SECTION 1: Product and Company Identification

1.1 Product identifier

Product name	:	Liquefied Petroleum Gas, LPG
Trade name	:	None.

1.2 Other means of identification

Chemical Name	:	Liquefied Petroleum Gas
Chemical Formula	:	None.

1.3 Recommended use and restrictions on use

Product use	:	Semiconductor Processes Industrial & Professional use Synthetic/Analytical chemistry Photovoltaic Processes

1.4 Details of supplier of the safety data sheet

Company identification	:	Iwatani Corporation (Singapore) Pte. Ltd.
Address	:	6 Shenton Way, OUE Downtown 2 #13-11, Singapore 068809
Phone	:	+65 6862 2111

1.5 Emergency contact

Emergency phone number	:	+65 6220 8347

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Physical hazards	:	Gases under pressure- liquefied gas.
Characteristic	:	Flammable, Category 1 (Danger).
Acute toxicity (inhalation)	:	Not classified.
Skin corrosion/irritation	:	Not classified.
Target organ systemic toxicity-single exposure	:	Category 3
Serious eye damage/eye irritation	:	Not classified.
Acute aquatic toxicity	:	Not classified.

2.2 GHS label elements, including precautionary statements

Pictogram(s) :

Signal word(s) : Danger

Hazard statement(s) : H220 - Extremely flammable gas
H280 – Contains gas under pressure; may explode if heated

H336: May cause drowsiness and dizziness

Precautionary statements

Prevention : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. - No smoking.
P261- Avoid breathing dust/fume/gas/mist/vapours/spray.
P271 - Use only outdoors or in a well-ventilated area.

Response : P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P312 - Call a POISON CENTRE/doctor if you feel unwell.

Storage : P403 - Store in a well-ventilated place.
P403+P410 - Store in a well-ventilated place. Protect from sunlight.
P404+P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.

Disposal : P501 - Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. Composition/Information on ingredients

3.1 Substances / 3.2. Mixture

Substance name	Contents	CAS No.
Petroleum products, liquefied gas	< 100% weight	68476-85-7
1,3- Butadiene	< 0.1% weight	106-99-0

SECTION 4. First-aid measures

4.1 Description of first aid measures

Inhalation : During an emergency, wear an approved, positive pressure air-suppling respirator. Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention.

Skin contact : Skin contact with the liquid may result in frostbite and burns. Soak contact area in tepid water to alleviate the immediate effects and get medical attention.

Eye contact : Flush eye with water immediately while holding the eyelids. Remove contact lenses, if worn, after initial flushing, and continue flushing for at least 15 minutes Get immediate medial attention.

Ingestion : No specific first aid measures are required because this material is a gas.

4.2 Most important symptoms/effect, acute and delayed

No information.

4.3 Indication of immediate medical attention and special treatment needed, if necessary

No information.

SECTION 5. Fire-fighting measures

Special Notes : In case of fire do not extinguish. Stop flow of fuel and allow fire to burn out.

5.1 Extinguishing media

Suitable extinguishing media : Allow gas to burn if flow cannot be shut safely.
Water spray or fog.
Apply water from a safe distance to cool container, surrounding equipment and structures. Container areas to direct flame contact should be cooled with large quantities of water (500 gallons water per minutes flame impingement exposure) to prevent weakening of container structures.

Unsuitable extinguishing media : Do not use water jet to extinguish.

5.2 Special hazards arising from the substance or mixture

No information.

5.3 Advice for fire-fighters

Dire Fighting Instructions : Do not extinguish. Stop flow of fuel and allow fire to burn out. If flames are accidently extinguished, explosive reignition may occur. Elimate ignition sources. Keep people away, isolate fire area and deny unnecessary entry. Immediately withdraw all personnel from area in case of rising sound from venting safety device or discoloration of the container. For unignited vapour clous, use water spray to knock down and control dispersion of vapours. Use water spray to cool fire- exposed containers and fire-affected zone until fire is out and danger of reignition has passed. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

Hazardous combustion products : Highly dependent on combustion conditions. A complex mixture of airborne solids, and gases including carbon monoxide, carbon dioxide and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Protective measures : Elimate all source of ignition in vicinity of release gas. If this material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator.
For large release, warm public of downwind explosion hazard.

6.2 Environmental precautions

Prevent spreading of vapours through sewers, ventilation systems and confined areas.

6.3 Methods and materials for containment and cleaning up

Spill Management : Stop the source of the release if you can do it without risk. Observe precautions in Exposure Controls/Personal Protection section of the SDS. All equipment used when handling the product must be grounded. If possible, turn leaking containers so that gas escapes rather than liquid. Use water spray to reduce vapours or divert vapour cloud drift. Do not direct water at spill or source of leak. Isolate area until gas has dispersed.

SECTION 7. Handling and storage

7.1 Precautions for safe handling

This material presents fire hazard. Gas can catch fire and burn with explosive force. Invisible gas spreads easily and can be set on fire by many sources such as pilot lights, welding equipment and electrical motors and switches. Gases are heavier than air and may travel along the ground or into drains to possible distant ignition source that may cause an explosive flashback. Do not breather vapour or fumes.

7.2 Conditions for safe storage, including any incompatibilities

Unusual handling hazards:

This product gas been odorized in order to aid in its detection in case of a leak or accidental discharge. During shipping or storage of an odorized material, alteration of the odorant and subsequent reduction in its effectiveness may occur. Odorants are reactive. Rust and scale in storage containers and pipes may significantly reduce an odorant's effectiveness. For this reason, storage containers must be free of rust and scale. Whenever an empty cylinder is filled it must be properly purged and conditioned to remove air and water and to deactivate sites for oxidation of the odorant. Underground pipelines should also be checked periodically for leaks. Prolonged exposure to an odorant or other strong smells in the environment may reduce an individual's ability to detect the odorant. People with an impaired ability to detect odours due to colds, allergies, smoking, injuries, etc. must be especially cautions.

Auto-refrigeration:

Drains can become plugged and valves may become inoperable because of the formation of ice due to expanding vapours or vaporizing liquids. Drains and valves may be thawed by applying an environmentally acceptable low freezing liquid to the outside surfaces. Liquid should be recovered for reuse or proper disposal.

Statis Hazard:

Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation and vacuum truck operations) and use appropriate mitigating procedures.

General storage information:

DO NOT USE OR STORE near heat, spark, flames or hit surfaces.
USE AND STORE ONLY IN WELL VENTILATIED AREA.
Keep container closed when not in use. When working with this material, the minimal oxygen content should be 19.5% by volume under normal atmospheric pressure.

SECTION 8. Exposure controls/personal protection

8.1 Control parameters/Occupational exposure limits

Components	CAS-No.	Value type (form of exposure)	Control parameters/permissible concentration	Basis
Petroleum products, liquefied gas	68476-85-7	TWA	1000 ppm (weight) Notation: Simple asphyxiant	ACGIH
		TWA	1800 mg/m^3	Singapore
1,3-butadiene	106-99-0	TWA	2 ppm(weight) Notation: A2	ACGIH
		TWA	4.4 mg/m^3	Singapore

TWA=Time weighted average
ACGIH value is provided for information only. Consult your authorities for appropriate values.

8.2 Appropriate engineering control measures

Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below the recommended exposure limits.
Use in a well-ventilated area.
Use explosion-proof ventilation equipment.

8.3 Personal protection

Individual protection measures, such as personal protective equipment (PPE): A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered: Protect eyes, face and skin from liquid splashes. PPE compliant to the recommended EN/ISO standards should be selected.

Hand protection : Wear appropriate protective chemical-resistant gloves that protect chemicals directly.
Standard EN 388 – Protective gloves against mechanical risk.

Eye/face protection : Wear eye protection such as safety glasses, chemical goggles, or face shields, if engineering controls or work practices are not adequate to prevent eye contact.
EN 166 - Personal Eye Protection.

Skin and Body protection : Wear protective clothing if engineering controls or work practices are not adequate to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted. Suggested materials for protective gloves include: Viton or Nitrile plus an inner liner of acrylic or wool for frostbite protection.

Respiratory protection : Determine if airborne concentrations are below the recommended occupational exposure limits for jurisdiction of use. If airborne concentrations are above the acceptable limits, wear an approved respirator that provides adequate protection from this material, such as: Full-Face Supplied-Air

		Respirator. Wear an approved positive pressure air-supplying respirator unless ventilation or other engineering controls are adequate to maintain a minimal oxygen content of 19,5% by volume under normal atmospheric pressure. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety practice.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	:	Gas
Colour	:	Colourless.
Odour	:	Hydrocarbon odour.
Odour threshold	:	No data available.
pH	:	No appliable.
Melting point	:	No data available.
Freezing point	:	-185 °C (-201°F) to to 105.6 °C (-158°F) (Estimated).
Boiling point	:	-45 °C (-49°F) to 0 °C (32°F) (Approximate).
Flash point	:	-105 °C (-157 °F) (Estimated).
Critical Temperature	:	No data available.
Flammability (solid, gas)	:	Extremely flammable gas.
Lower explosive limit	:	1.9 % by volume in air
Upper explosive limit	:	9.5 % by volume in air
Vapour pressure	:	375 – 1015 kPa @ 37.8 °C (100 °F)
Vapour density (air=1)	:	1.4-2.07
Specific gravity	:	0.5568 @ 60 °C (140 °F) (Approximate).
Density	:	502 -580 kg/m^3
Molecular mass	:	58 g/mol
Solubility	:	Soluble in hydrocarbon solvents; insoluble in water.
Viscosity	:	No data available.
Partition coefficient: n-octanol/water	:	No data available.
Evaporation rate	:	No data available.
Decomposition temperature	:	No data available.
Autoignition temperature	:	No data available.

Section 10. Stability and reactivity

10.1 Reactivity

Hazardous reactions will not occur under normal conditions.

10.2 Chemical stability

This material is considered stable under normal ambient and anticipated storage and handing conditions of temperature and pressure.

10.3 Possibility of hazardous reactions

No data available.

10.4 Conditions to avoid

Avoid contact with heat, sparks, fire and oxidizing agents.

10.5 Incompatible materials

May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

10.6 Hazardous decomposition products

No data available.

SECTION 11. Toxicology information

11.1 Information on toxicological effects

Acute toxicity (Oral)	:	The acute oral toxicity is based on data for a similar material.
Acute toxicity (Inhalation)	:	The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components. The hazard evaluation is based on data for components or a similar material.
Skin corrosion or irritation	:	Because the liquid product evaporates quickly, it can have a severe chilling effect on skin and can cause local freezing of issues (frostbite). Contact with the skin is not expected to cause an allergic skin response. Symptoms may include pain, itching, discoloration, swelling and blistering.
Serious eye damage or irritation	:	Because the liquid product evaporates quickly, it can have a severe chilling effect on skin and can cause local freezing of issues (frostbite). Contact with the skin is not expected to cause an allergic skin response. Symptoms may include pain, itching, discoloration, swelling and blistering. The eye irritation hazard is based on evaluation of data for similar materials or product component.
Inhalation	:	This material can act as a simple asphyxiant by displacement of air. Symptoms of asphyxiation may include rapid breathing. Incoordination, rapid fatigue, excessive salivation, disorientation, headache, nausea, and vomiting Excessive or prolonged breathing of this material may cause central nervous system effects. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsion, loss of consciousness, coma or death.
Respiratory or skin sensitization	:	Not information.
Germ cell mutagenicity	:	Not information.

Carcinogenicity	:	Not information.
Reproductive toxicity	:	Not information.
Specific Target Organ Toxicity (STOT)-single exposure	:	Not information.
STOT-repeated exposure	:	Not information.
Additional toxicology information	:	This product contains 1,3-butadiene (BD). BD is an asphyxiant and at very high concentration (>10% in air) may cause respiratory paralysis and death. BD cause genetic damage in mice. BD can be metabolized to toxic epoxides which cause genetic damage and cancer laboratory animals. Mice chronically exposed to BD had an increase in lymphoma and tumours of the heart, harderian gland, mammary gland, ovary, liver, stomach and lung. Ovarian atrophy was also increased. Rats chronically exposed to BD had an increase in tumours of the thyroid, trestles, and mammary gland. Effect in rats were at 1000 – 8000 ppm versus effects in mice at concentrations as low as 6 ppm. Epidemiological data from the rubber industry indicates that chronic exposure to BD was associated with an increased incidence of leukaemia. The historical exposures to BD associated with this increase are not known but were substantially higher than current workplace standards. Exposures to pregnant rats at 8000 ppm BD (6 hr/day, gestation days 6-15) had an effect on fatal body weight and the incidence of skeletal abnormalities. The developmental no effect level was 1000 ppm.
Aspiration hazard	:	Not information.

SECTION 12. Ecological information

12.1 Ecotoxicity

This material is not expected to be harmful to aquatic organisms. The product has not been tested. The statement has been derived from the properties of the individual components.

12.2 Persistence and degradability

This material is expected to be readily biodegradable. The product has not been tested. The statement has been derived from the properties of the individual components.

12.3 Bioaccumulative potential

Not data available.

12.4 Mobility in soil

No information available.

SECTION 13. Disposal information

13.1 Disposal methods

Waste from residues	:	Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by

international, country, or local laws and regulations.
Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", downloadable at http://www.eiga.org) for more guidance on suitable disposal methods.

Contaminated packaging : Container may remain hazardous when empty. Continue to observe all precaution. Handle empty container with care because residual vapours are flammable. Do not puncture or incinerate container.

SECTION 14. Transport information

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

14.1 UN number

: UN1075

14.2 UN proper shipping name

Transport by road/rail (ADR/RID) : LIQUEFIED PETROLEUM GAS, NON-ORDRIZED, NON-CORROSIVE (FOR FURTHER MIXING, BLEDNING, OR PROCESSING).
Transport by sea (IATA) : PETROLEUM GASES, LIQUEFIED.
Transport by sea (IMDG) : PETROLEUM GASES, LIQUEFIED.

14.3 Transport Hazard Class(es)

UNRTDG (United Nations Recommendations Transport Dangerous Goods)

Class : 2.1
Subsidiary risk : Not classified.

IATA-DGR (International Air Transport Association – Dangerous Goods)

Class : 2.1
Subsidiary risk : Not classified.

IMDG (International Maritime Dangerous Goods) – Code

Class : 2.1
Subsidiary risk : Not classified.

14.4 Packing group

Not assigned by regulation.

14.5 Environmental hazards

None.

14.6 Special precaution for user

Avoid transport on vehicles where the load space is not separated from the driver's compartment.
Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or

an emergency.
Before transporting product containers:

- Ensure there is adequate ventilation.
- Ensure that containers are firmly secured.
- Ensure valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

SECTION 15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Restrictions on use	:	None.
Other information, restriction and prohibition regulations	:	Ensure all national/local regulations are observed.
Applicable national regulations	:	Safety, health and environmental regulations/legislation specific for the substance or mixture are observed.

SECTION 16. Other information

16.1 Other information

Indication of changes	:	Ensure all national/local regulations are observed.
Disclaimer of liability	:	Before using this product in any new process or experiment, a thorough material combability and safety study should be carried out. Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use ca be accepted.

End of Safety Data Sheet