MCF600N170L2E3

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V_{CE}	Ic nom
1700V	600A

E3

DESCRIPTION

The MCF600N170L2E3 module with JSCJ advanced Trench and FS (Field Stop) IGBT provide very low Collector-Emitter Saturation Voltage, easy to use in drives and inverters.

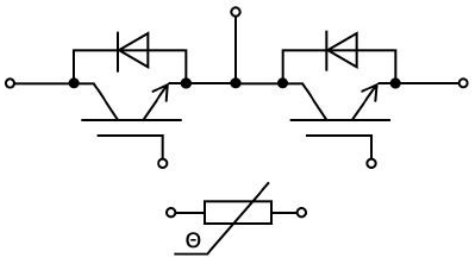
Features

- 1700V Trench Gate & Field Stop Structure
- High Short Circuit Capability
- Low switching loss
- High Reliability
- Positive Temperature Coefficient

Application

- High Power Converters
- Wind turbines
- Motor Driver

EQUIVALENT CIRCUIT



Order Code	Package	Marking	Parking
MCF600N170L2E3	E3	600N170	Module

Absolute Maximum Ratings (T_C=25°C unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	DC Collector Current, Tc=100℃	600	A
I_{CM}	Peak Collector Current, tp=1ms	1200	A
I_F	Continuous Diode Forward Current	600	A
I_{FRM}	Diode Peak Forward Current, t_p=1ms	1200	A
P_D	IGBT Maximum Power Dissipation	3660	W
t_{sc}	IGBT Short Circuit Withstand Time	10	μs
$T_{vJ\ MAX}$	Maximum Junction Temperature	175	℃
T_{vJ}	Operating Junction Temperature	-40 to 150	℃
T_{STG}	Storage Temperature	-40 to 125	℃
T_L	Maximum lead temperature for soldering	260	℃

Electrical Characteristics (TJ=25°C unless otherwise noted)

Parameter	Symbol	Condition		Value			Unit
				Min	Typ.	Max	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=600A, V_{GE}=15V	T_{vj}=25℃		1.80	2.20	V
			T_{vj}=125℃		2.20		V
			T_{vj}=150℃		2.30		V
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C=24mA, V_{CE}=V_{GE}		5.5	6.0	6.5	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1700V, V_{GE}=0V				1	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-100		100	nA
Internal Gate Resistance	R_{Gint}	T_{vj}=25℃			1.2		Ω
Gate Charge	Q_G	V_{GE}=-15V~+15V			4.5		μC
Input Capacitance	C_{ies}	V_{CE}=25V, V_{GE}=0V, f=1MHz			87.7		nF
Reverse Transfer Capacitance	C_{res}				0.52		nF
Turn-on Delay Time	$t_{d(on)}$	I_C=600A V_{CE}=900V V_{GE}=±15V R_{Gon}=1Ω R_{Goff}=1Ω	T_{vj}=25℃		160		ns
			T_{vj}=125℃		180		ns
			T_{vj}=150℃		185		ns
Rise Time	t_r	I_C=600A, V_{CE}=900V, V_{GE}=±15V, R_{Gon}=1Ω, R_{Goff}=1Ω, 开通 di/dt=3650A/us (T_{vj}=150° C) 关断 dv/dt=4250V/us (T_{vj}=150° C) Inductive Load	T_{vj}=25℃		95		ns
			T_{vj}=125℃		125		ns
			T_{vj}=150℃		130		ns
Turn-off Delay Time	$t_{d(off)}$		T_{vj}=25℃		595		ns
			T_{vj}=125℃		645		ns
			T_{vj}=150℃		665		ns

Fall Time	t_f	I_C=600A V_{CE}=900V V_{GE}=±15V R_{Gon}=1Ω R_{Goff}=1Ω I_C=600A, V_{CE}=900V, V_{GE}=±15V, R_{Gon}=1Ω, R_{Goff}=1Ω, 开通 di/dt=3650A/us (T_{vj}=150°C) 关断 dv/dt=4250V/us (T_{vj}=150°C) Inductive Load	T_{vj}=25℃		290		ns
			T_{vj}=125℃		480		ns
			T_{vj}=150℃		500		ns
Turn-on Energy Loss	E_{on}		T_{vj}=25℃		145		mJ
			T_{vj}=125℃		210		mJ
			T_{vj}=150℃		230		mJ
Turn-off Energy Loss	E_{off}		T_{vj}=25℃		115		mJ
			T_{vj}=125℃		155		mJ
			T_{vj}=150℃		170		mJ
Short Circuit Current	I_{SC}	V_{GE}≤15V, t_p≤10us, V_{CC}=1000V, T_{vj}=150℃ $V_{CE,max}$=V_{CES}-$L_{s,CE}$ x di/dt			3030		A

Diode Electrical Characteristics

Parameter	Symbol	Condition		Value			Unit
				Min	Typ.	Max	
Forward Voltage	V_F	I_F=600A	T_{vj}=25℃		2.20	2.60	V
			T_{vj}=125℃		2.45		V
			T_{vj}=150℃		2.50		V
Peak Reverse Recovery Current	I_{Rm}	I_F=600A, V_R=900V, V_{GE}=-15V di_F/dt=-3600A/μs (T_{vj}=150℃)	T_{vj}=25℃		335		A
			T_{vj}=125℃		380		A
			T_{vj}=150℃		390		A
Reverse Recovery Charge	Q_{rr}		T_{vj}=25℃		80		μC
			T_{vj}=125℃		160		μC
			T_{vj}=150℃		185		μC
Reverse Recovery Energy Loss	E_{rec}		T_{vj}=25℃		40		mJ
			T_{vj}=125℃		80		mJ
			T_{vj}=150℃		100		mJ

NTC-Thermistor

Parameter	Symbol	Condition	Min	Typ.	Max	Unit
Rated resistance	R_{25}	Tc=25℃		5.00		KΩ
Power dissipation	P_{25}				10	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15K))]$		3375		K

Package Properties

Parameter	Symbol	Condition	Value			Unit
			Min	Typ.	Max	
IGBT Thermal Resistance: Junction to Case	$R_{th(J-C)}$	per IGBT			0.041	K/W
Diode Thermal Resistance: Junction to Case	$R_{th(J-C)}$	per Diode			0.060	K/W
IGBT Thermal Resistance: Case to Heatsink	$R_{th(C-H)}$	per IGBT λ_{grease}=1W/(m•K)		0.033		K/W
Diode Thermal Resistance: Case to Heatsink	$R_{th(C-H)}$	per Diode λ_{grease}=1W/(m•K)		0.037		K/W
Isolation Voltage	V_{isol}	RMS, f=50Hz, t=60s		3.4		V
Creepage Distance	d_{cr}	Terminal to Heatsink		14		mm
		Terminal to Terminal		13.5		mm
Clearance Distance	d_{cl}	Terminal to Heatsink		12.5		mm
		Terminal to Terminal		10		mm
Comparative Tracking Index	CTI			>200		
Module Stray Inductance	$L_{s,\ CE}$	per Switch		20		nH
Module lead Resistance, Terminal to Chip	$R_{CC`+EE`}$	per Switch, T_C=25℃		1.1		mΩ
Mounting Torques	M	Baseplate to Heatsink, M5	3		6	Nm
		Power Terminal, M6	3		6	Nm
Module Weight	G			345		g

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

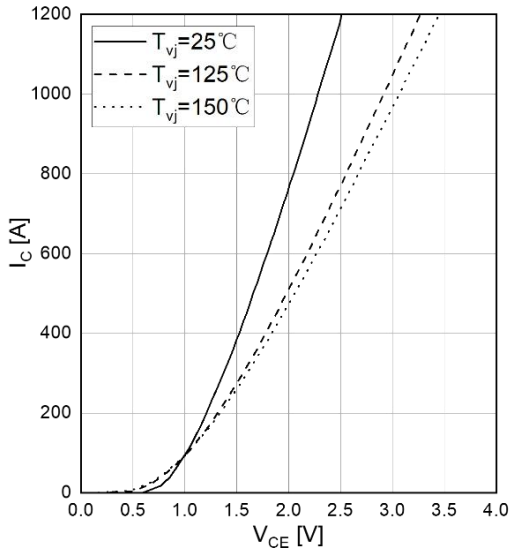


Fig.1 IGBT Output Characteristic
I_C vs V_{CE}, V_{GE}=15V

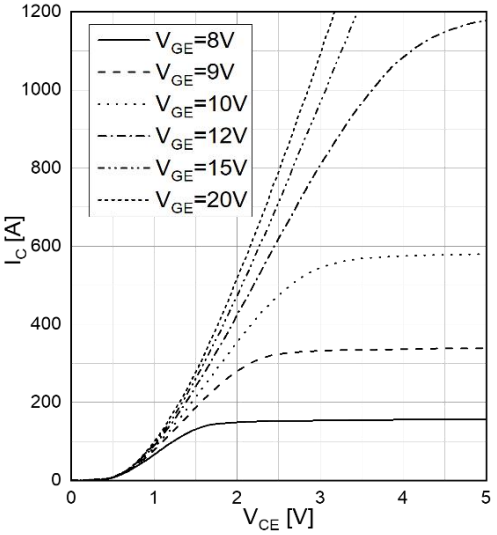


Fig.2 IGBT Output Characteristic
I_C vs V_{CE}, T_{vj}=150℃

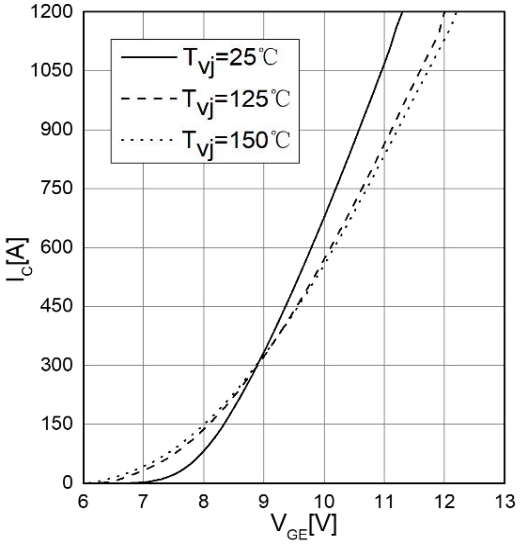


Fig.3 IGBT Transfer Characteristic
I_C vs V_{GE}, V_{CE}=20V

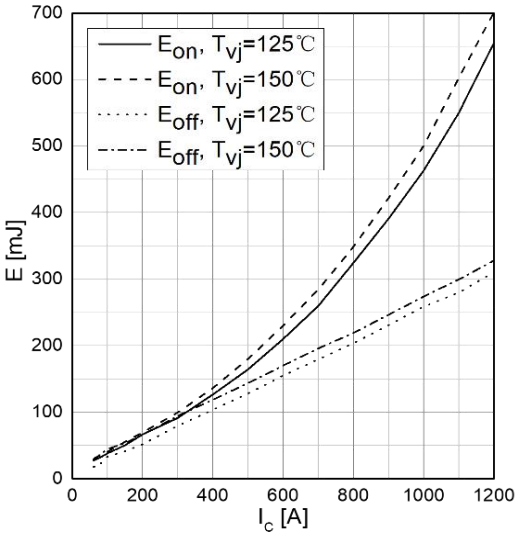


Fig.4 IGBT Switching Energy Loss
E_{on}, E_{off} vs I_C, V_{GE}=±15V, R_G=1.1Ω, V_{CE}=900V

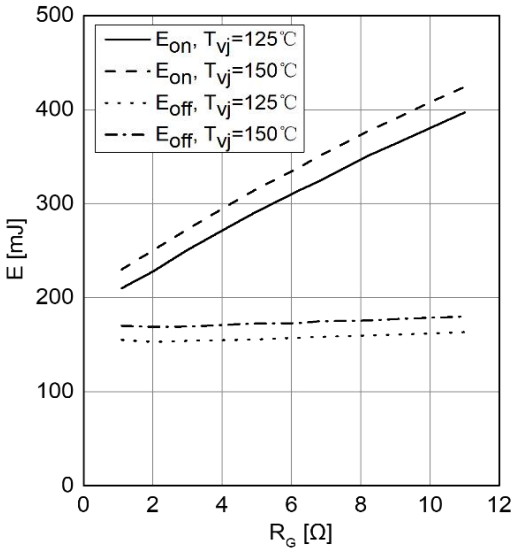


Fig.5 IGBT Switching Energy Loss
I_C=600A, V_{CE}=900V, V_{GE}=±15V

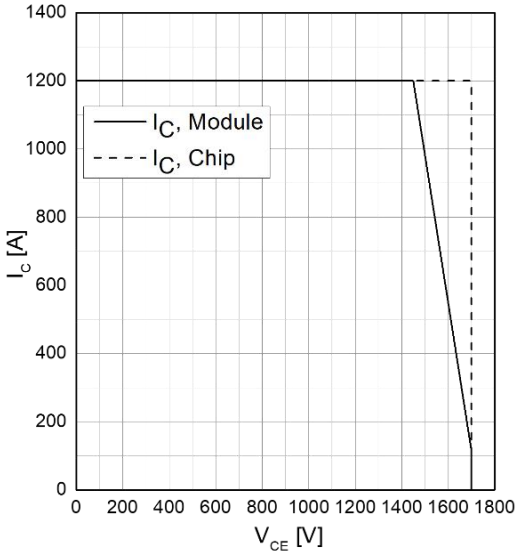


Fig.6 Reverse Bias Safe Operating Area IGBT
V_{GE}=±15V,R_{Goff}=1.1Ω,T_{vj}=150°C

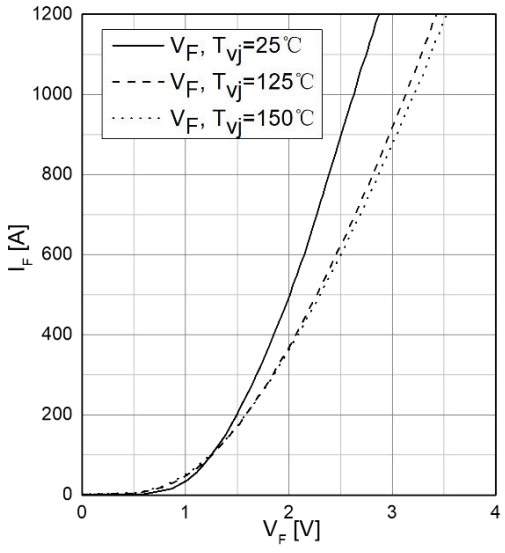


Fig.7 Forward Characteristic FRD
I_F vs V_F

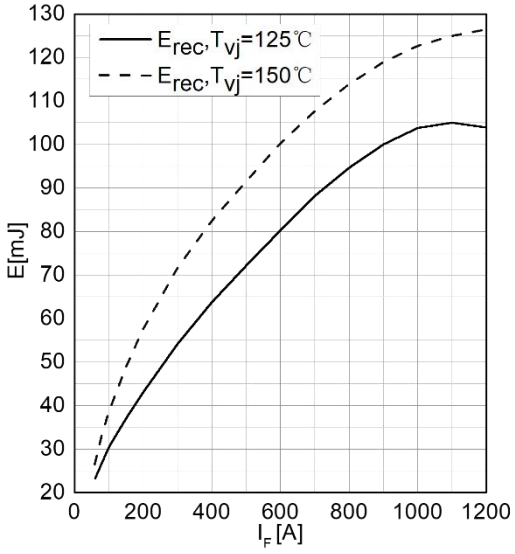


Fig.8 DiodeSwitching Losses Diode
E_{rec} vs I_F, R_{Gon}=1.1Ω, V_{CE}=900V

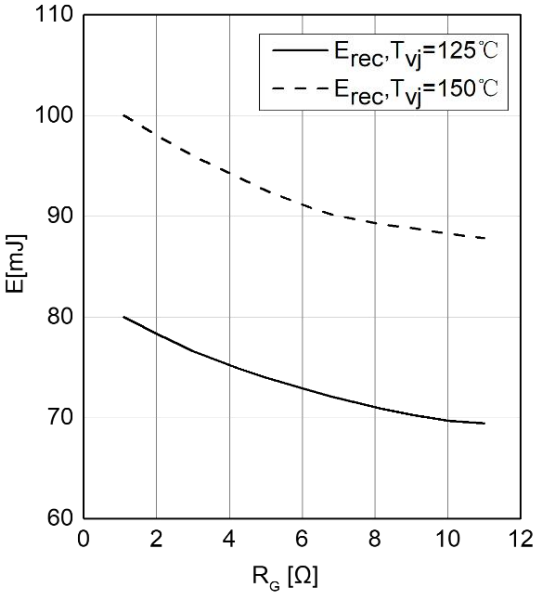


Fig.9 Diode Switching Losses Diode
E_{rec} vs R_G , V_{CE}=900V

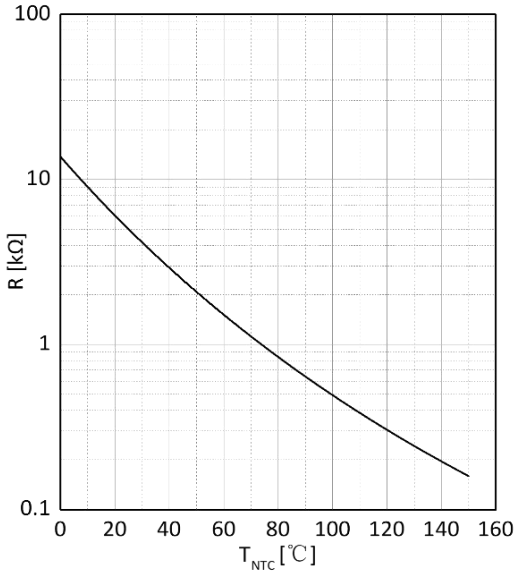


Fig.10 NTC Temperature Characteristic
R vs T_{NTC}

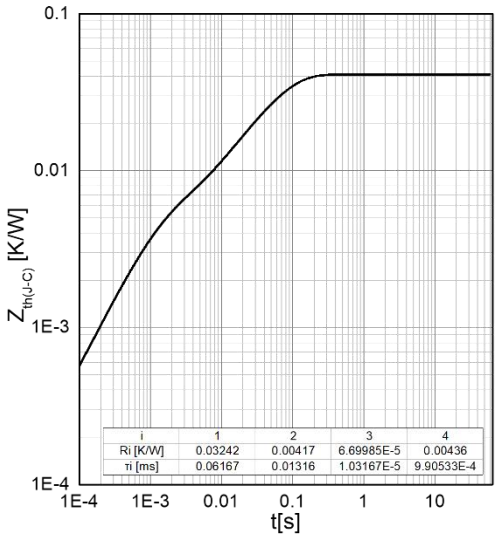


Fig.11 Transient Thermal Impedance IGBT
$Z_{th(J-C)}$ vs t

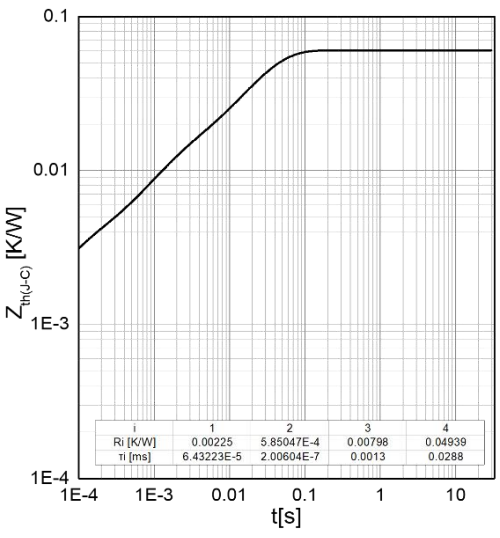
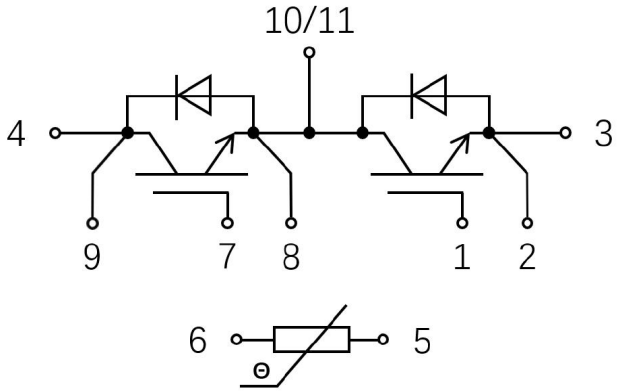


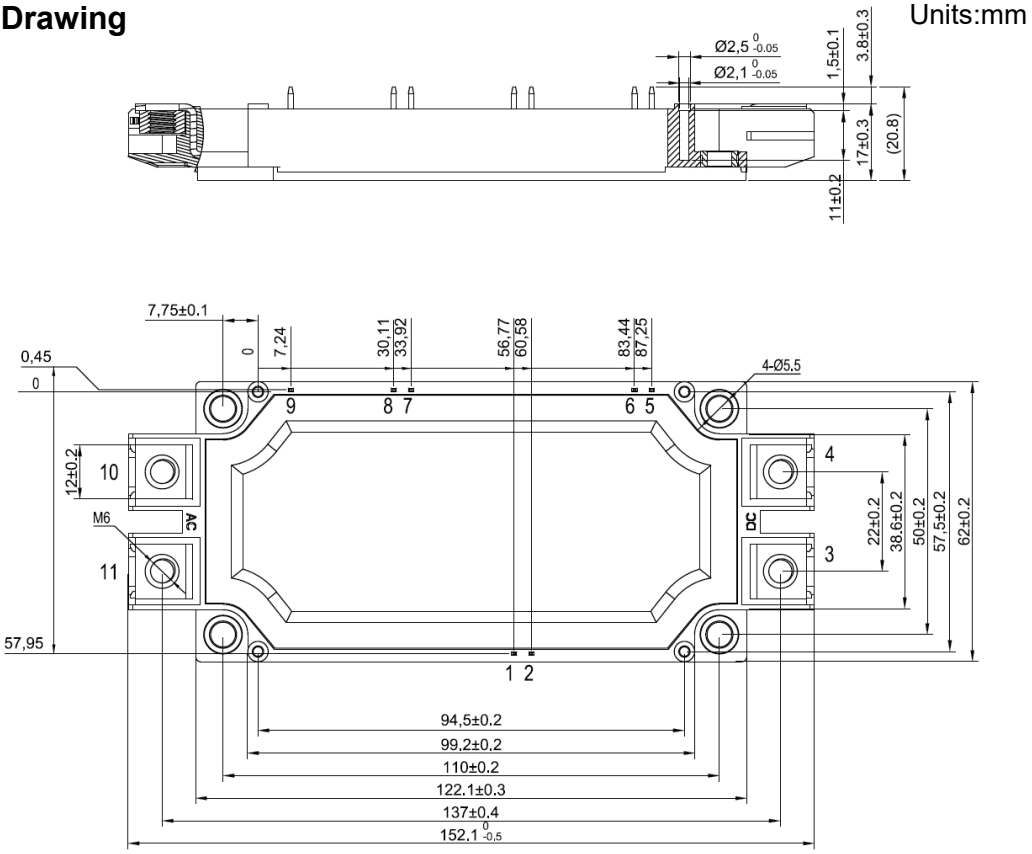
Fig.12 Transient Thermal Impedance Diode
$Z_{th(J-C)}$ vs t

Circuit Diagram



Outline Drawing

Units:mm



Revision History

Version	Date	Description
v1.0	2022-01-22	Preliminary Version
v2.0	2022-06-16	Formal Version