



Power Semiconductor Module

Leading Solution

LS Industrial Systems is taking off as a global leader!

In the field of electric power solutions, producing a wide variety of products that are based on power supply technology and are highly competitive both in Korea and overseas.

Using technology that it has accumulated over more than 30 years in the electric power industry, LS Industrial Systems develops, produces, and supplies a whole range of products related to power plants, power transmission & distribution, equipment for electricity users, and electric power it to overseas markets as well as within Korea.

LS Industrial Systems' electric equipment products are developed under the quality-first principle. Year on year, its sales in the global market have increased by 30 to 40 percent.

LS Industrial Systems develops and produces various products in the field of power solutions.



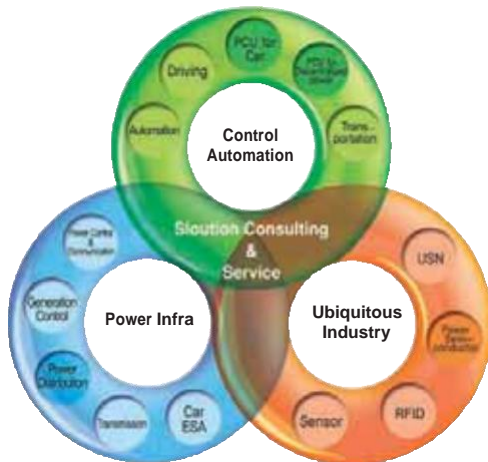
Power Semiconductor Module Business Field.

Optimize your application designs : Less power loss! Save cost and time!

LS Industrial Systems (LSIS) sets the long term goal as "Total solution provider in power semiconductors", providing system solutions based on power semiconductors. LS Industrial Systems is now producing and going to develop a low-cost and high-performance Power Semiconductor Modules including Application Specific IPMs (ASIPM) for Industry applications, Power supplies, Renewable energy, Automotive and Home appliances.

Our product portfolio includes:

- Application Specific Power Modules
 - Simple Solution Power Modules (SISPM™) : 2-Pack, 4-Pack
 - Eco Friendly Power Modules (EFPM™) : 2-Pack, 6-Pack
- Standard IGBT Modules
 - Super Solution Power Modules (SUSPM™) : 2-Pack
 - Simple Solution Power Modules (SISPM™) : CIB, CIP, CIPB, 6-Pack, 7-Pack
 - Total Power Solution (TOSPM™) customized Power Modules
- Application Specific Intelligent Power Modules (ASIPM)
 - Total Solution Power intelligent Module (TOSPiM™) : 6-Pack and 7-Pack CIB IPMs ICs, integrated drive peripheral circuit and protection functions in a single housing
 - Super Solution Power intelligent Module (SUSPiM™) : 2-Pack IPMs integrated drive ICs, peripheral circuit and protection functions in a single housing



LS Industrial Systems is continually discovering the new industry for the future and industrializing it.



Manufacturing Plant_Cheonan City, Korea



Head Office_Anyang City, Korea



R&D Center_Anyang City, Korea



Manufacturing Line_Cheonan City, Korea



Standard IGBT Modules

SUSPM™ Super Solution Power Modules

LS Industrial Systems Co.,Ltd (LSIS) releases 2-Pack SUSPM™ Product lines for industrial applications.

These power modules are compact design with flexibility and optimized performance for each application with high reliability, which meets customers' requirements.

SUSPM™ product lines offer three standard package types (34mm, 48mm, 62mm) with the latest IGBT technology. And they cover the current range from 50A (@Tc ≥ 80°C) to 400A (@Tc ≥ 80°C) at 600V, 1200V and 1700V.

LS Industrial Systems also can provide some special products with ESD protection and Shoot-through protection functions for customer satisfaction.

Features

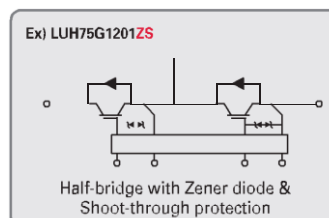
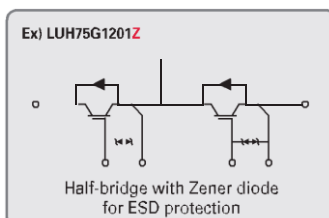
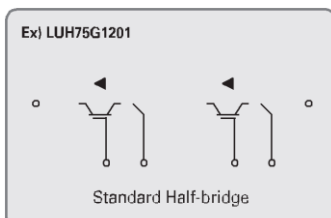
- *Optimized characteristics for each applications
- *Embedded protection functions
 - ESD and Transient voltage protection
 - Shoot-through protection
- *Very low VCE(sat) with positive temperature coefficient

Application

- *Industrial Motor Drives
- *Welding machines
- *UPS/EPS
- *Induction Heating



SUSPM™ Topology (2-Pack IGBT Modules)



Special Functions

ESD Protection

- *Protection the gate from the failure due to Electrostatic Discharge (ESD)
- *Protection the gate from the failure due to transient voltage across the gate to the emitter

Shoot-Through Protection (STP) (Option)

- *No dead time control
- *Reduced output distortion
- *Reduced harmonic and noise

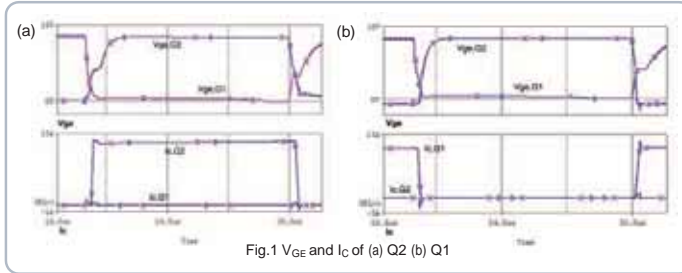


Fig.1 V_{GE} and I_c of (a) Q2 (b) Q1

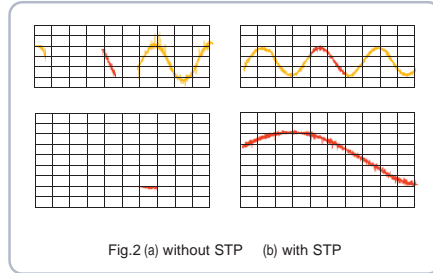



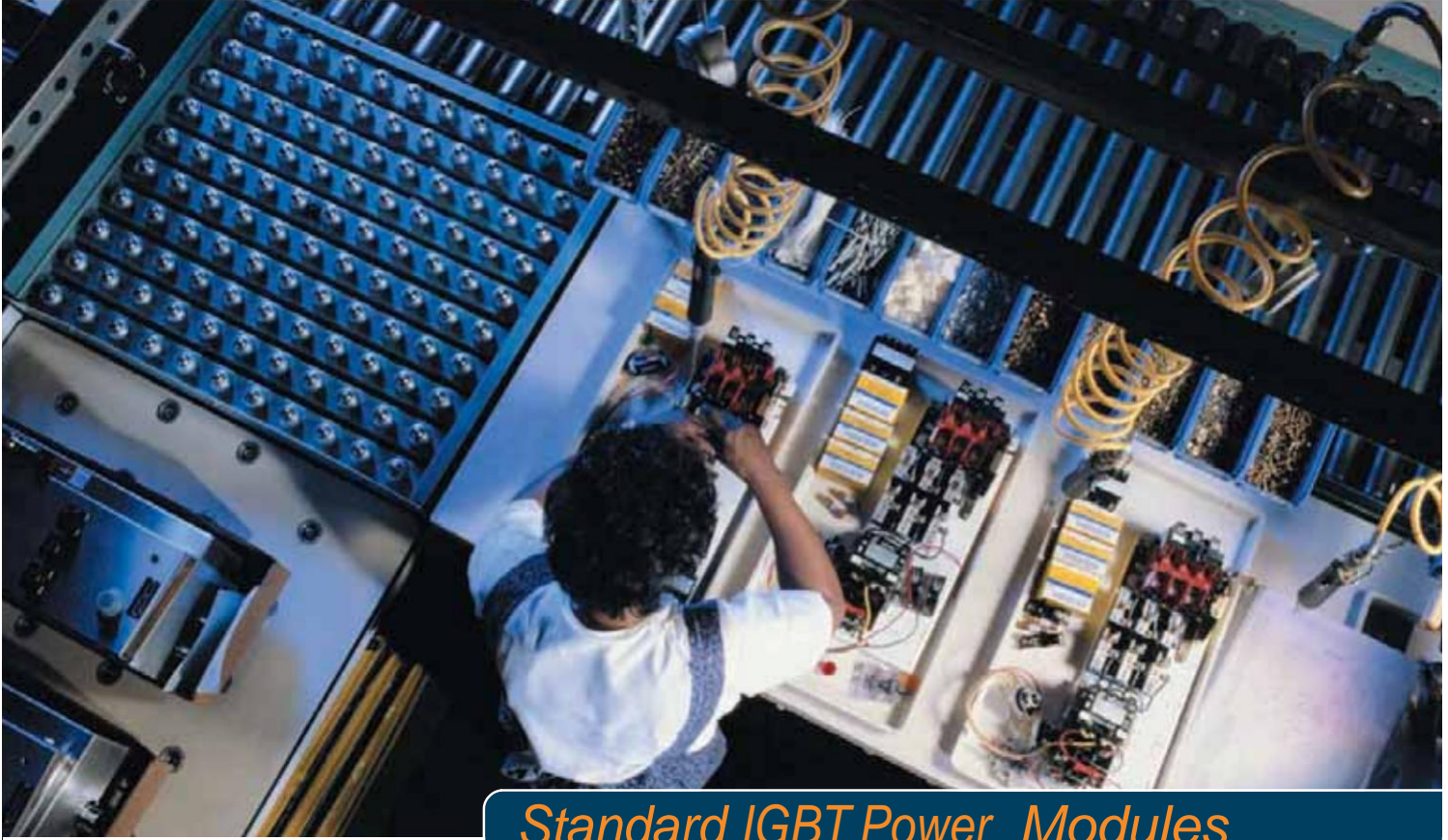


Fig.2 (a) without STP (b) with STP

Package	V _{CES} [V]	I _c [A]	Part Number	Type (IGBT Tech)	Frequency	V _{CE(sat)} [V] typ @25°C	E _{on} [mJ] typ	E _{off} [mJ] typ	R _{THJ-C} [°C/W] Max	
 SUSPM1	600	75	LUH75G602Z *	602Z (Planar NPT)	≤ 40kHz	2.50	4.2@150°C	3.3@150°C	0.44	
		100	LUH100G602Z *			2.50	9.8@150°C	8.8@150°C	0.33	
		75	LUH75G603Z	603Z (Trench F/S)	≤ 20kHz	1.45	0.60@150°C	3.0@150°C	0.33	
		100	LUH100G603Z			1.45	0.8@150°C	3.5@150°C	0.27	
		150	LUH150G603Z			1.45	1.5@150°C	5.6@150°C	0.19	
		200	LUH200G603Z			1.45	1.8@150°C	6.9@150°C	0.15	
	1200	50	LUH50G1201Z	1201Z (Planar F/S)	≤ 20kHz	1.77	5.9@125°C	4.7@125°C	0.4	
		75	LUH75G1201Z			1.92	8.0@125°C	6.5@125°C	0.32	
		100	LUH100G1201Z			1.92	8.6@125°C	8.6@125°C	0.25	
		75	LUH75G1202Z	1202Z (Planar NPT)	≤ 40kHz	3.10	8.2@150°C	5.5@125°C	0.18	
		100	LUH100G1202Z			3.30	13.5@125°C	9.6@125°C	0.15	
		75	LUH75G1203Z			1203Z (Trench F/S)	≤ 20kHz	1.70	7.0@125°C	9.5@125°C
	100	LUH100G1203Z	1.70	9.7@125°C	12@125°C			0.14		
	1700	50	LUH50G1703Z	1703Z (Trench F/S)	≤ 20kHz	2.00	16@125°C	15.5@125°C	0.23	
75		LUH75G1703Z	2.00			24@125°C	23.5@125°C	0.15		
 SUSPM2	600	300	LVH300G603Z	603Z (Trench F/S)	≤ 20kHz	1.45	3.3@150°C	12.5@150°C	0.1	
		400	LVH400G603Z			1.45	3.4@150°C	15.5@150°C	0.08	
	1200	150	LVH150G1201Z	1201Z (Planar F/S)	≤ 20kHz	2.00	12.7@125°C	14.6@125°C	0.16	
		200	LVH200G1201Z			2.13	11.8@125°C	20.2@125°C	0.125	
		150	LVH150G1202Z	1202Z (Planar NPT)	≤ 40kHz	3.10	TBD	TBD	TBD	
		150	LVH150G1203Z			1.70	11@125°C	26@125°C	0.09	
	1700	100	LVH100G1703Z	1703Z (Trench F/S)	≤ 20kHz	2.00	TBD	TBD	TBD	
		150	LVH150G1703Z			2.00	TBD	TBD	TBD	
	 SUSPM3	600	300	LWH300G603	603Z (Trench F/S)	≤ 20kHz	1.45	3.10@125°C	12.0@125°C	TBD
			400	LWH400G603			1.45	3.4@150°C	15.5@150°C	TBD
1200		150	LWH150G1201	1201Z (Planar F/S)	≤ 20kHz	2.00	12.7@125°C	14.6@125°C	TBD	
		200	LWH200G1201			2.13	11.8@125°C	20.2@125°C	TBD	
		300	LWH300G1201			2.00	TBD	TBD	TBD	
		150	LWH150G1202	1202Z (Planar NPT)	≤ 40kHz	3.10	TBD	TBD	TBD	
		200	LWH200G1202			3.30	TBD	TBD	TBD	
		200	LWH200G1203			1203Z / 1207Z (Trench F/S)	≤ 20kHz	1.70	15@125°C	25@125°C
300		LWH300G1203	1.70	25@125°C	37@125°C			TBD		
400		LWH400G1207	1.70	28@125°C	45@125°C			TBD		
1700		200	LWH200G1703	1703Z (Trench F/S)	≤ 20kHz	2.00	78@125°C	63@125°C	TBD	
		300	LWH300G1703			2.00	105@125°C	94@125°C	TBD	

* Some values are target specification for development and specifications may change in any manner without notice.

* E_{ON} and E_{OFF} of 602Z condition: V_{CC}=400V.



Standard IGBT Power Modules

SISPM™

Simple Solution Power Modules

CIB Modules

LSIS releases SISPM™ Product lines for low power inverter and treadmill applications.

These power modules has compact design with flexibility and optimized performance for each application with high reliability, which meets customers' requirements.

SISPM™ product lines offer two package types of SISPM0 and SISPM1.

They cover the current range from 6A (@ $T_c \geq 80^\circ\text{C}$) to 50A (@ $T_c \geq 80^\circ\text{C}$)

at 600V and 1200V. SISPM1 product lines have three different configurations

to satisfy the various customer system requirements.

- CIB : 3 Φ or 1 Φ Converter + Inverter + Brake
- CIP : 1 Φ Converter + Inverter + PFC
- CIPB : 1 Φ Converter + Inverter + PFC + Brake



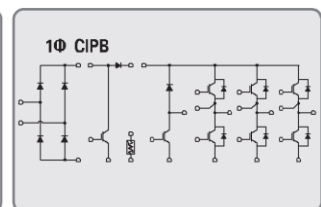
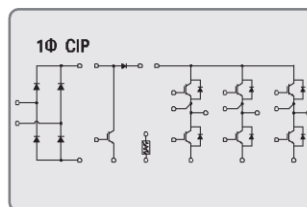
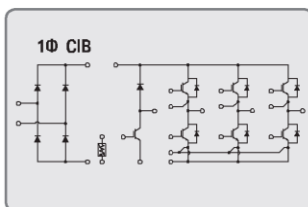
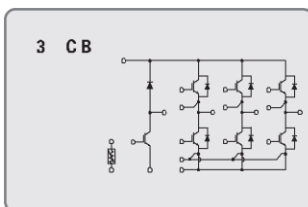
Features

- *Various configurations
- *The latest IGBT technology
- *Operation frequency
 - Inverter & Brake up to 15kHz
 - PFC up to 40kHz

Application


- *General purpose Inverter
- *Servo Drive
- *Sewing Machine
- *Treadmill

CIB Modules Topology





CIB Modules

Package	V _{CE(S)} [V]	I _c [A] (INVERTER)	Part Number	Type (IGBT Tech)	Frequency	V _{CE(EM)} [V] typ @25°C (INVERTER)	E _{ON} [mJ] typ (INVERTER)	E _{OFF} [mJ] typ (INVERTER)	R _{THJ-C} [°C/W] typ (INVERTER)
 SISPM0	CIB : 3Φ Converter + Inverter + Brake + NTC								
	600	6	LFC6G603	603 (Trench F/S)	≤ 20kHz	1.55	0.12@125°C	0.18@125°C	TBD
		10	LFC10G603			1.55	0.20@125°C	0.30@125°C	TBD
		15	LFC15G603			1.55	0.32@125°C	0.44@125°C	TBD
		20	LFC20G603			1.55	0.44@125°C	0.56@125°C	TBD
		30	LFC30G603			1.55	0.65@125°C	0.75@125°C	TBD
	1200	4	LFC4G1207	1207 (Trench F/S)	≤ 20kHz	1.85	TBD	TBD	TBD
		8	LFC8G1207			1.85	TBD	TBD	TBD
		10	LFC10G1207			1.85	1.35@125°C	0.80@125°C	TBD
	 SISPM1	CIB : 3Φ Converter + Inverter + Brake + NTC							
600		15	LEC15G604	604 (Trench F/S)	≤ 20kHz	1.85	0.26@125°C	0.33@125°C	2.1
		20	LEC20G604	604 (Trench F/S)		1.8	0.56@125°C	0.59@125°C	1.65
		30	LEC30G603	603 (Trench F/S)		1.55	0.65@125°C	0.75@125°C	TBD
		50	LEC50G603	603 (Trench F/S)		1.45	0.34@125°C	1.60@125°C	TBD
1200		10	LEC10G1203	1203 (Trench F/S)	≤ 20kHz	1.9	1.35@125°C	1.05@125°C	1.5
		15	LEC15G1207	1207 (Trench F/S)		1.85	1.75@125°C	1.20@125°C	TBD
		25	LEC25G1207	1207 (Trench F/S)		1.85	2.40@125°C	2.15@125°C	TBD
CI : 1Φ Converter + Inverter + NTC									
600		15	LEL15G604	604	≤ 20kHz	1.85	0.26@125°C	0.33@125°C	2.1
CIPB : 1Φ Converter + Inverter + PFC + Brake + NTC									
600	15	LEB15G604	604 (Trench F/S)	≤ 20kHz	1.85	0.26@125°C	0.33@125°C	2.1	

* Some values are target specification for development and specifications may change in any manner without notice.



Application Specific Power Modules

SISPM™ Simple Solution Power Modules

Half Bridge Modules MOSFET

LSIS releases SISPM™ Product lines for half bridge application. These power modules are consisted of MOSFETs and meet customers' requirements for compact design, flexibility, optimized performance for each application with high reliability. It offers a package type of SISPM1 and it covers the different current range from 200A to 400A (@Tc=80°C) at 75V, 100V and 150V.

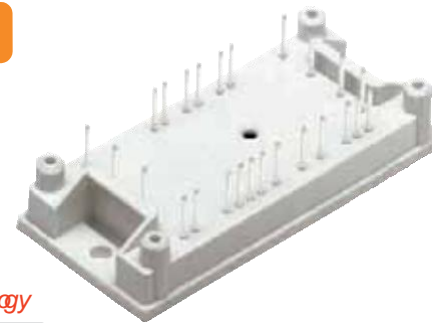
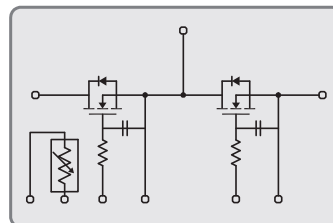
Features

- *Half bridge configuration
- *Latest MOSFET technology
- *Operation frequency - up to 100kHz
- *Included temperature sensor


Application

- *Battery Vehicle

Half Bridge Modules Topology



Half Bridge Modules (MOSFET)

Package	V _{DSS} [V]	I _D [A]	Part Number	Type (MOSFET Tech)	Frequency	R _{DS(ON)} [mΩ] typ	E _{ON} [mJ] typ	E _{OFF} [mJ] typ	R _{THJ-d} [°C/W] Max
 SISPM1	2 Pack MOSFET-Half Bridge								
	75	400	LEH400M076	076	≤ 10kHz	0.75	TBD	TBD	0.07
	100	400	LEH400M106	106	≤ 10kHz	1.1	TBD	TBD	0.07
	150	200	LEH200M156	156	≤ 10kHz	1.4	TBD	TBD	0.07

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Full Bridge Modules **IGBT**

LSIS releases SISPM™ Product lines for Full Bridge Application.

These power modules are consisted of IGBTs and meet customers' requirements for compact design, flexibility, optimized performance for each application with high reliability. It offers a package type of SISPM1 and it covers the different current range from 50A to 100A (@Tc≥80°C) at 600V.



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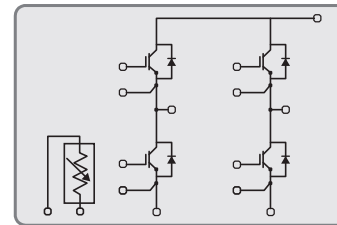
Features

- *Full bridge configuration
- *Latest IGBT technology
- *Operation frequency - up to 40 kHz

Application

- *Welding Machine
- *SMPS
- *UPS
- *PV Inverter

Full Bridge Module Topology



Full Bridge Modules (IGBT)

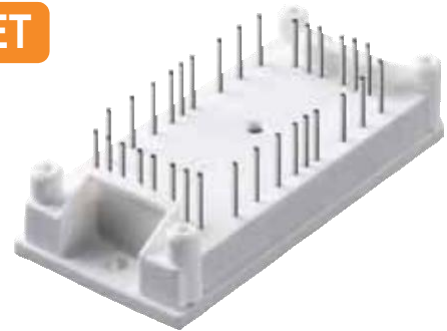
Package	V _{CEs} [V]	I _c [A]	Part Number	Type (IGBT Tech)	Frequency	V _{CE(sat)} [V] typ @25°C	E _{on} [mJ] typ	E _{off} [mJ] typ	R _{thj-c} [°C/W] Max
4 Pack IGBT-Full Bridge									
SISPM1	600	75	LEF75G602	602Z (Planar NPT)	≤ 40kHz	2.5	4.2@150°C	3.3@150°C	0.44
	600	100	LEF100G602			2.5	9.8@150°C	8.8@150°C	0.33

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Full Bridge Modules **MOSFET**

LSIS releases SISPM™ Product lines for Full Bridge Application.

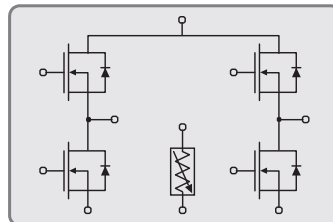
These power modules are consisted of MOSFETs and meet customers' requirements for compact design, flexibility, optimized performance for each application with high reliability. It offers a package type of SISPM1 and it covers the different current range from 30A to 60A (@Tc=25°C) at 500V and 900V.



Features

- *Full bridge configuration
- *Latest MOSFET technology
- *Operation frequency - up to 100kHz
- *Included temperature sensor

Full Bridge Modules Topology



Application

- *SMPS
- *Welding Machines
- *UPS

Full Bridge Modules (MOSFET)

Package	V _{DSS} [V]	I _b [A]	Part Number	Type (MOSFET Tech)	Frequency	R _{DS(on)} [mΩ] typ	E _{ON} [mJ] typ	E _{OFF} [mJ] typ	R _{thj-c} [°C/W] Max
4 Pack MOSFET-Full Bridge									
	500	45	LEF45M505	505	≤ 100kHz	0.347	TBD	TBD	0.33
		60	LEF60M505	505		0.219	TBD	TBD	0.253
	900	30	LEF30M905	905		1.05	TBD	TBD	0.28
	500	45	LEF45M50T	50T		TBD	TBD	TBD	TBD
		60	LEF60M50T	50T		TBD	TBD	TBD	TBD
	900	30	LEF30M90T	90T		TBD	TBD	TBD	TBD

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Application Specific Power Modules

EFPM™ Eco Friendly Power Modules

EFPM1

LSIS releases EFPM™ Product lines for automotive and battery vehicle.

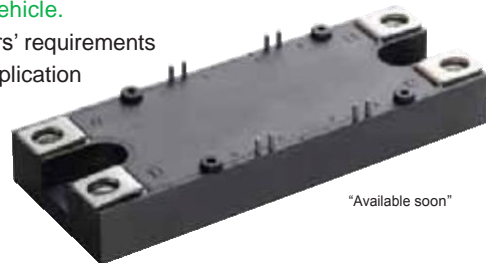
These power modules are consisted of MOSFETs and meet customers' requirements for compact design, flexibility, and optimized performance for each application with high reliability. EFPM1 covers the different current range from 500A to 900A (@Tc=80°C) at 75V, 100V and 150V.

Features

- *Low loss & High ruggedness MOSFET
 - Low R_{DS(ON)}
 - Enhanced body diode dv/dt, di/dt capability
 - Improved gate, avalanche, dynamic dv/dt ruggedness
- *Half bridge configuration
- *Insulated package without copper base plate
- *Fully characterized capacitance & avalanche SOA
- *Included temperature sensor

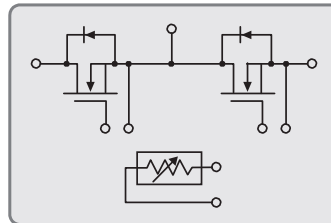
Application


- *Automotive
- *Battery vehicle
- *SMPS



"Available soon"

EFPM™ Topology



Package	V _{DSS} [V]	I _b [A]	Part Number	Type (MOSFET Tech)	Frequency	R _{DS(ON)} [mΩ] typ	E _{ON} [mJ] typ	E _{OFF} [mJ] typ	R _{THJ-d} °C/W Max
	2 Pack MOSFET-Half Bridge								
	75	900	LMH900M076	076	≤ 10kHz	0.375	TBD	TBD	0.04
	100	800	LMH800M106	106	≤ 10kHz	0.55	TBD	TBD	0.04
	150	500	LMH500M156	156	≤ 10kHz	1.2	TBD	TBD	0.04

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EFPM2

LSIS releases EFPM™ Product lines for automotive and battery vehicle.

These power modules are consisted of MOSFETs or IGBTs, which meet the customers' requirements for compact design, flexibility, and optimized performance for each application with high reliability. EFPM2 covers the different current ranges.

– MOSFET : 350A~650A (@Tc=80°C) at 75V, 100V and 150V

– IGBT : 400A (@Tc=@80°C) at 600V

Features

MOSFET 6 in one

- *Low loss & High ruggedness MOSFET
 - Low R_{DS(ON)}
 - Enhanced body diode dv/dt, di/dt capability
 - Improved gate, avalanche, dynamic dv/dt ruggedness

*6-pack configuration

- *Insulated package with copper base plate
- *Fully characterized capacitance & avalanche SOA
- *Included temperature sensor

IGBT 6 in one

- *Latest IGBT Technology
- *Low loss & low V_{CE(SAT)}
- *6-pack configuration
- *Insulated package with copper base plate
- *Included temperature sensor

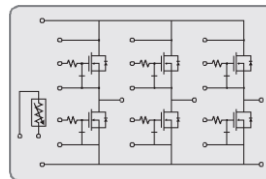
Application

- *Automotive
- *Inverter
- *Low voltage battery vehicle

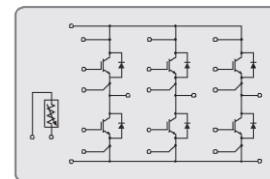


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EFPM™2 Topology



MOSFET



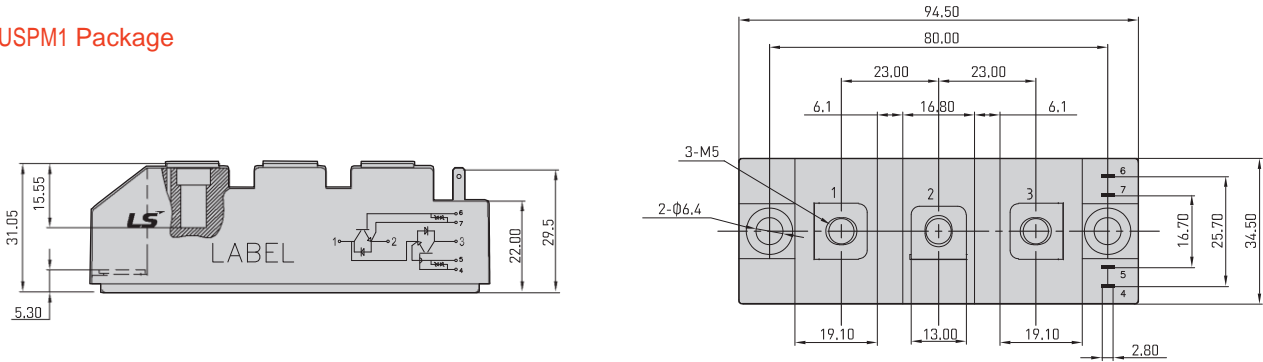
IGBT

Package	V _{DS} [V]	I _D [A]	Part Number	Type (MOSFET Tech)	Frequency	R _{DS(ON)} [mΩ] typ	E _{ON} [mJ] typ	E _{OFF} [mJ] typ	R _{THJ-C} [°C/W] Max
 EFPM2	6 Pack MOSFET								
	75	650	LNI650M076	076	≤ 10kHz	0.5	TBD	TBD	0.047
	100	600	LNI600M106	106	≤ 10kHz	0.73	TBD	TBD	0.047
	150	350	LNI300M156	156	≤ 10kHz	1.6	TBD	TBD	0.047
	V _{CE(S)} [V]	I _C [A]	Part Number	Type (IGBT Tech)	Frequency	V _{CE(sat)} [V] typ @25°C	E _{ON} [mJ] typ	E _{OFF} [mJ] typ	R _{THJ-C} [°C/W] Max
6 Pack IGBT									
600	400	LNI400G603Z	603Z(Trench F/S)	≤ 20kHz	1.9	TBD	TBD	TBD	

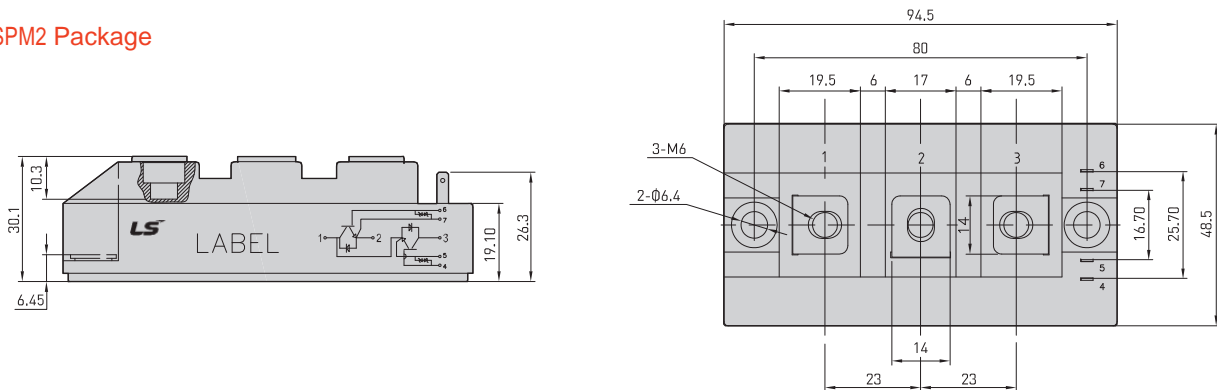
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SUSPMTM Package Dimension

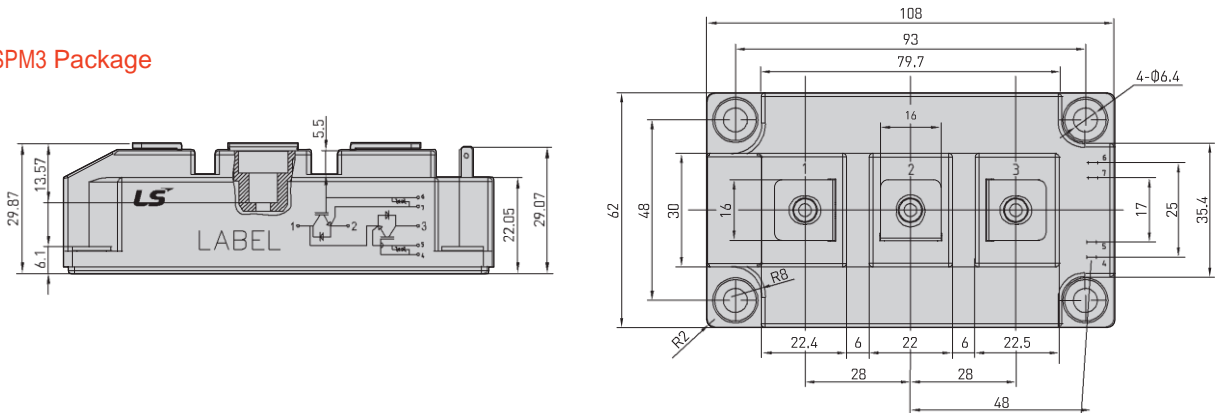
SUSPM1 Package



SUSPM2 Package

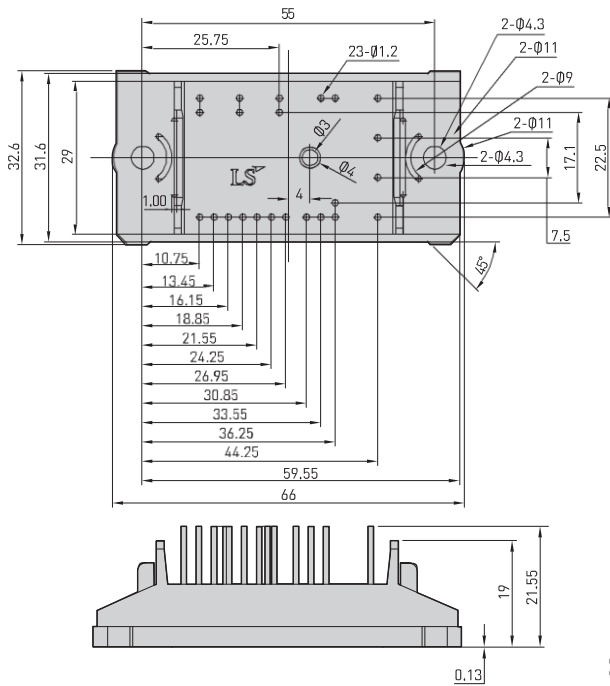


SUSPM3 Package

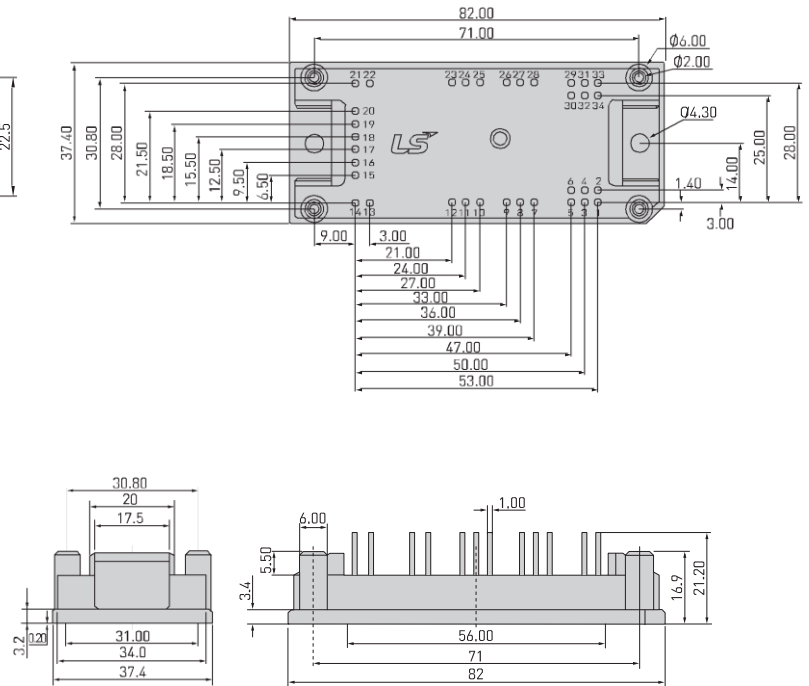


SISPM™ Package Dimension

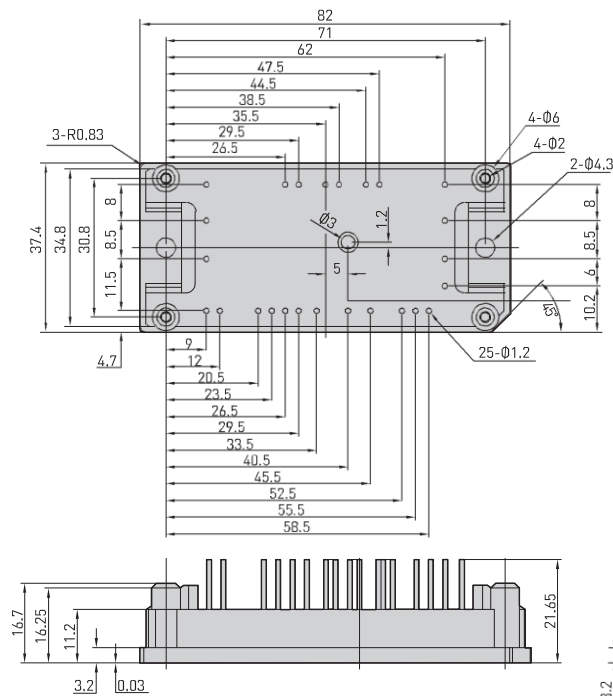
SISPM0 Package



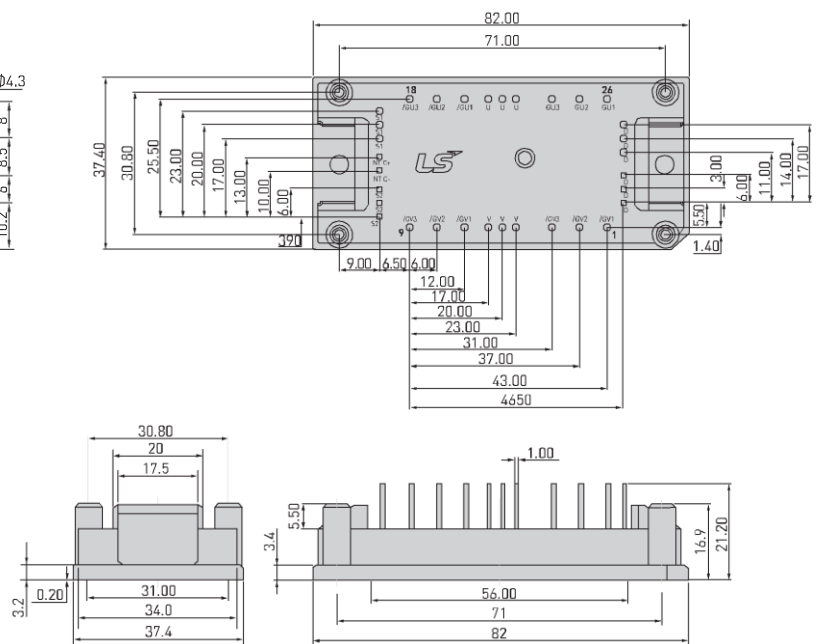
SISPM™1 (2-Pack MOSFET, 4-Pack IGBT Modules)

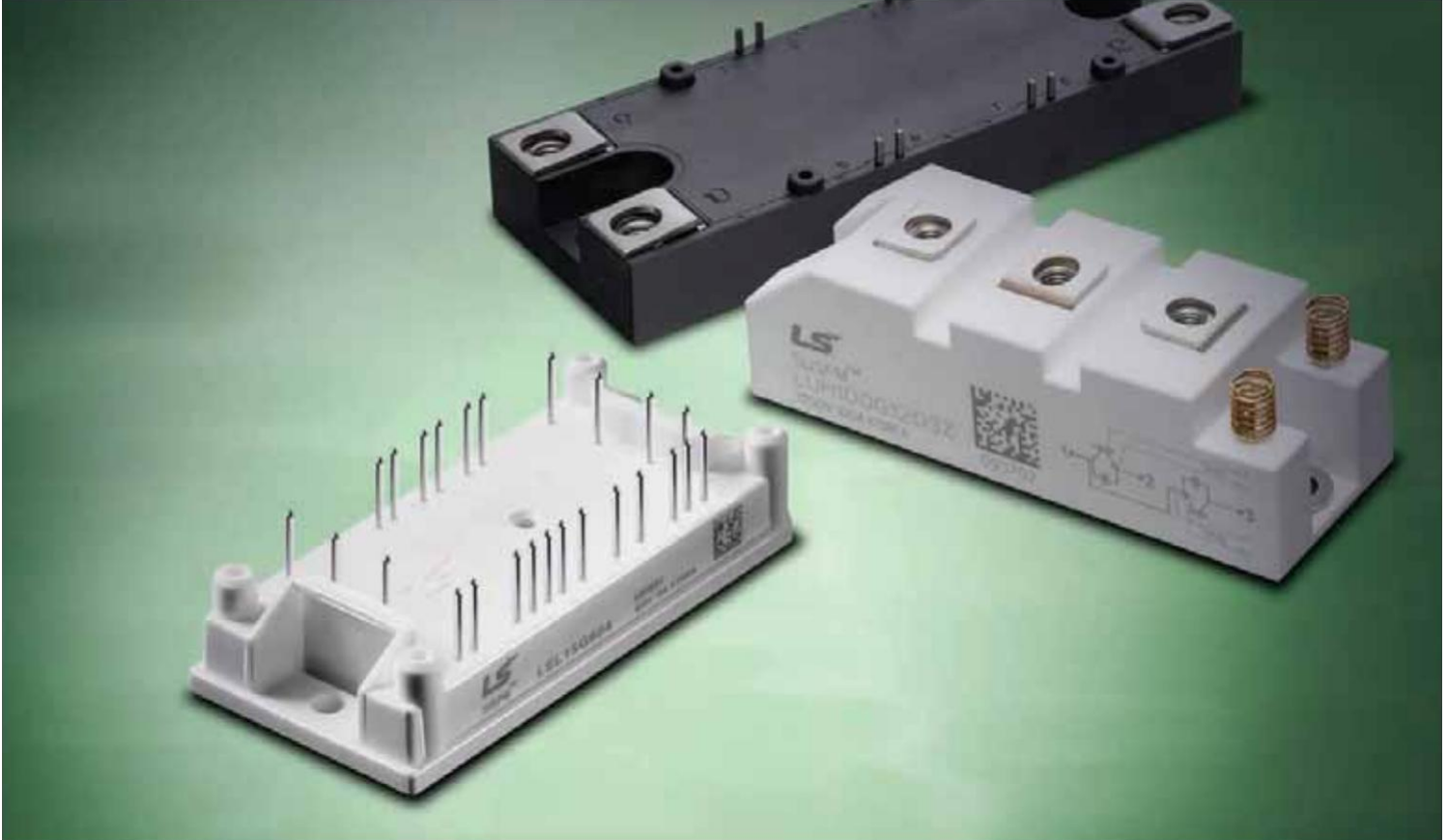


SISPM™1 (CIB Modules)

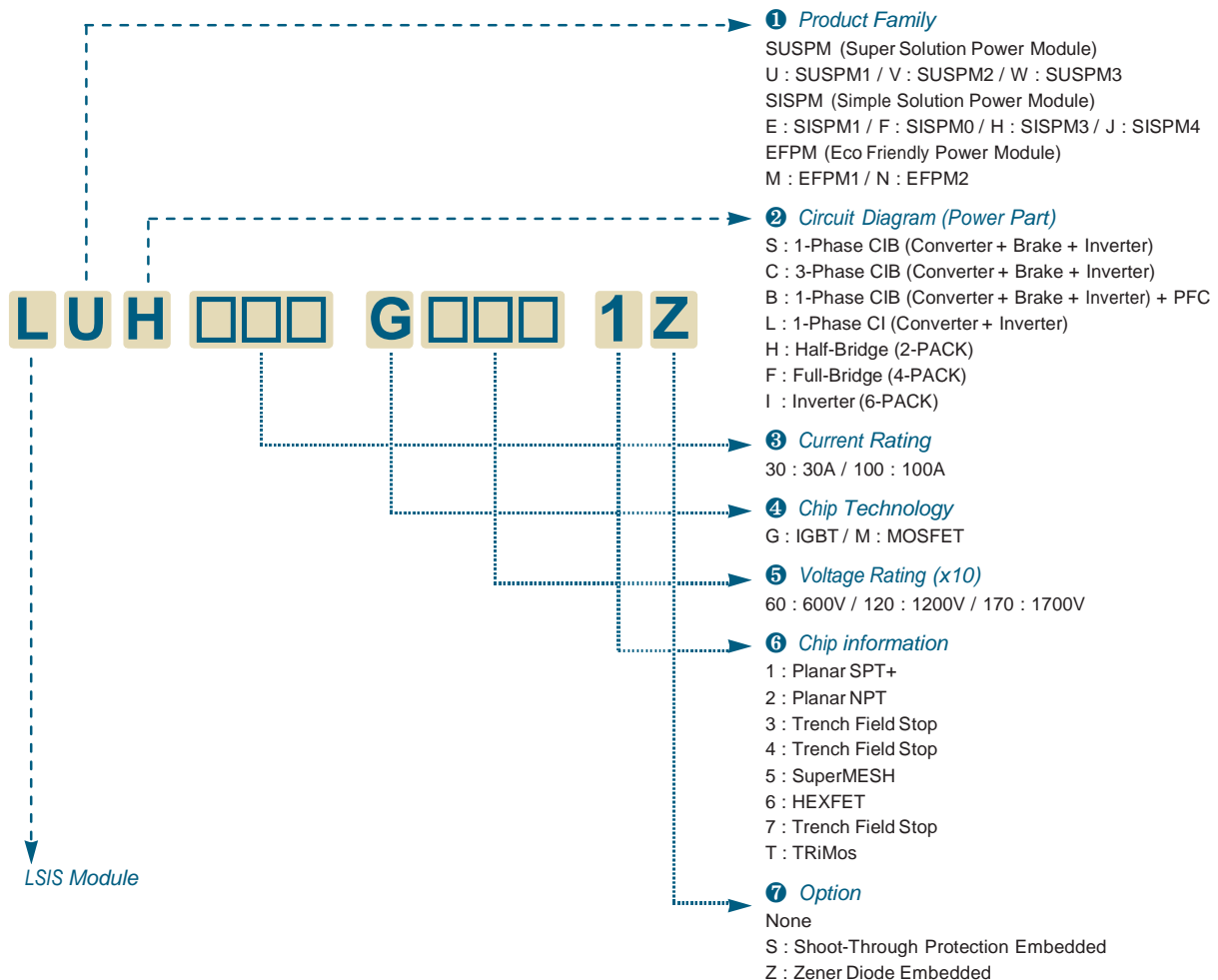


SISPM™1 (4-Pack MOSFET Modules)





Ordering information





Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance. Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

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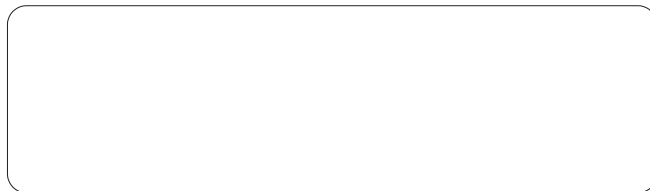
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