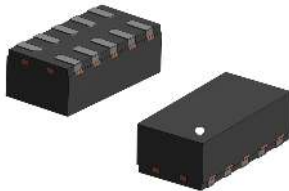
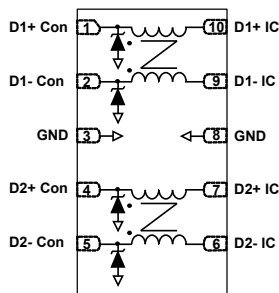


Automotive common mode filter with ESD protection



QFN-10L 2.6 X 1.35 X 0.75




Product status link

[ECMF4-2459A6M10Y](#)

Product summary

Order code	ECMF4-2459A6M10Y
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Features

- AEC-Q101 qualified 
- 9 GHz differential bandwidth to comply with HDMI 2.0, HDMI2.1, HDMI 1.4, USB 3.2 generation 1 and 2, MIPI and DisplayPort, FPD link III and GMSL
- Common mode attenuation on LTE, GPS, Wi-Fi and V2x frequencies:
 - -13 dB at 1.5 GHz
 - -34 dB at 2.4 GHz
 - -20 dB at 5.9 GHz
- Wettable flank for automatic optical inspection
- Low PCB space consumption: 3.5 mm²
- Thin package for compact applications: 0.75 mm
- RoHS package

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002
- IPC7531 footprint and JEDEC registered package
- ISO 10605, IEC 61000-4-2, C = 150 pF – R = 330 Ω level 4:
 - 8 kV (contact discharge)
 - 15 kV (air discharge)
- ISO 10605, C = 330 pF – R = 330 Ω:
 - 8 kV (contact discharge)
 - 15 kV (air discharge)

Description

The [ECMF4-2459A6M10Y](#) is an integrated common mode filter designed to suppress EMI/RFI common mode noise on high speed buses HDMI 2.0, HDMI2.1, HDMI 1.4 and DisplayPort, FPD link III, GMSL, USB3.2 generation 1 and 2, MIPI. It is designed to replace discrete common mode chokes or LTCC.

The device embeds ESD protections on connector side to meet ISO 10605 requirements.

Packaged in QFN-10L with wettable flank, it is compatible with automatic visual inspection.

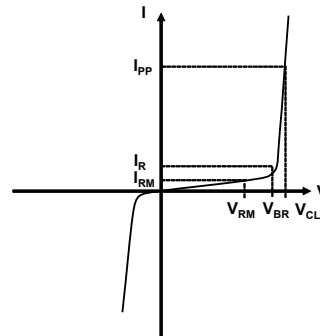
1 Characteristics

Table 1. Absolute maximum ratings ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Parameter	Value	Unit
V_{PP}	Peak pulse voltage	ISO 10605 (C = 330 pF, R = 330 Ω):	
		Contact discharge	8
	Air discharge	15	
	ISO10605 / IEC 61000-4-2 (C = 150 pF, R = 330 Ω):	Contact discharge	8
Air discharge		15	
I_{RMS}	RMS current	100	mA
T_{op}	Operating ambient temperature range	-55 to +125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-55 to +150	

Figure 1. Electrical characteristics (definitions)

V_{RM} Maximum stand-off voltage
 V_{CL} Clamping voltage at peak pulse current I_{PP}
 I_{RM} Leakage current at V_{RM}
 I_{PP} Peak pulse current
 V_{BR} Breakdown voltage
 R_{DC} DC serial resistance
 f_c Differential cut off frequency


Table 2. Electrical characteristics ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Test conditions	Min.	Typ.	Max.	Unit
V_{BR}	$I_R = 1\text{ mA}$	5.3	5.8		V
I_R	$V_R = 3.6\text{ V}$			50	nA
I_{RM}	$V_{RM} = 5\text{ V}$			70	nA
R_{DC}	$I_{DC} = 20\text{ mA}$		5		Ω
f_c	$S_{DD21} = -3\text{ dB}$		9		GHz
V_{CL}	8 kV contact discharge after 30 ns, ISO 10605 (150 pF – 330 Ω)		18.5		V

1.1 Characteristics (curves)

Figure 2. Differential attenuation versus frequency
($Z_{0_diff} = 100 \Omega$)

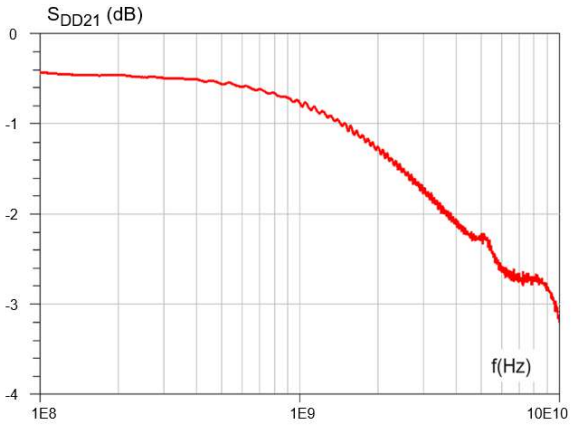


Figure 3. Common mode attenuation versus frequency
($Z_{0_com} = 50 \Omega$)

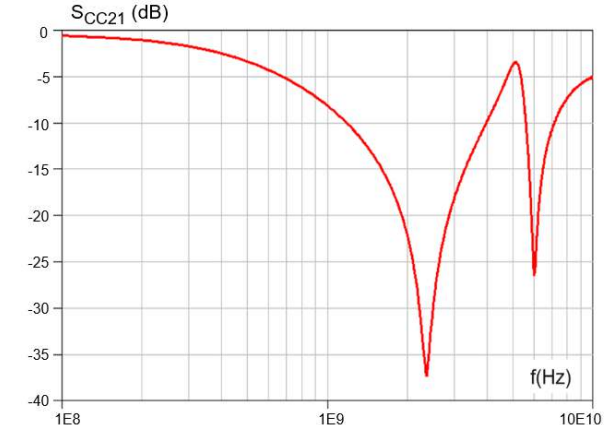


Figure 4. ISO 10605 - C = 150 pF, R = 330 Ω (+8 kV contact)

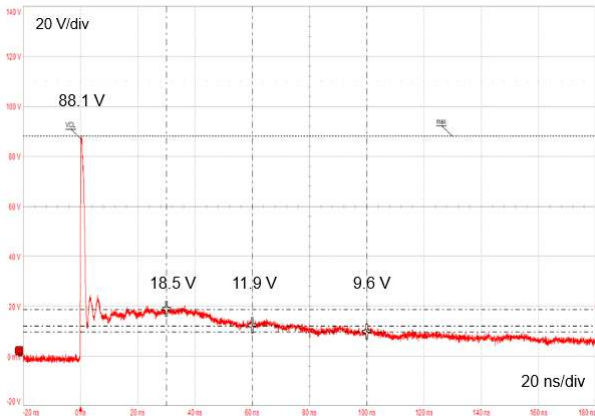


Figure 5. ISO 10605 - C = 150 pF, R = 330 Ω (-8 kV contact)

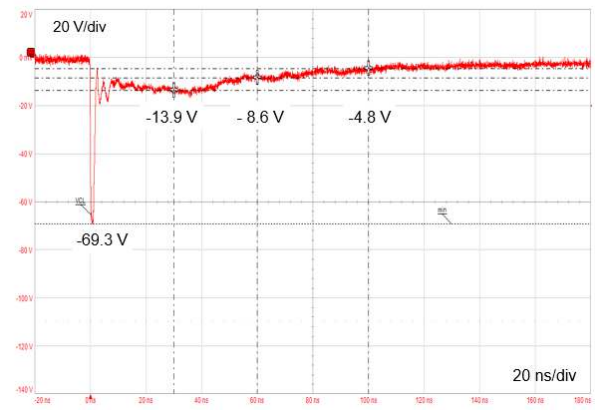


Figure 6. TDR with 200 ps rise time

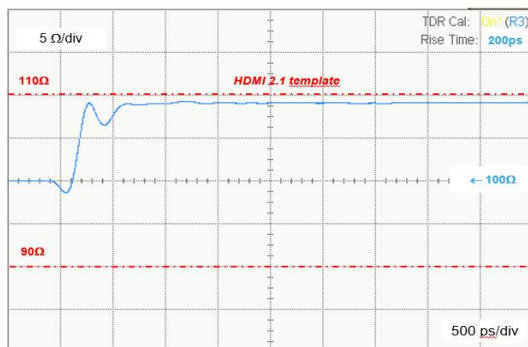


Figure 7. TLP characteristic

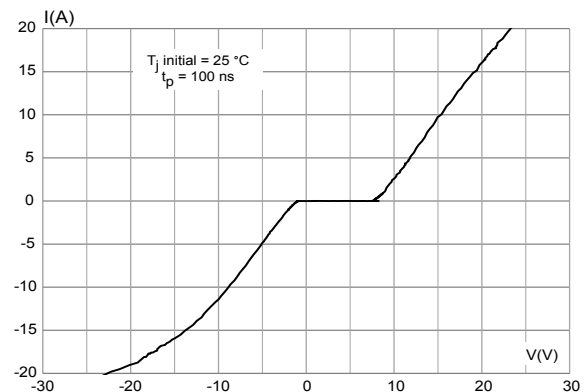


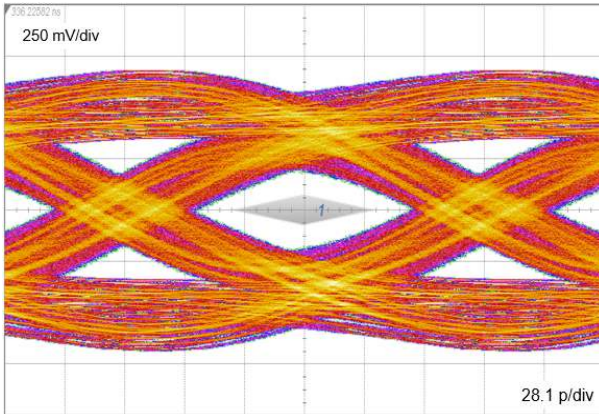
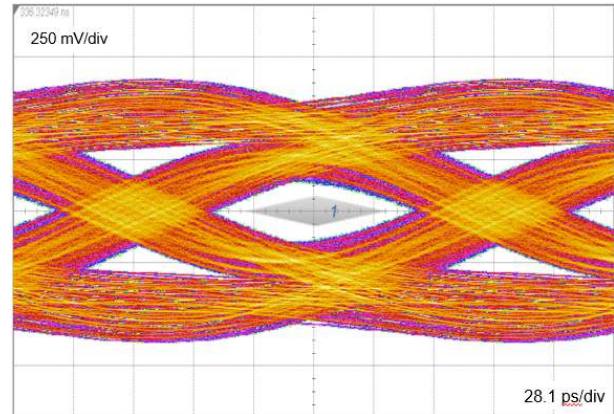
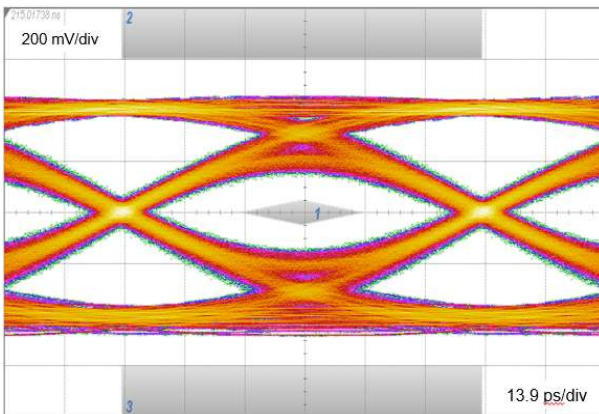
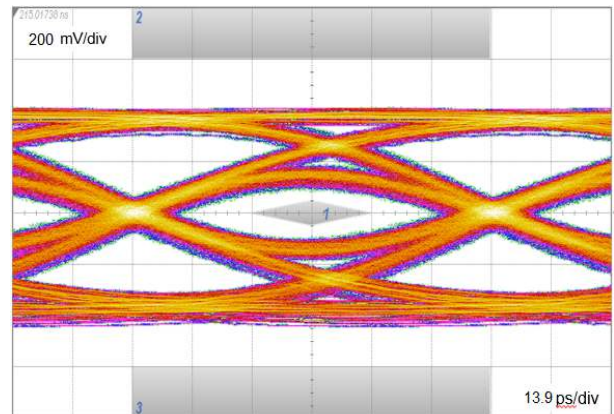
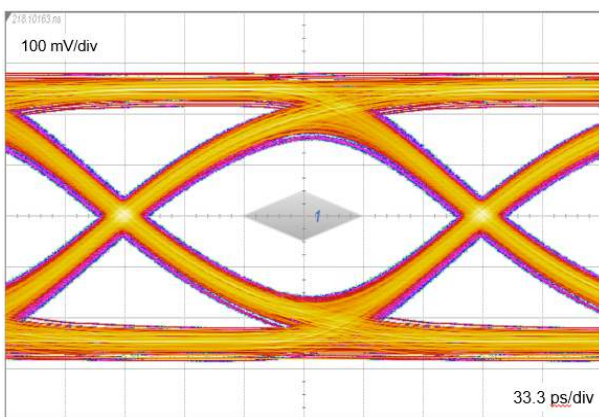
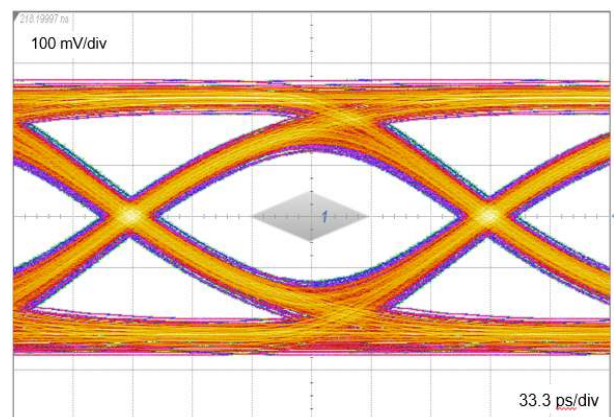
Figure 8. HDMI2.0 – 5.94 Gbps eye diagram without device (with worst cable and equaliser)

Figure 9. HDMI2.0 – 5.94 Gbps eye diagram with device (with worst cable and equaliser)

Figure 10. HDMI2.1 – 12 Gbps eye diagram without device (with worst cable model WCM3), EQ with 8 dB CTLE and one-tap DFE

Figure 11. HDMI2.1 – 12 Gbps eye diagram with device (with worst cable model WCM3), EQ with 8 dB CTLE and one-tap DFE

Figure 12. USB3.2 Gen1 – 5 Gbps Type-C eye diagram without device (with type C connector, reference cable and equalizer)

Figure 13. USB3.2 Gen1 – 5 Gbps Type-C eye diagram with device (with type C connector, reference cable and equalizer)


Figure 14. USB3.2 Gen2 – 10 Gbps eye diagram without device (with type C connector, reference cable, equalizer with ADC = 6 dB and DFE)

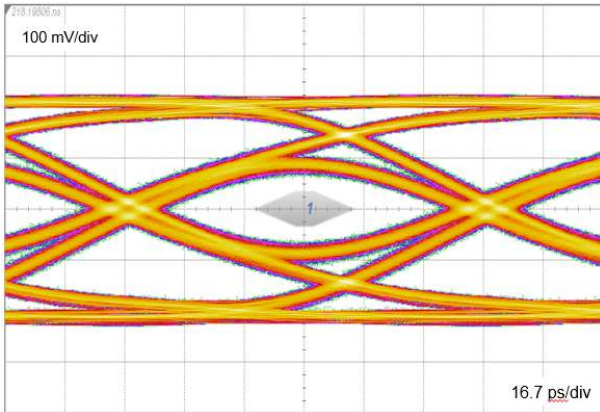


Figure 15. USB3.2 Gen2 – 10 Gbps eye diagram with device (with type C connector, reference cable, equalizer with ADC = 6 dB and DFE)

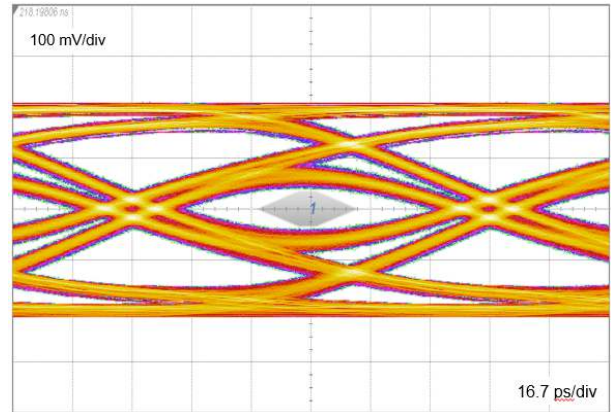


Figure 16. FPD LinkIII – 4.16 Gbps eye diagram without device

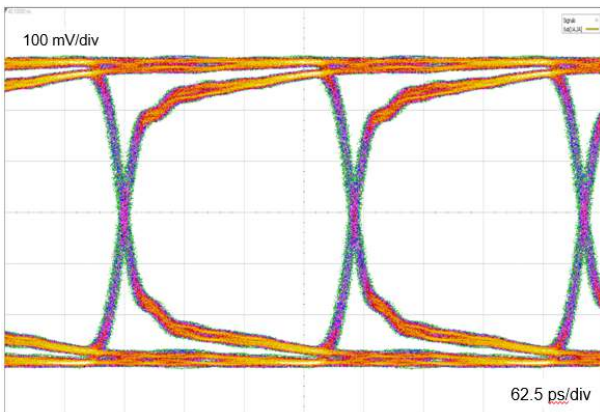


Figure 17. FPD LinkIII – 4.16 Gbps eye diagram with device

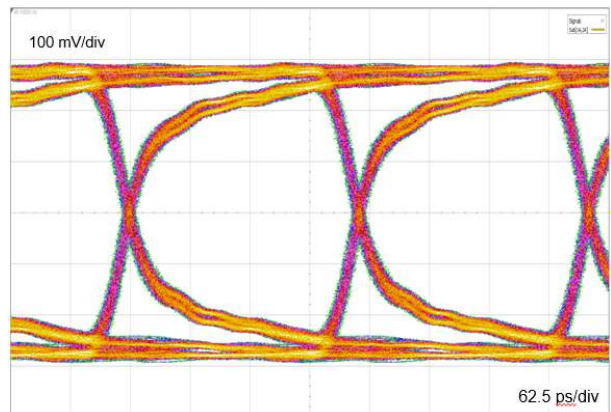


Figure 18. GMSL – 3.12 Gbps eye diagram without device

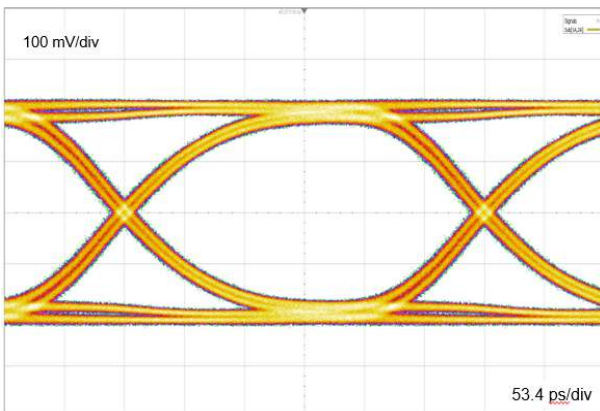
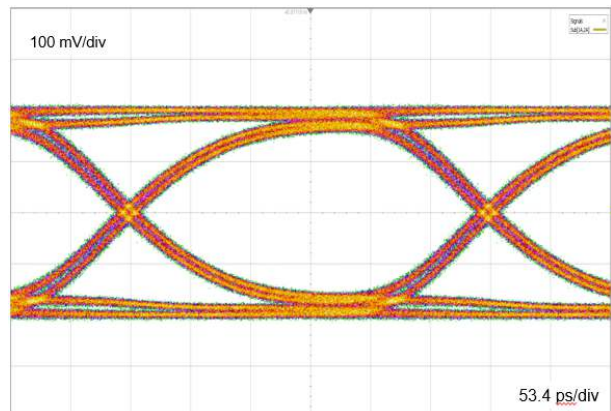


Figure 19. GMSL – 3.12 Gbps eye diagram with device



2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

2.1 QFN-10L package information

Figure 20. QFN-10L package outline

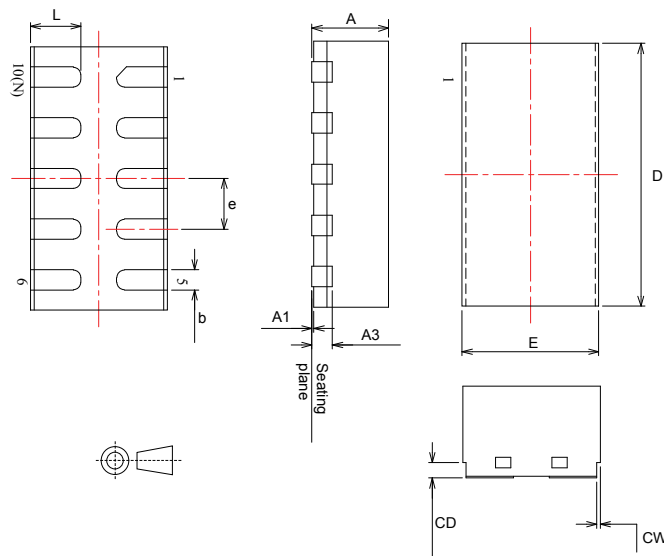


Table 3. QFN-10L mechanical data

Ref.	Dimensions					
	Millimeters			Inches ⁽¹⁾		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.70	0.75	0.80	0.0275	0.0295	0.0315
A1	0.00	0.02	0.05	0.0000	0.0008	0.0020
A3		0.20			0.0079	
b	0.15	0.20	0.25	0.0059	0.0079	0.0099
D	2.55	2.60	2.65	0.1003	0.1024	0.1044
E	1.30	1.35	1.40	0.0511	0.0531	0.0552
e		0.50			0.0197	
L	0.45	0.50	0.55	0.0177	0.0197	0.0217
CW	0.01	0.05	0.09	0.0003	0.0020	0.0032
CD	0.10			0.0039		

1. Value in inches are converted from mm and rounded to 4 decimal digits

3 PCB assembly recommendations

Figure 21. Recommended stencil opening (mm)

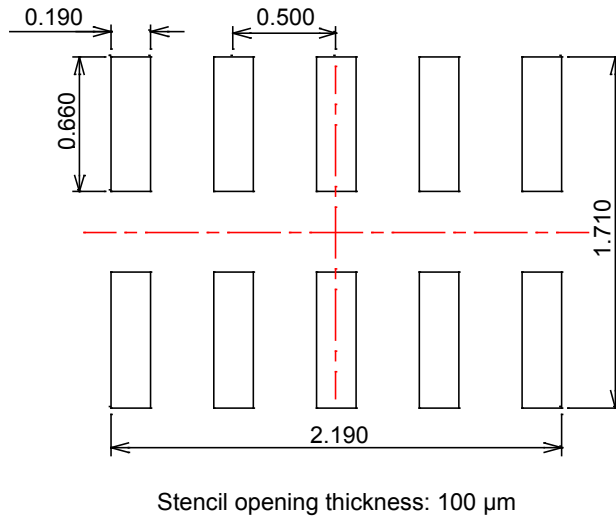


Figure 22. Wettable flank profile



3.1 Solder paste

1. Halide-free flux qualification ROL0 according to ANSI/J-STD-004.
2. “No clean” solder paste is recommended.
3. Offers a high tack force to resist component movement during high speed.
4. Use solder paste with fine particles: powder particle size is 20-38 μm.

3.2 QFN-10L packing information

Figure 23. Footprint recommendations (mm)

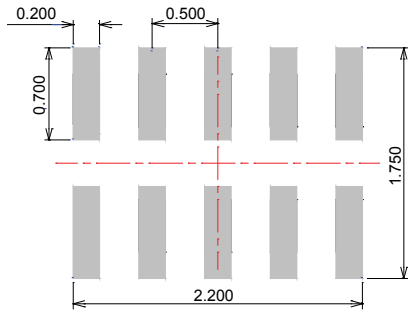
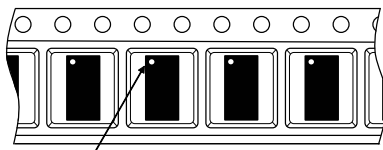


Figure 24. Marking



Dot indicates pin 1
XX: Marking
Y: Year
M: Month

Figure 25. Package orientation in reel



Pin 1 located according to EIA-481

Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

Figure 26. Tape and reel orientation

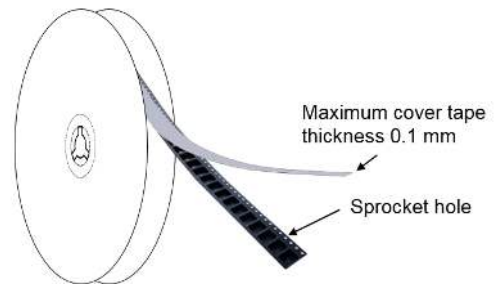


Figure 27. Reel dimensions (mm)

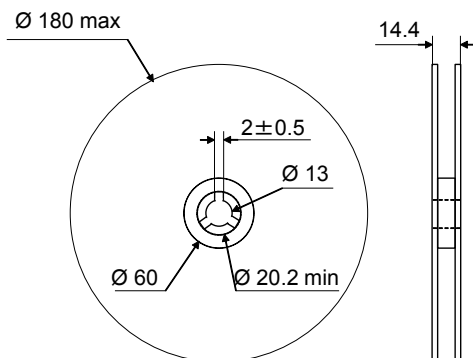


Figure 28. Inner box dimensions (mm)

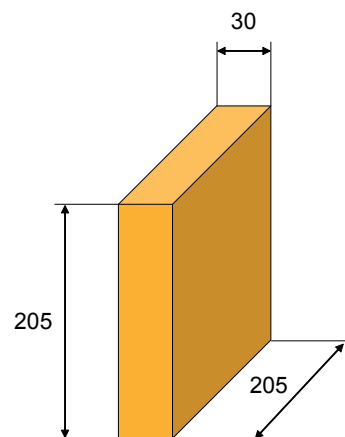
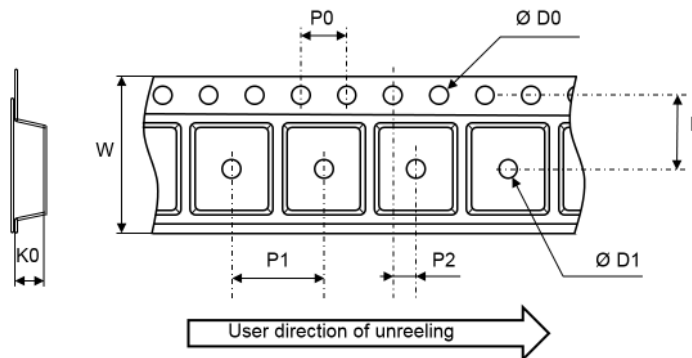


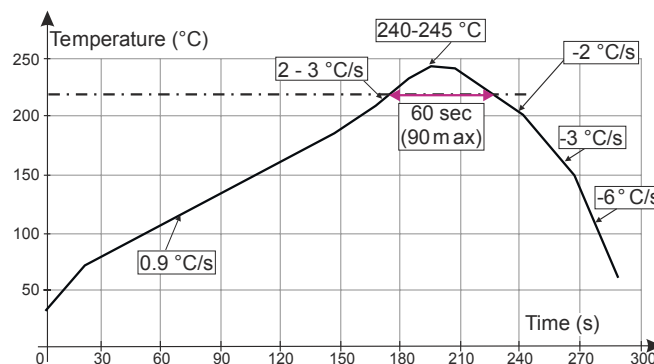
Figure 29. Tape and reel outline


Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

Table 4. Tape and reel mechanical data

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
ØD0	1.40	1.50	1.50
ØD1	0.80		
F	1.65	1.75	1.85
K0	0.85	0.95	1.05
P0	3.9	4.0	4.1
P1	3.9	4.0	4.1
P2	1.95	2.00	2.05
W	7.9	8.0	8.3

3.3 Solder reflow

Figure 30. ST ECOPACK® recommended soldering reflow profile for PCB mounting


Note: Minimize air convection currents in the reflow oven to avoid component movement. Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.

4 Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
ECMF4-2459A6M10Y	CY ⁽¹⁾	QFN-10L	7 mg	3000	Tape and reel

1. The marking can be rotated to differentiate assembly location

Revision history

Table 5. Document revision history

Date	Version	Changes
20-Oct-2020	1	Initial release.

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