LGM40PI120C1T3A

1200V/40A PIM in one-package

FEATURES

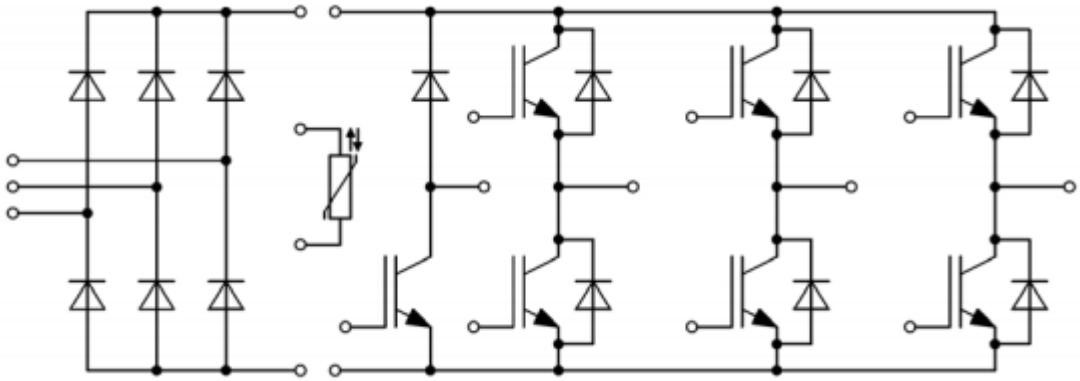
- V_{CEsat} with positive temperature coefficient
- Low V_{CEsat}
- Low inductance case
- 10μs short circuit capability
- Isolated copper baseplate using DBC technology

Preliminary Data
VCES = 1200V
IC nom = 40A / ICRM = 80A

APPLICATION

- Motor drivers
- Air Conditioning
- Auxiliary inverters

Equivalent Circuit Schematic



IGBT, Inverter

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Collector-emitter voltage	Tvj = 25°C	V_{CES}	1200	V
Continuous DC collector current	T_C = 100°C, Tvj max = 175°C T_C = 25°C, Tvj max = 175°C	I_C	40 68	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	80	A
Total power dissipation	TC = 25°C, Tvj max = 175°C	P_{tot}	272	W
Gate-emitter peak voltage		V_{GE}	±20	V

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 40A, V_{GE} = 15 V Tvj = 25°C	V_{CEsat}		1.85		V
Gate threshold voltage	I_C = 1.5 mA, V_{CE} = V_{GE} Tvj = 25°C	V_{GEth}		6.5		V
Gate charge	V_{GE} = -15 / 15 V	Q_G		0.167		µC
Input capacitance	f = 1 MHz, Tvj = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{ies}		3.53		nF
Reverse transfer capacitance		C_{res}		0.11		nF
Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, Tvj = 25°C	I_{CES}			1.0	mA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, Tvj = 25°C	I_{GES}			400	nA
Turn-on delay time, inductive load	I_C = 40 A, V_{CE} = 600 V V_{GE} = -15 / 15 V , RG = 10Ω Tvj = 25°C	$t_{d\ on}$		0.15		µs
Rise time, inductive load		t_r		0.09		µs
Turn-off delay time, inductive load		$t_{d\ off}$		0.11		µs
Fall time, inductive load		t_f		0.16		µs
Turn-on energy loss per pulse		E_{on}		3.2		mJ
Turn-off energy loss per pulse		E_{off}		4		mJ
SC data	V_{GE} ⩽ 15 V, V_{CC} = 800 V t_P ⩽ 10 µs, Tvj = 25°C	ISC		254		A
Thermal resistance, junction to case	per IGBT	RthJC			0.55	K/W
Thermal resistance, case to heatsink	per IGBT λ_{Paste}=1 W/(m·K) /λ_{grease}=1 W/(m·K)	RthCH		0.27		K/W
Temperature under switching conditions		Tvj op	-40		150	°C

Diode, Inverter

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25°C	VRRM	1200	V
Continuous DC forward current		IF	40	A
Repetitive peak forward current	t_P = 1 ms	IFRM	80	A

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Forward voltage	I_F = 40 A, V_{GE} = 0 V Tvj = 25°C	V_F		2.00		V
Peak reverse recovery current	I_F = 40 A, - d_{iF}/d_t = 1400 A/µs V_R = 600 V, VGE = -15 V Tvj = 25°C	I_{RR}		43		A
Recovered charge		Q_{RR}		1.9		µC
Reverse recovery energy		E_{rec}		0.8		mJ
Thermal resistance, junction to case	per diode	R_{thJC}			1..05	K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)	R_{thCH}		0.5		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

Diode, Rectifier

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25°C	V_{RRM}	1600	V
Maximum RMS current at rectifier output	Tc=80°C	I_F	40	A
Surge forward current	t_p = 10 ms, Tvj = 25°C	I_{FSM}	580	A
I^2t - value	t_p = 10 ms, Tvj = 25°C	I^2t	1950	A^2s

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Forward voltage	Tvj = 25°C, I_F = 40 A	V_F		1.2		V
Reverse current	Tvj = 25°C, VR = 1600 V	I_R		1.00		mA
Thermal resistance, junction to case	per diode	R_{thJC}			0.87	K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)	R_{thCH}		0.46		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

IGBT, Brake-Chopper
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Collector-emitter voltage	Tvj = 25°C	V_{CES}	1200	V
Continuous DC collector current	T_C = 100°C, Tvj max = 175°C T_C = 25°C, Tvj max = 175°C	I_C	15 30	A
Repetitive peak collector current	t_P = 1 ms	I_{CRM}	30	A
Total power dissipation	TC = 25°C, Tvj max = 175°C	P_{tot}	147	W
Gate-emitter peak voltage		V_{CES}	±20	V

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 15 A, V_{GE} = 15 V Tvj = 25°C	V_{CEsat}		1.9		V
Gate threshold voltage	I_C = 0.48 mA, V_{CE} = V_{GE} Tvj = 25°C	V_{GEth}		5.9		V
Gate charge	V_{GE} = -15 / 15 V	Q_G		0.12		µC
Input capacitance	f = 1 MHz, Tvj = 25°C, V_{CE} = 25 V, V_{GE} = 0 V	C_{ies}		0.95		nF
Reverse transfer capacitance		C_{res}		0.04		nF
Collector-emitter cut-off current	V_{CE} = 1200 V, V_{GE} = 0 V, Tvj = 25°C	I_{CES}			1.0	mA
Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, Tvj = 25°C	I_{GES}			400	nA
Turn-on delay time, inductive load	I_C = 15 A, V_{CE} = 600 V V_{GE} = -15 / 15 V , RG = 20Ω Tvj = 25°C	$t_{d\ on}$		0.035		µs
Rise time, inductive load		t_r		0.03		µs
Turn-off delay time, inductive load		$t_{d\ off}$		0.09		µs
Fall time, inductive load		t_f		0.13		µs
Turn-on energy loss per pulse		E_{on}		1.75		mJ
Turn-off energy loss per pulse		E_{off}		0.4		mJ
SC data	V_{GE} ⩽ 15 V, V_{CC} = 800 V t_P ⩽ 10 µs, Tvj = 25°C	ISC		130		A
Thermal resistance, junction to case	per IGBT	RthJC		1.02	1.15	K/W
Thermal resistance, case to heatsink	per IGBT λ_{Paste}=1 W/(m·K) /λ_{grease}=1 W/(m·K)	RthCH		1.02		K/W
Temperature under switching conditions		Tvj op	-40		150	°C

Diode, Brake-Chopper
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Repetitive peak reverse voltage	Tvj = 25°C	VRRM	1200	V
Continuous DC forward current		IF	15	A
Repetitive peak forward current	t_P = 1 ms	IFRM	30	A

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Forward voltage	I_F = 15 A, V_{GE} = 0 V Tvj = 25°C	V_F		1.9		V
Peak reverse recovery current	I_F = 15 A, - d_{iF}/d_t = 1200 A/µs (Tvj=150°C) V_R = 600 V, VGE = -15 V Tvj = 25°C	I_{RR}		24		A
Recovered charge		Q_{RR}		1.8		µC
Reverse recovery energy		E_{rec}		0.35		mJ
Thermal resistance, junction to case	per diode	R_{thJC}		1.68	1.8	K/W
Thermal resistance, case to heatsink	per diode l_{Paste} = 1 W/(m·K) / l_{grease} = 1 W/(m·K)	R_{thCH}		1.2		K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	°C

NTC-Thermistor
Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Rated resistance	T_{NTC} = 25°C	R_{25}		5		kΩ
Deviation of R100	T_{NTC} = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
Power dissipation	T_{NTC} = 25°C	P_{25}			20	mW

Module

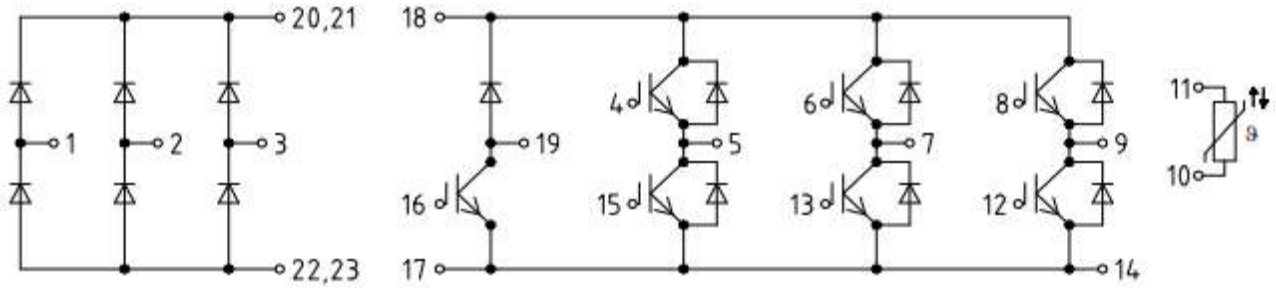
Maximum Rated Values

Parameter	Conditions	Symbol	Values	Units
Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	VISOL	2.5	kV
Internal isolation	basic insulation (class 1, IEC 61140)		AI_2O_3	
Creepage distance	terminal to heatsink terminal to terminal		10	mm
Clearance	terminal to heatsink terminal to terminal		7.5	mm
Comperative tracking index		CTI	＞200	

Characteristic Values

Parameter	Conditions	Symbol	Values			Units
			Min.	Typ.	Max.	
Stray inductance module and fixture		L_{sCE}		60		nH
Module lead resistance, terminals - chip	TC = 25°C, per switch	$R_{CC'+EE'}$ $R_{AA'+CC'}$		4 3		mΩ
Storage temperature		T_{stg}	-40		125	°C
Mountig force per clamp		F	3		6	N
Weight		G		200		g

Circuit diagram



Package outlines (mm)