

# TSMC Fluorinated Greenhouse Gas (F-GHGs) Emissions Reduction Declaration for Y2022

Taiwan Semiconductor Manufacturing Company, Ltd. (the "TSMC") has made following efforts to ensure the semiconductor manufacturing process in accordance with the Part A and B of IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays (IEEE Std 1680.1a<sup>TM</sup>-2020) Criterion 4.1.10.2 Optional - Reduce fluorinated greenhouse gas emissions from semiconductor production. The fluorinated greenhouse gas (F-GHG) emissions inventory has been reported and F-GHG emissions have been reduced for all TSMC's 300mm process semiconductor manufacturing facilities, which including Fab 12A, Fab 12B, Fab 14A, Fab 14B, Fab 15A, Fab 15B, Fab 18A, Fab 18B, Advanced Backend Fab2 and Advanced Backend Fab3 (the "Fabs in scope").

## For Part A

TSMC develops a F-GHG emissions inventory by the method of the 2019 refinement to the 2006 IPCC guidelines Tier 2c methodology to obtain emissions from etching and chamber cleaning processes with 100-year global warming potentials (GWPs) from the IPCC Fifth Assessment (IPCC AR5). In addition, TSMC annually commissions a third-party to perform a verification of greenhouse gas assertions, including emissions of fluorinated GHGs used in plasma etching/wafer cleaning, chamber cleaning processes and heat transfer fluid use, on the basis of ISO 14064-1:2018, and publicly reports the result on our ESG report.

## For Part B

Our abatement equipment is electrically heated, fuelled-combustion, plasma, and catalytic devices that are specifically designed to abate F-GHGs, are used within the manufacturer's specified process window and in accordance with specified maintenance schedules, and whose destruction and removal efficiency (DRE) have been measured and confirmed under actual process conditions, using a technically sound protocol, which accounts for known measurement errors including, for example, CF<sub>4</sub> by-product formation during C<sub>2</sub>F<sub>6</sub> abatement as well as the effect of dilution, the use of oxygen or both in combustion abatement systems.

TSMC calculate that F-GHG emissions based on the equation(1) and equation(2) and the reduction percentage we are adopted is  $\geq 75\%$  as the fluorinated heat transfer fluids (F-HTFs) are included from the reduction assessment. The percentage reductions are shown in the table "F-GHG reduction results for the 2022 in-scope plant".

$$\text{Percent of Total Reduced Emissions} = 100\% \times \left[ 1 - \left[ \frac{\sum TE_{FAB}}{\sum BE_{FAB}} \right] \right] \quad (1)$$

where:

$TE_{FAB}$  is the total emissions per fab in scope calculated using the methodology in Part A.

$BE_{FAB}$  is the baseline emissions per fab calculated using the following equation.

**BE<sub>FAB</sub> equation per fab:**

$$BE_{FAB} = 1.15 \times [(C_{EW} \times WF_{EW}) + (C_{CC} \times WF_{CC})] \quad (2)$$

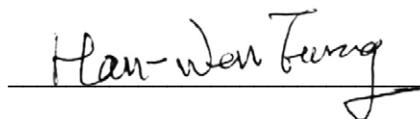
where:

- 1.15** is the factor to account for fluorinated heat transfer fluid emissions (omit if excluding HTFs)
- C<sub>EW</sub>** is the total consumption of all F-GHGs by all etching and wafer cleaning processes within the fab in reporting year.
- WF<sub>EW</sub>** is the weighting factor for etching and wafer cleaning that is **5330**.
- C<sub>CC</sub>** is the total consumption of all F-GHGs by all CVD chamber cleaning processes within the fab in reporting year.
- WF<sub>CC</sub>** is the weighting factor for CVD chamber cleaning that is **7495**.

**F-GHG Reduction Emissions Result for Y2022 to the Fabs in Scope**

Fabs in Scope	Fab 12A	Fab 12B	Fab 14A	Fab 14B	Fab 15A	Fab 15B	Fab 18A	Fab 18B	AP02	AP03
<b>Reduction % = 1-(TE<sub>FAB</sub>/BE<sub>FAB</sub>)</b>	<b>97.7%</b>	<b>97.5%</b>	<b>96.7%</b>	<b>97.5%</b>	<b>98.1%</b>	<b>97.7%</b>	<b>97.4%</b>	<b>97.8%</b>	<b>95.2%</b>	<b>97.4%</b>
<b>TE<sub>FAB</sub> (MT CO<sub>2</sub>e)</b>	48,662	24,428	140,317	46,842	57,858	98,573	101,494	28,857	24,064	418
<b>BE<sub>FAB</sub> (MT CO<sub>2</sub>e)</b>	2,077,718	974,529	4,218,209	1,867,042	2,980,620	4,269,463	3,885,741	1,340,134	502,411	16,377
<b>C<sub>EW</sub> (kg)</b>	68,426	13,850	156,367	64,744	81,328	126,863	124,122	85,628	7,906	0
<b>C<sub>CC</sub> (kg)</b>	192,395	103,215	378,195	170,571	287,974	405,123	362,553	94,588	52,667	1,900

**Taiwan Semiconductor Manufacturing Company**



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