	10	mA
VCMP	CMP pin voltage	0	VZCMP	V
Tj	Junction temperature	-40	125	ºC

Recommended Component Values

Symbol	Component	Min.	Max.	Units
CCMP	Compensation capacitor value	470	---	nF
CVCC	VCC filter capacitor	100	---	nF
CVBUS	VBUS pin filter capacitor	1.0	---	nF

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Electrical Characteristics

VCC=14V, CVCC=0.1uF, CCMP=0.68uF, CPFC=1nF, CVBUS=10nF, and Ta=25°C unless otherwise specified.

Symbol	Definition	Min	Typ	Max	Units	Test Conditions
Supply Characteristics						
VCLAMP	VCC clamp voltage	19.8	20.8	21.8	V	ICC = 19 mA
VCCUV+	Rising VCC under-voltage lock-out threshold	10.0	11.1	12.0		N/A
VCCUV-	Falling VCC under-voltage lock-out threshold	7.0	7.9	9.0		
VCCUVHYS	VCC UVLO hysteresis	---	3.2	---		
IQCCUV	Micro-power start-up VCC supply current	---	---	60.0	µA	VCC = VCCUV+ - 500mV rising
ICC50kHz	VCC current @ 50kHz	---	2.5	---	mA	MOSFET = IRF840A
PFC Characteristics						
VBUSREG	VBUS Pin Regulation Voltage	4.02	4.1	4.18	V	
VBUSOV+	VBUS Pin OVP Threshold	---	4.47	---		
VBUSOV-	VBUS Pin OVP Fault Reset Threshold	---	4.26	---		
VBUSOC+	VBUS Pin Over-Current Threshold	---	0.56	---		VBUS = 3V
tWD	Watch Dog Timer Pulse Interval	---	125	---		
ICMP+	CMP Pin OTA IO+	---	30	---	µA	VBUS=3.5V,VCMP=0V
ICMP-	CMP Pin OTA IO-	---	-30	---		VBUS=4.5V,VCMP=5V
VCMPOH	OTA Output Voltage Swing (high state)	9.9	10.2	11.5	V	VBUS=3.5V
VCMPOL	OTA Output Voltage Swing (low state)	---	0	---		VBUS=4.5V
VCMPFLT	OTA Output Voltage in Fault Mode	---	0	---		
VZCMP	CMP Pin Clamp Voltage	9.9	10.2	11.5		VBUS=3.5V
Gate Driver Output Characteristics (PFC)						
VPFCON	Gate High Voltage	---	VCC	---	V	
VPFCOFF	Gate Low Voltage	---	0.59	---		
tf	Output fall time	---	20	---	nsec	Falling, 80% to 20%
IO-	Output sink current	---	450	---	mA	

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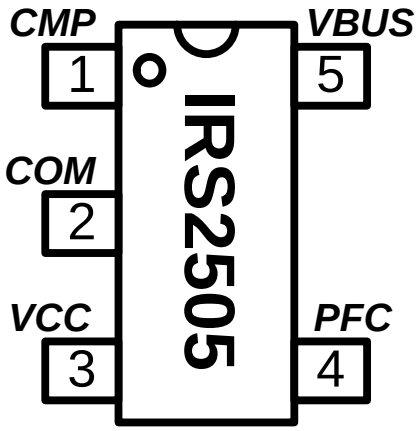
Pin Assignments and Definitions



Pin	Name	Description
1	***CMP***	PFC error amplifier compensation
2	***COM***	IC power and signal ground
3	***VCC***	Logic and gate drive supply voltage
4	***PFC***	PFC gate driver output and zero-crossing detection
5	***VBUS***	DC bus sensing input, OVP and OCP

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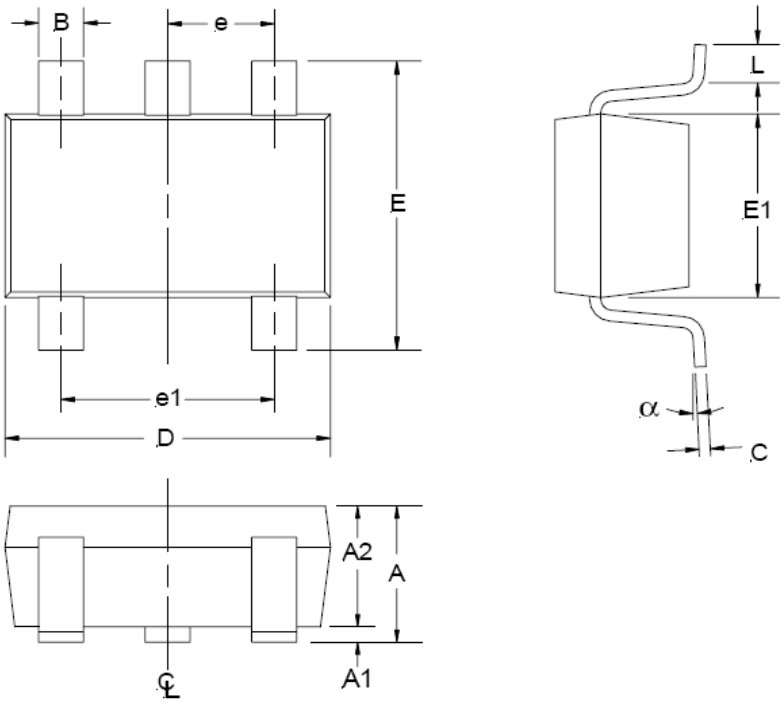
Package Details: 5 Lead SOT23



SYMBOL	MIN	MAX
A	0.90	1.45
A1	0.00	0.15
A2	0.90	1.30
B	0.25	0.50
C	0.09	0.20
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.75
e	0.95 REF	
e1	1.90 REF	
L	0.35	0.55
α	08	108

NOTE: ALL MEASUREMENTS ARE IN MILLIMETERS.

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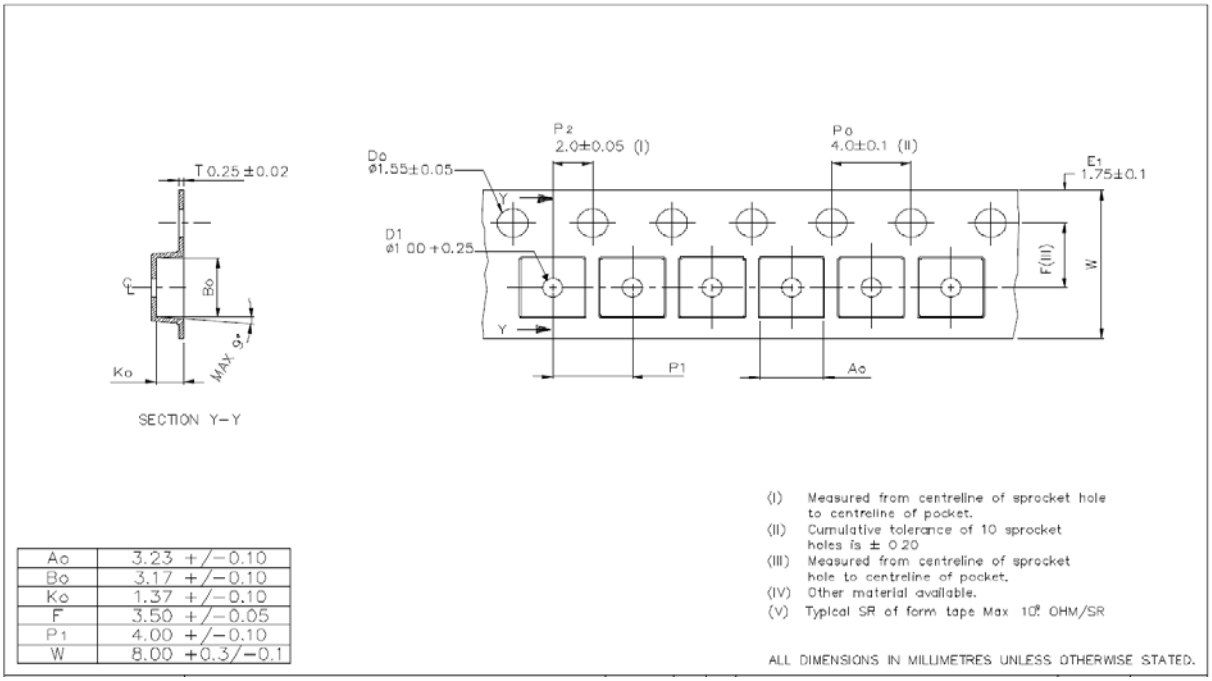
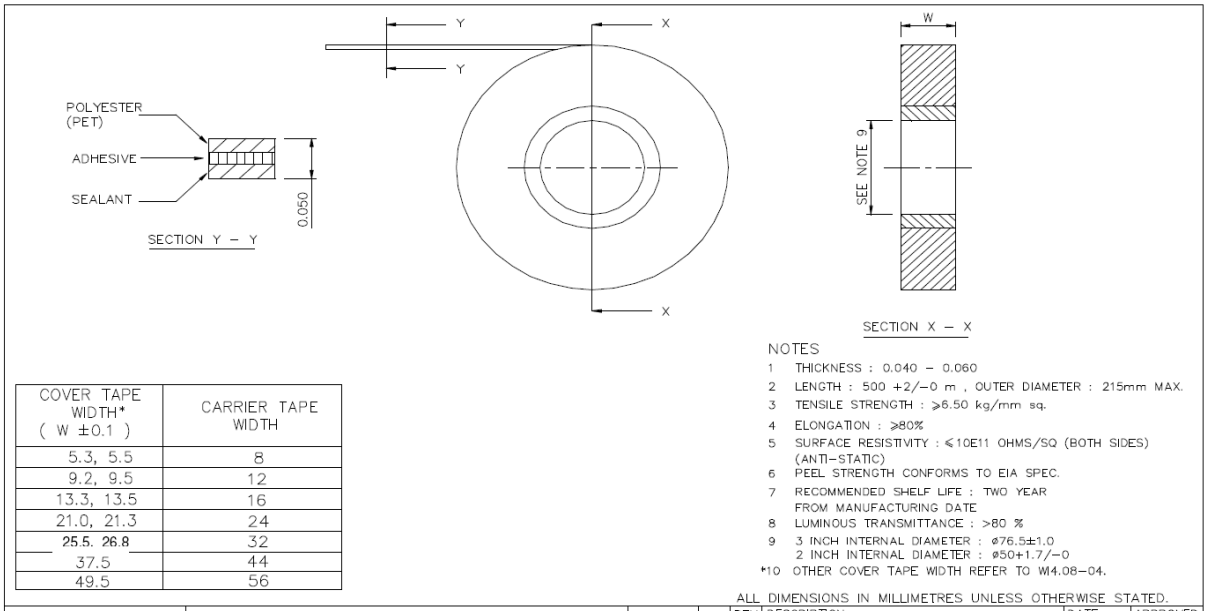
Tape and Reel Details: 5 Lead SOT23



Ao	3.23 +/−0.10
Bo	3.17 +/−0.10
Ko	1.37 +/−0.10
F	3.50 +/−0.05
P1	4.00 +/−0.10
W	8.00 +0.3/−0.1

(I) Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20
(III) Measured from centreline of sprocket hole to centreline of pocket.
(IV) Other material available.
(V) Typical SR of form tape Max 10^{5} OHM/SR

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.



COVER TAPE WIDTH* (W ±0.1)	CARRIER TAPE WIDTH
5.3, 5.5	8
9.2, 9.5	12
13.3, 13.5	16
21.0, 21.3	24
25.5, 26.8	32
37.5	44
49.5	56

NOTES
1 THICKNESS : 0.040 – 0.060
2 LENGTH : 500 +2/−0 m , OUTER DIAMETER : 215mm MAX.
3 TENSILE STRENGTH : ≥6.50 kg/mm sq.
4 ELONGATION : ≥80%
5 SURFACE RESISTIVITY : ≤10E11 OHMS/SQ (BOTH SIDES) (ANTI−STATIC)
6 PEEL STRENGTH CONFORMS TO EIA SPEC.
7 RECOMMENDED SHELF LIFE : TWO YEAR FROM MANUFACTURING DATE
8 LUMINOUS TRANSMITTANCE : >80 %
9 3 INCH INTERNAL DIAMETER : ø76.5±1.0
2 INCH INTERNAL DIAMETER : ø50+1.7/−0
*10 OTHER COVER TAPE WIDTH REFER TO W4.08−04.

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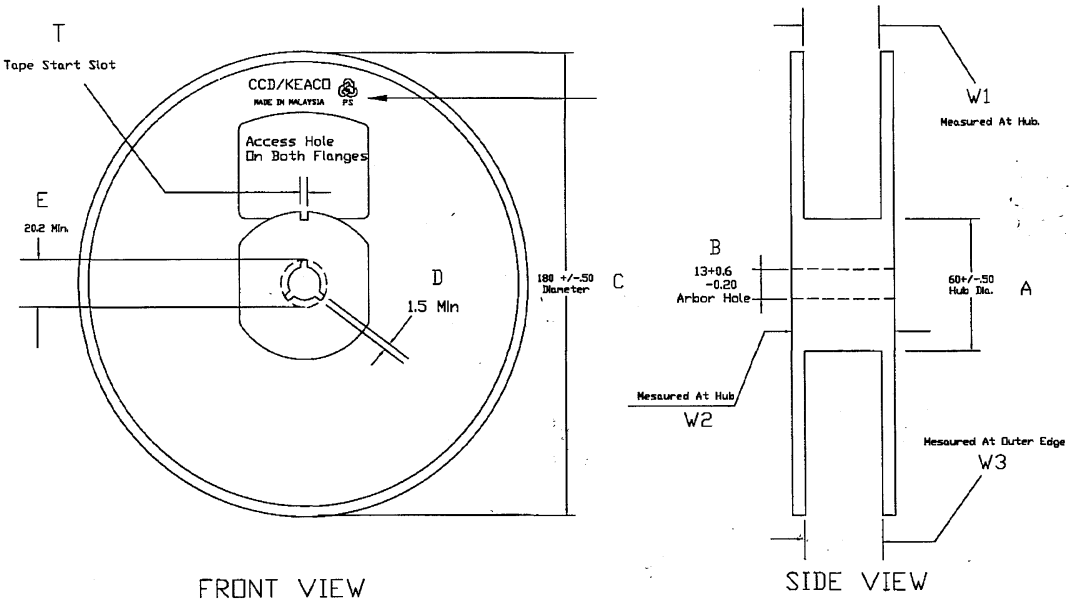

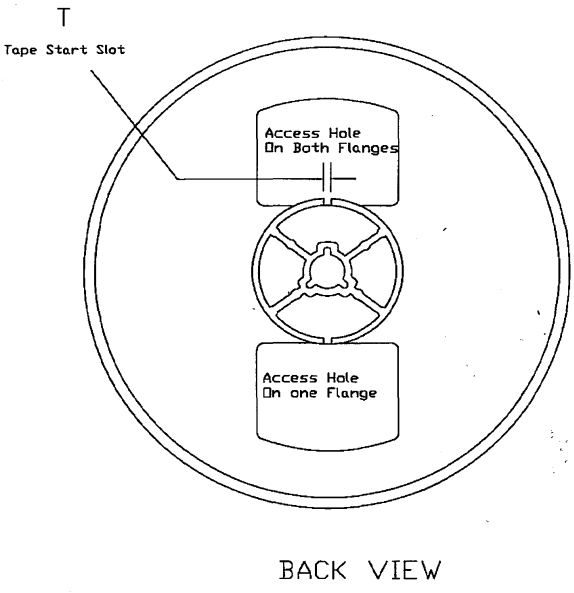

NOTE:
1. MATERIAL : POLYSTRENE
2. SURFACE RESISTIVITY : </= 10E11 OHMS/SQ
(EXTERNAL OR DIPPED)
3. STATIC DECAY : < 2SEC. AT 50%RH

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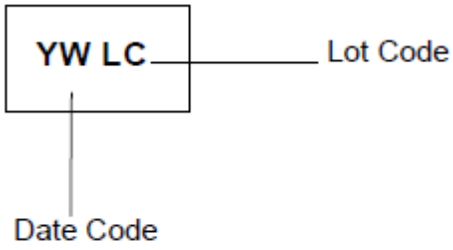
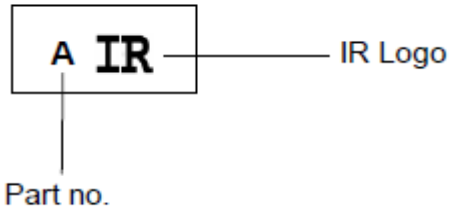
Part Marking Information: 5 Lead SOT23

Top Marking



Bottom Marking



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