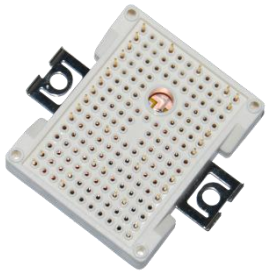
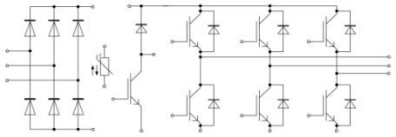
LCG35PIS120B2

1200V, 35A PIM Module



Features

- $V_{CE(sat)}$ with positive temperature coefficient
- Low $V_{CE(sat)}$
- Low switching losses
- High current capability
- Short circuit rated



Typical Applications

- Motor drives
- Air conditioning
- Auxiliary inverters

Maximum Ratings

	Parameter	Symbols	Conditions		Value	Unit
Inverter	Collector to emitter voltage	V_{CES}			1200	V
	Gate to emitter voltage	V_{GES}			±20	V
	Collector current	I_C	Contentious	T_H = 25 °C	55	A
			Contentious	T_H = 60 °C	35	A
		I_{CM}	t_p = 1 ms		70	A
	Operating junction temperature	T_{Jop}			150	°C
	Maximum junction temperature	T_{Jmax}			175	°C
	Maximum power dissipation	P_D	1 device	T_J = 175 °C	125	W
Brake	Collector to emitter voltage	V_{CES}			1200	V
	Gate to emitter voltage	V_{GES}			±20	V
	Collector current	I_C	Contentious	T_H = 25 °C	55	A
			Contentious	T_H = 60 °C	35	A
		I_{CM}	t_p = 1 ms		70	A
	Operating junction temperature	T_{Jop}			150	°C
	Maximum junction temperature	T_{Jmax}			175	°C
	Maximum power dissipation	P_D	1 device	T_J = 175 °C	100	W
Rectifier	Repetitive peak reverse voltage	V_{RRM}			1600	V
	Average output current	I_O	50Hz/60Hz, sine wave		30	A
	Surge forward current	I_{FSM}	t_p = 10 ms	T_C = 25 °C	360	A
	I^2t – value	I^2t	t_p = 10 ms	T_C = 25 °C	648	A^2S
	Operating junction temperature	T_{Jop}			150	°C
Case temperature		T_C			125	°C
Storage temperature		T_{stg}			150	°C

Electrical Characteristics (T_J = 25°C unless otherwise specified)

	Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Inverter, IGBT	Collector-emitter breakdown voltage	BV_{CES}	V_{GE} = 0 V, I_C = 1 mA		1200	-	-	V
	Collector-emitter cutoff current	I_{CES}	V_{GE} = 0 V, V_{CE} = V_{CES}		-	-	1	mA
	Gate leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = V_{GES}		-	-	±100	nA
	Gate emitter threshold Voltage	$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 250uA		5.2	5.9	6.5	V
	Internal gate resistor	R_{gint}	f = 1 MHz		-	0	-	Ω
	Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 35 A, V_{GE} = 15 V	T_J = 25°C	-	1.75	2.15	V
			I_C = 35 A, V_{GE} = 15 V	T_J = 125°C	-	2.25	-	V
			I_C = 35 A, V_{GE} = 15 V	T_J = 150°C	-	2.35	-	V
	Input capacitance	C_{ies}	V_{GE} = 0 V, V_{CE} = 25 V, f = 1 MHz		-	6.1	-	nF
	Reverse transfer capacitance	C_{res}			-	0.1	-	
	Total gate charge	Q_g	V_{CE} = 600 V, I_C = 35 A V_{GE} = -15 V….+15 V		-	0.26	-	uC
	Turn-on delay time	$T_{d(on)}$	V_{CC} = 600 V, I_C = 35 A V_{GE} = ±15 V R_{gon} = 10 Ω, R_{Goff} = 10 Ω	T_J = 25°C	-	0.067	-	us
				T_J = 125°C	-	0.066	-	us
				T_J = 150°C	-	0.065	-	us
	Rise time	T_r		T_J = 25°C	-	0.057	-	us
				T_J = 125°C	-	0.074	-	us
				T_J = 150°C	-	0.076	-	us
	Turn-off delay time	$T_{d(off)}$		T_J = 25°C	-	0.188	-	us
				T_J = 125°C	-	0.230	-	us
				T_J = 150°C	-	0.236	-	us
	Fall time	T_f		T_J = 25°C	-	0.093	-	us
				T_J = 125°C	-	0.129	-	us
				T_J = 150°C	-	0.144	-	us
	Turn-on switching loss	E_{on}		T_J = 25°C	-	1.496	-	mJ
				T_J = 125°C	-	2.784	-	mJ
				T_J = 150°C	-	3.243	-	mJ
	Turn-off switching loss	E_{off}		T_J = 25°C	-	1.752	-	mJ
				T_J = 125°C	-	2.452	-	mJ
				T_J = 150°C	-	2.499	-	mJ
	Short circuit data	I_{sc}	V_{GE} = 15 V, V_{CC} = 800 V V_{CEmax} = V_{CES} -L_{sCE} • di/dt tp ⩽ 10 us	T_j = 125°C	-	250	-	A
	Thermal resistance, junction to heatsink	R_{thJH}	Per IGBT, λ_{grease} = 1 W/(m·K)		-	1.2	-	K/W

Electrical Characteristics (T_J = 25°C unless otherwise specified)

	Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Inverter, FRD	Forward voltage	V_F	I_F = 35 A	T_J = 25°C	-	2.0	2.4	V
				T_J = 125°C	-	1.7	2.2	V
	Peak reverse recovery current	I_{rr}	I_F = 35 A, V_R = 600 V V_{GE} = -15 V, R_{gon} = 10 Ω	T_J = 25°C	-	32	-	A
				T_J = 125°C	-	41	-	A
	Reverse recovery charge	Q_{rr}		T_J = 25°C	-	3.0	-	uC
				T_J = 125°C	-	5.6	-	uC
	Reverse recovery energy	E_{rec}		T_J = 25°C	-	0.52	-	mJ
				T_J = 125°C	-	1.51	-	mJ
	Thermal resistance, junction to heatsink	R_{thJH}	Per Diode, λ_{grease} = 1 W/(m·K)		-	1.65	-	K/W

Electrical Characteristics (T_J = 25°C unless otherwise specified)

	Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Rectifier	Forward voltage	V_F	I_F = 35 A	T_J = 25°C	-	1.1	1.4	V
	Reverse current	I_{rr}	V_R = 1600 V	T_J = 25°C	-	-	1	mA
	Thermal resistance, junction to heatsink	R_{thJH}	Per Diode, λ_{grease} = 1 W/(m·K)		-	1.3	-	K/W

Electrical Characteristics (T_J = 25°C unless otherwise specified)

	Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Brake, IGBT	Collector-emitter breakdown voltage	BV_{CES}	V_{GE} = 0 V, I_C = 1 mA		1200	-	-	V
	Collector-emitter cutoff current	I_{CES}	V_{GE} = 0 V, V_{CE} = V_{CES}		-	-	1	mA
	Gate leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = V_{GES}		-	-	±100	nA
	Gate emitter threshold Voltage	$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 1 mA		5.0	5.6	6.5	V
	Internal gate resistor	R_{gint}	f = 1 MHz		-	0	-	Ω
	Collector-emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 35 A, V_{GE} = 15 V		-	1.5	2.0	V
			I_C = 35 A, V_{GE} = 15 V	T_J = 125°C	-	1.77	-	V
	Input capacitance	C_{ies}	V_{GE} = 0 V, V_{CE} =25 V, f = 1 MHz		-	5.59	-	nF
	Reverse transfer capacitance	C_{res}			-	0.134	-	
	Total gate charge	Q_g	V_{CE} = 600 V, I_C = 35 A V_{GE} = -15V….+15 V		-	0.3	-	uC
	Turn-on delay time	$T_{d(on)}$	V_{CC} = 600 V, I_C = 35 A V_{GE} = ±15 V R_{gon} = 10 Ω, R_{goff} = 10 Ω	T_J = 25°C	-	0.019	-	us
				T_J = 125°C	-	0.018	-	us
				T_J = 150°C	-	0.017	-	us
	Rise time	T_r		T_J = 25°C	-	0.017	-	us
				T_J = 125°C	-	0.021	-	us
				T_J = 150°C	-	0.023	-	us
	Turn-off delay time	$T_{d(off)}$		T_J = 25°C	-	0.17	-	us
				T_J = 125°C	-	0.21	-	us
				T_J = 150°C	-	0.23	-	us
	Fall time	T_f		T_J = 25°C	-	0.018	-	us
				T_J = 125°C	-	0.022	-	us
				T_J = 150°C	-	0.024	-	us
	Turn-on switching loss	E_{on}		T_J = 25°C	-	2.2	-	mJ
				T_J = 125°C	-	2.9	-	mJ
				T_J = 150°C	-	3.1	-	mJ
	Turn-off switching loss	E_{off}		T_J = 25°C	-	1.3	-	mJ
				T_J = 125°C	-	1.8	-	mJ
				T_J = 150°C	-	2.1	-	mJ
	Short circuit data	I_{sc}	V_{GE} = 15 V, V_{CC} = 800 V V_{CEmax} = V_{CES} -L_{sCE} • di/dt tp ⩽ 10 us	T_J = 125°C	-	180	-	A
	Thermal resistance, junction to heatsink	R_{thJH}	per IGBT, λ_{grease} = 1 W/(m·K)		-	1.5	-	K/W

Electrical Characteristics (T_J = 25°C unless otherwise specified)

	Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Brake, FRD	Forward voltage	V_F	I_F = 15 A	T_J = 25°C	-	2.0	2.4	V
				T_J = 125°C	-	1.7	-	V
	Peak reverse recovery current	I_{rr}	I_F = 15 A, V_R = 600 V V_{GE} = -15 V, R_{gon} = 10 Ω	T_J = 25°C	-	13	-	A
				T_J = 125°C	-	18	-	A
	Reverse recovery charge	Q_{rr}		T_J = 25°C	-	1.2	-	uC
				T_J = 125°C	-	2.45	-	uC
	Reverse recovery energy	E_{rec}		T_J = 25°C	-	0.31	-	mJ
				T_J = 125°C	-	0.59	-	mJ
	Thermal resistance, junction to heatsink	R_{thJH}	per Diode, λ_{grease} = 1 W/(m·K)		-	2.5	-	K/W

Electrical Characteristics (T_J = 25°C unless otherwise specified)

	Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
NTC	Rated resistance	R_{25}	T_C = 25°C		-	5	-	kΩ
	Deviation of R_{100}	△R/R	R_{100} = 493 Ω	T_J = 100°C	-5	-	5	%
	Power dissipation	P_{25}	T_C = 25°C		-	-	20	mW
	B-value	$B_{25/50}$	$R_2 = R_{25}$ exp [$B_{25/50}$(1/T2 - 1/(298.15 K))]		-	3375	-	W

Electrical Characteristics (T_J = 25°C unless otherwise specified)

	Parameter	Symbol	Test Conditions	Value	Unit
Module	Isolation test voltage	V_{ISOL}	RMS, f = 50 Hz, t = 1 min.	2.5	kV
	Internal isolation		basic insulation (class 1, IEC 61140)	Al_2O_3	
	Creepage distance		terminal to heatsink	11.5	mm
			terminal to terminal	6.3	
	Clearance		terminal to heatsink	10.0	mm
			terminal to terminal	5.0	
	Comperative tracking index	CTI		>200	
	Thermal resistance, case to heatsink	R_{thCH}	per module, λ_{grease} = 1 W/(m·K)	0.01	K/W
	Stray inductance module	L_{sCE}		30	nH
	Module lead resistance, terminals - chip	$R_{CC'+EE'}$	per switch	5	mΩ
		$R_{AA'+CC'}$		6	
	Mounting torque for module mounting	M	Screw M4	1.6~2.2	Nm
	Weight	G		40	g

Fig 1, Output Characteristics IGBT, Inverter (typical)

$I_C = f(V_{CE})$

V_{GE} = 15 V

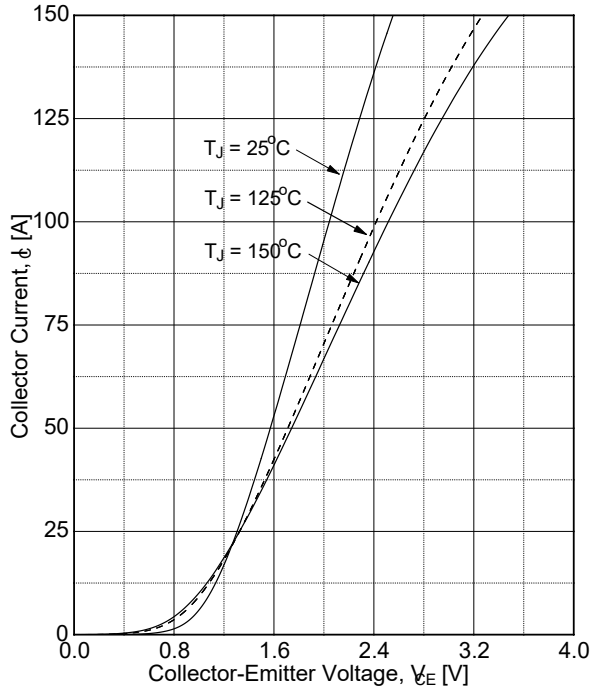


Fig 2, Output Characteristics IGBT, Inverter(typical)

$I_C = f(V_{CE})$

T_J = 150°C

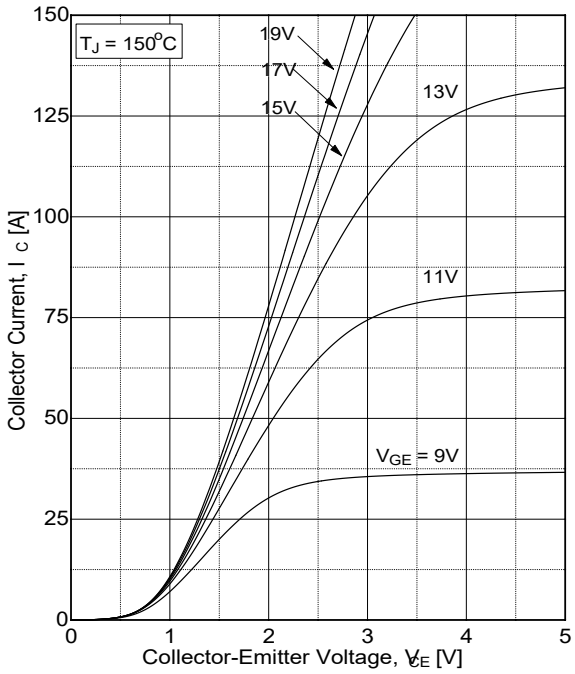


Fig 3, Transfer Characteristics IGBT, Inverter (typical)

$I_C = f(V_{GE})$

V_{CE} = 20 V

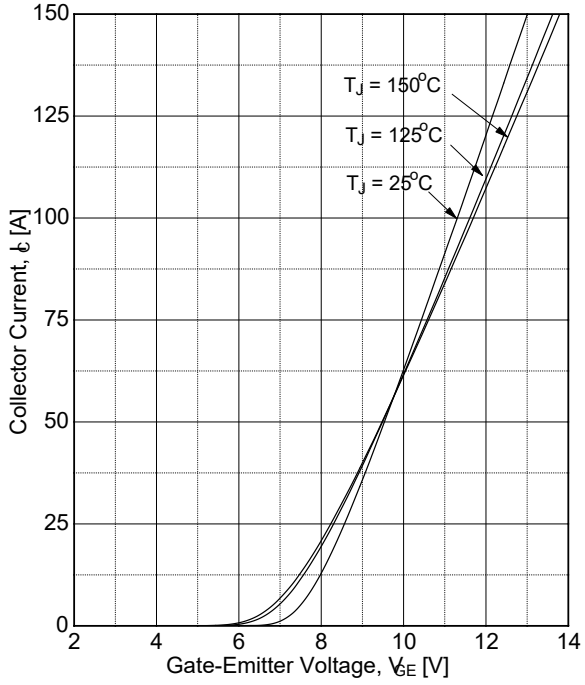


Fig 4, Switching Losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$

V_{GE} = +/-15 V, R_{gon} = 10 Ω, R_{goff} = 10 Ω, V_{CE} = 600 V

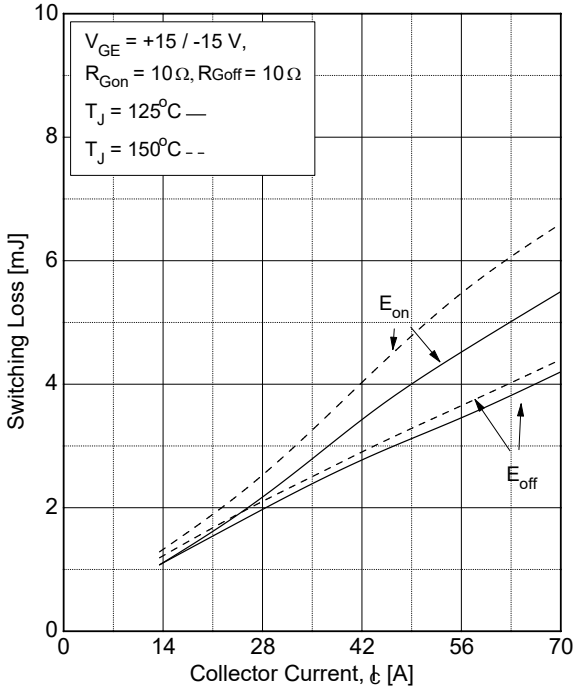


Fig 5, Switching Losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$

V_{GE} = +/-15 V, I_{CE} = 35 A, V_{CE} = 600 V

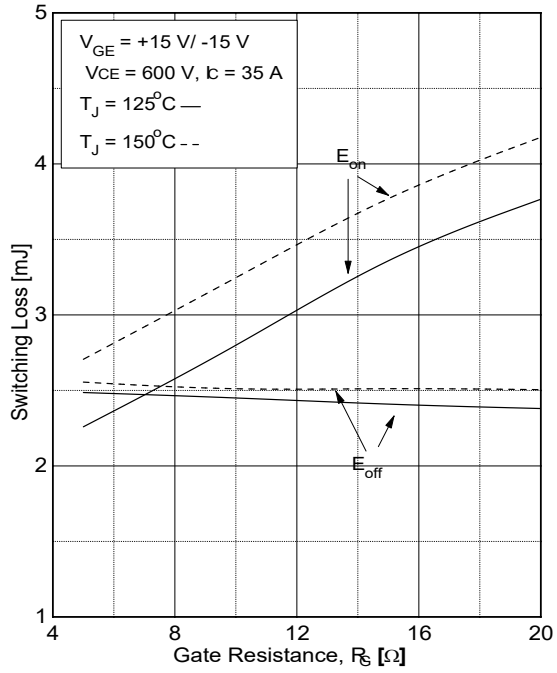


Fig 6, Transient Thermal Impedance IGBT, Inverter

$Z_{thJC} = f(t)$

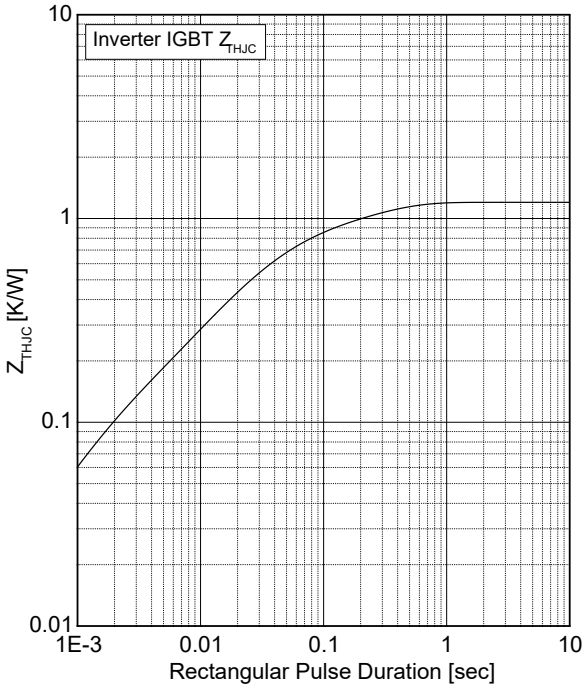


Fig 7, Reverse Bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$

V_{GE} = +/-15 V, R_{goff} = 10 Ω, T_J = 150°C

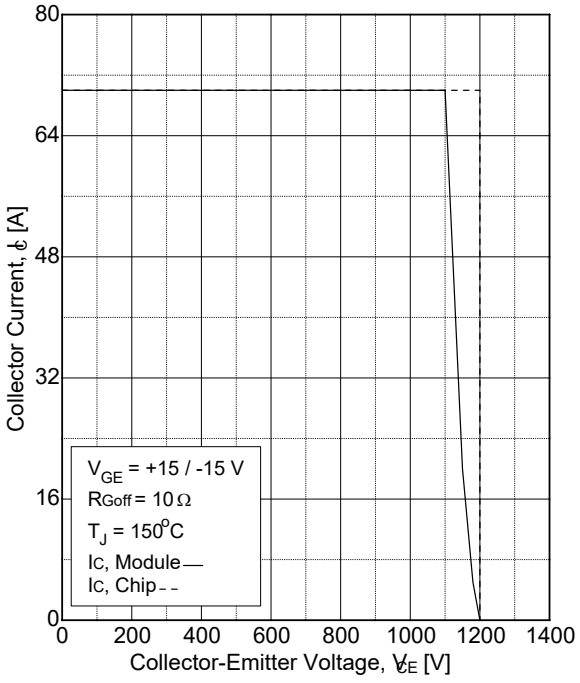


Fig 8, Forward Characteristics of Diode, Inverter (typical)

$I_F = f(V_F)$

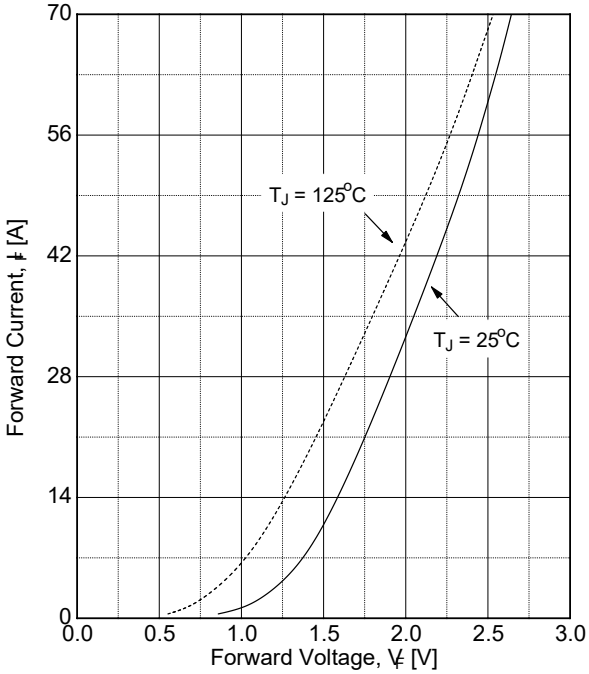


Fig 9, Switching Losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

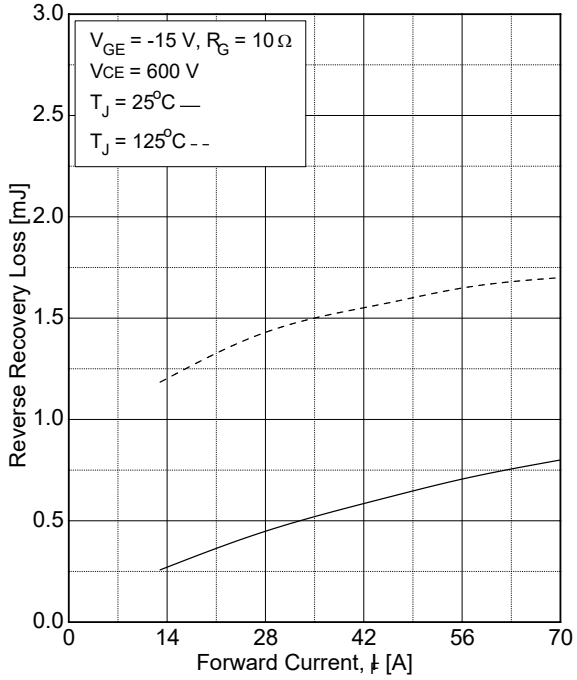


Fig 10, Switching Losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

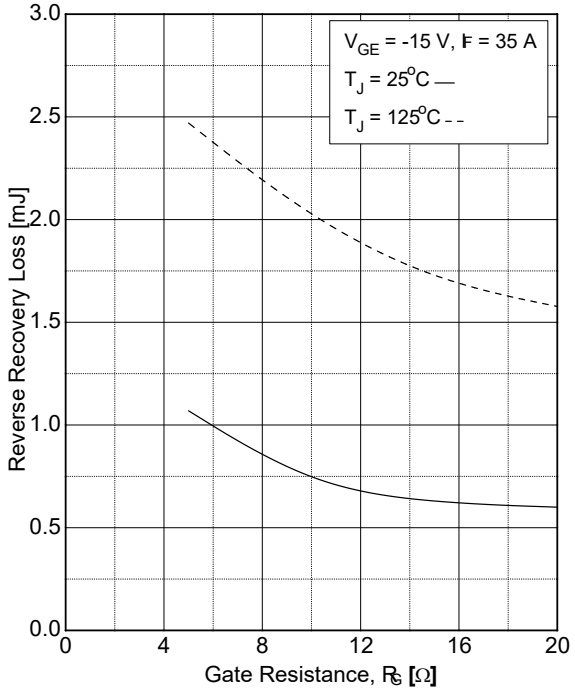


Fig 11, Transient Thermal Impedance Diode, Inverter

$Z_{thJC} = f(t)$

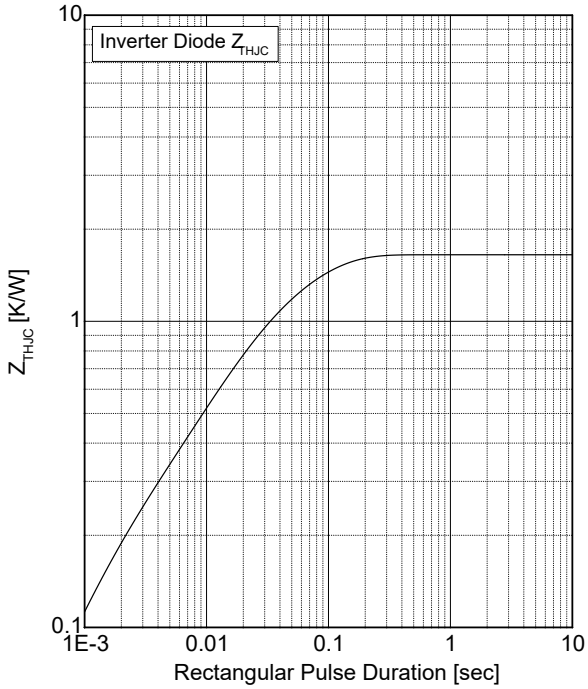


Fig 12, Forward Characteristics of Diode, Rectifier (typical)

$I_F = f(V_F)$

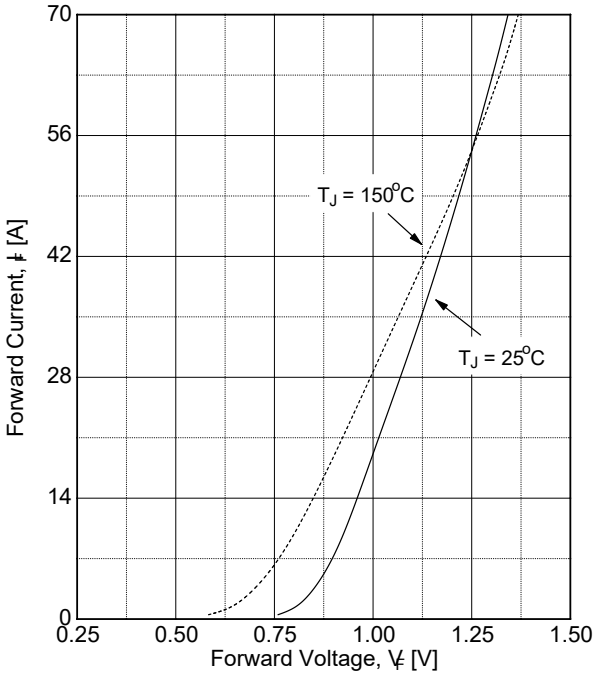


Fig 13, Output Characteristics IGBT, Brake (typical)

$I_C = f(V_{CE})$

V_{GE} = 15 V

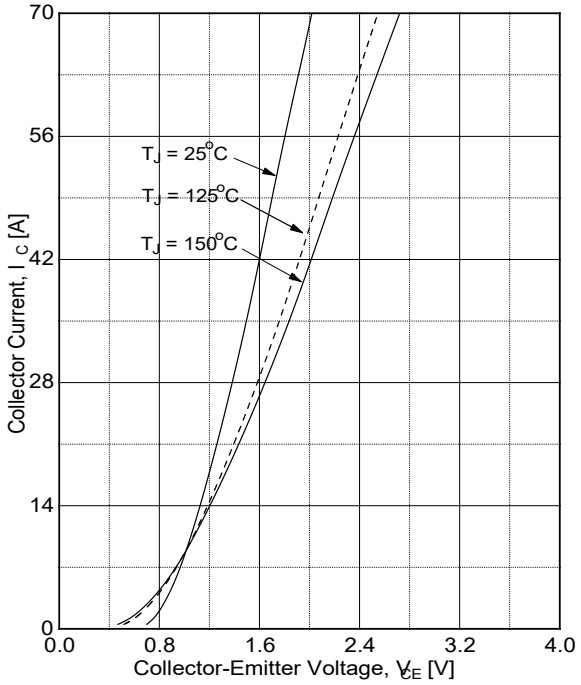


Fig 14, Forward Characteristics of Diode, Brake (typical)

$I_F = f(V_F)$

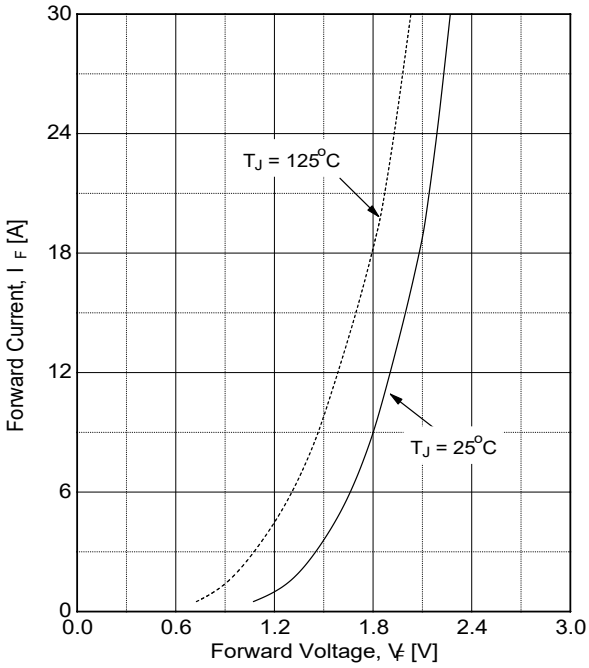
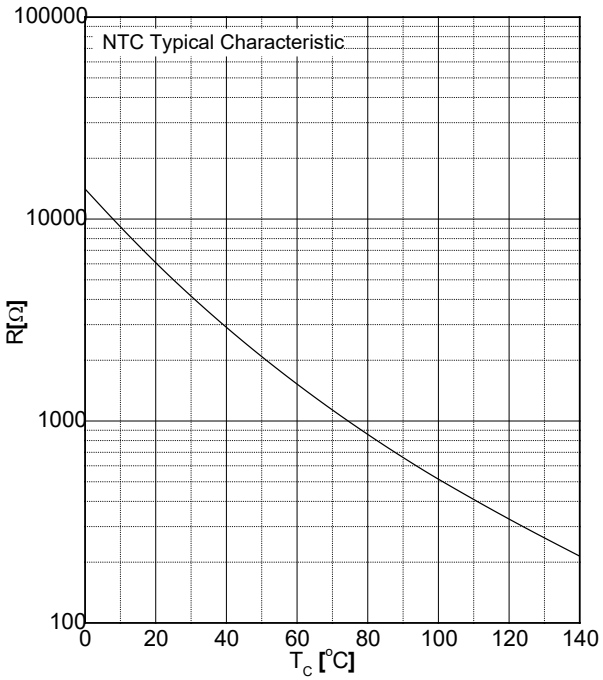
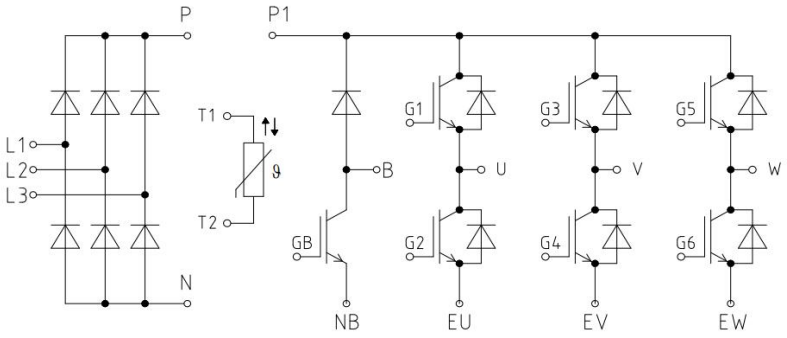


Fig 15, NTC Characteristics (typical)

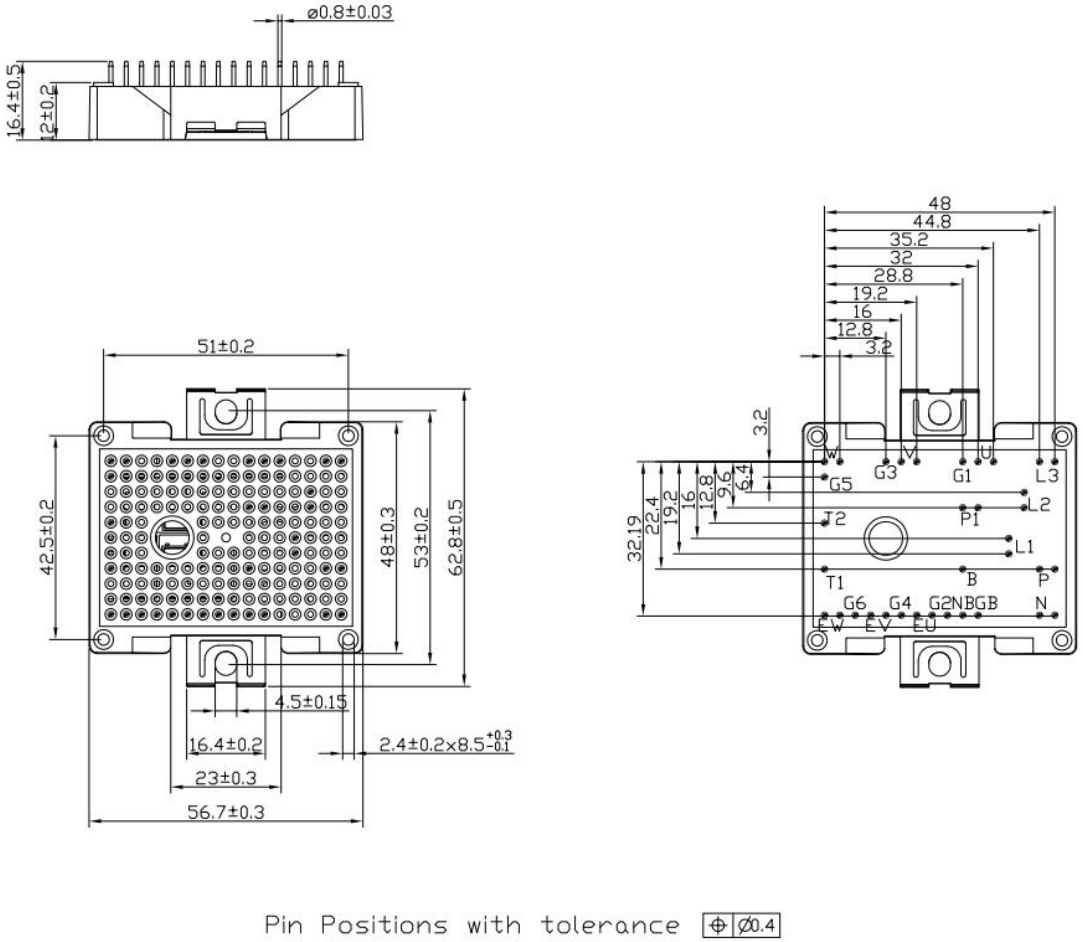
R = f(T)



Circuit Diagram



Package Outlines



Pin Positions with tolerance ⌖ Ø0.4

Revisions History

Version	Description of Change	Date
1.0	Preliminary Datasheet	Jun.14.2019
2.0	Final Datasheet	Feb.10.2020
3.0	Update Datasheet	Jan.25.2022