

**MCF450N170L2E3**

V_{CE}	I_c nom
1700V	450A

E3**DESCRIPTION**

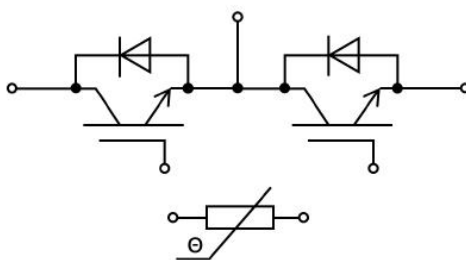
The MCF450N170L2E3 module with JSCJ advanced Trench and FS (Field Stop) IGBT provide very low Collector-Emitter Saturation Voltage, easy to use in drives and inverters.

Features

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

Application

- Wind Converters
- Motor Drives
- Static Var Generator

EQUIVALENT CIRCUIT

Order Code	Package	Marking	Parking
MCF450N170L2E3	E3	450N170	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, T _c =100°C	450	A
I _{CM}	Peak Collector Current, t _p =1ms	900	A
I _F	Continuous Diode Forward Current	450	A
I _{FRM}	Diode Peak Forward Current, t _p =1ms	900	A
P _D	IGBT Maximum Power Dissipation	2500	W
t _{sc}	IGBT Short Circuit Withstand Time	10	μs
T _{VJ MAX}	Maximum Junction Temperature	175	°C
T _{VJ}	Operating Junction Temperature	-40 to 150	°C
T _{STG}	Storage Temperature	-40 to 125	°C
T _L	Maximum lead temperature for soldering	260	°C

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

Parameter	Symbol	Condition		Value			Unit
				Min	Typ.	Max	
Collector-Emitter Saturation Voltage	V _{CE(sat)}	I _C =450A, V _{GE} =15V	T _{vj} =25°C		1.80	2.20	V
			T _{vj} =125°C		2.20		V
			T _{vj} =150°C		2.30		V
Gate-Emitter Threshold Voltage	V _{GE(th)}	I _C =18mA, V _{CE} =V _{GE}		5.2	5.8	6.4	V
Collector-Emitter Cut-off Current	I _{CES}	V _{CE} =1700V, V _{GE} =0V				3	mA
Gate-Emitter Leakage Current	I _{GES}	V _{CE} =0V, V _{GE} =±20V		-400		400	nA
Internal Gate Resistance	R _{Gint}	T _{vj} =25°C			1.57		Ω
Gate Charge	Q _G	V _{GE} =-15V~+15V			5.2		μC
Input Capacitance	C _{ies}	V _{CE} =25V, V _{GE} =0V, f=1MHz			60.0		nF
Reverse Transfer Capacitance	C _{res}				0.7		nF
Turn-on Delay Time	t _{d(on)}	I _C =450A V _{CE} =900V V _{GE} =±15V R _{Gon} =3.3Ω R _{Goff} =3.3Ω Inductive Load	T _{vj} =25°C		260		ns
			T _{vj} =125°C		280		ns
			T _{vj} =150°C		280		ns
Rise Time	t _r		T _{vj} =25°C		140		ns
			T _{vj} =125°C		160		ns
			T _{vj} =150°C		160		ns
Turn-off Delay Time	t _{d(off)}		T _{vj} =25°C		640		ns
			T _{vj} =125°C		700		ns
			T _{vj} =150°C		715		ns

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Fall Time	t_f	$I_C=450A$ $V_{CE}=900V$ $V_{GE}=\pm 15V$ $R_{Gon}=3.3\Omega$ $R_{Goff}=3.3\Omega$ Inductive Load	$T_{vj}=25^{\circ}C$		405		ns
			$T_{vj}=125^{\circ}C$		590		ns
			$T_{vj}=150^{\circ}C$		595		ns
Turn-on Energy Loss	E_{on}		$T_{vj}=25^{\circ}C$		75		mJ
			$T_{vj}=125^{\circ}C$		110		mJ
			$T_{vj}=150^{\circ}C$		130		mJ
Turn-off Energy Loss	E_{off}		$T_{vj}=25^{\circ}C$		105		mJ
			$T_{vj}=125^{\circ}C$		130		mJ
			$T_{vj}=150^{\circ}C$		140		mJ
Short Circuit Current	I_{SC}	$V_{GE}\leq 15V, t_p\leq 10\mu s,$ $V_{CC}=1000V, T_{vj}=150^{\circ}C$ $V_{CE,max}=V_{CES}-L_s, CE \times di/dt$			2300		A

Diode Electrical Characteristics

Parameter	Symbol	Condition		Value			Unit
				Min	Typ.	Max	
Forward Voltage	V _F	IF=450A,	T _{vj} =25°C		2.00	2.4	V
			T _{vj} =125°C		2.20		V
			T _{vj} =150°C		2.20		V
Reverse Recovery Current	I _{rr}	IF=450A, VR=900V, VGE=-15V diF/dt=-2800A/μs	T _{vj} =25°C		245		A
			T _{vj} =125°C		265		A
			T _{vj} =150°C		280		A
Reverse Recovery Charge	Q _{rr}		T _{vj} =25°C		60		μC
			T _{vj} =125°C		100		μC
			T _{vj} =150°C		120		μC
Reverse Recovery Energy Loss	E _{rec}		T _{vj} =25°C		40		mJ
			T _{vj} =125°C		60		mJ
			T _{vj} =150°C		70		mJ

NTC-Thermistor

Parameter	Symbol	Condition	Min	Typ.	Max	Unit
Rated resistance	R_{25}	$T_C=25^{\circ}C$		5.00		K Ω
Power dissipation	P_{25}				10	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298,15K))]$		3380		K

Package Properties

Parameter	Symbol	Condition	Value			Unit
			Min	Typ.	Max	
IGBT Thermal Resistance: Junction to Case	$R_{th(J-C)}$	per IGBT			0.060	K/W
Diode Thermal Resistance: Junction to Case	$R_{th(J-C)}$	per Diode			0.100	K/W
IGBT Thermal Resistance: Case to Heatsink	$R_{th(C-H)}$	per IGBT $\lambda_{grease}=1W/(m \cdot K)$		0.029		K/W
Diode Thermal Resistance: Case to Heatsink	$R_{th(C-H)}$	per Diode $\lambda_{grease}=1W/(m \cdot K)$		0.048		K/W
Isolation Voltage	V_{isol}	RMS, f=50Hz, t=60s	3.4			kV
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, $T_C=25^{\circ}C$		1.1		mΩ
Mounting Torques	M	Baseplate to Heatsink, M5	3.0		6.0	Nm
		Power Terminal, M6	3.0		6.0	Nm
Module Weight	G			345		g

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

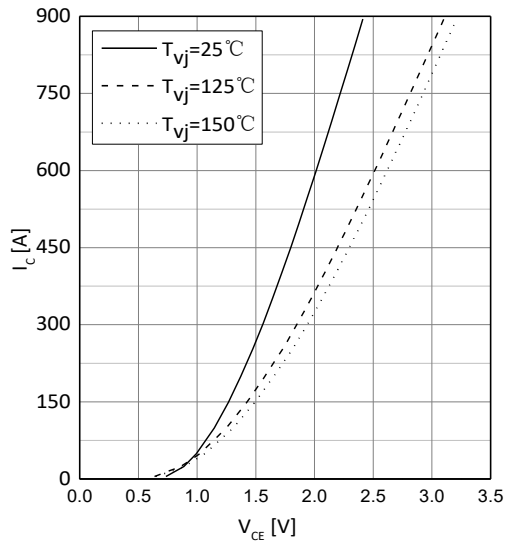


Fig.1 IGBT Output Characteristic
 I_C vs V_{CE} , $V_{GE}=15V$

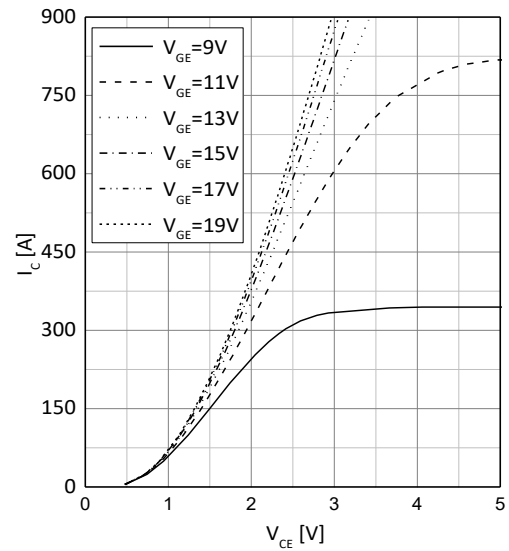


Fig.2 IGBT Output Characteristic
 I_C vs V_{CE} , $T_{vj}=150^\circ C$

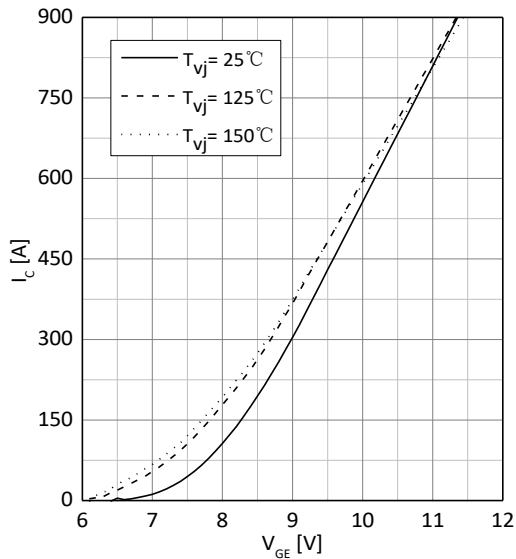


Fig.3 IGBT Transfer Characteristic
 I_C vs V_{GE} , $V_{CE}=20V$

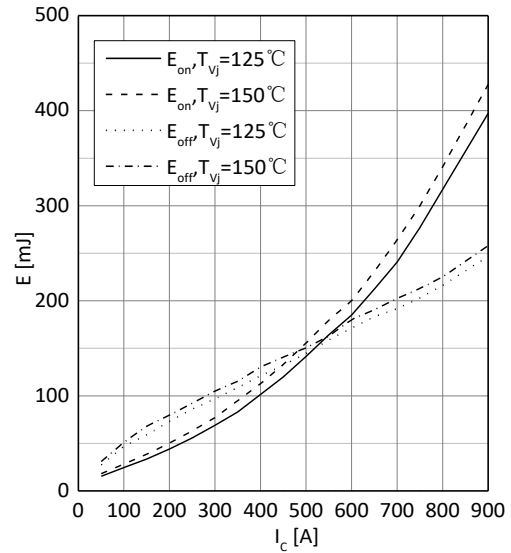


Fig.4 IGBT Switching Energy Loss
 E vs I_C , $V_{GE}=\pm 15V$, $R_{Gon}=R_{Goff}=3.3\Omega$, $V_{CE}=900V$

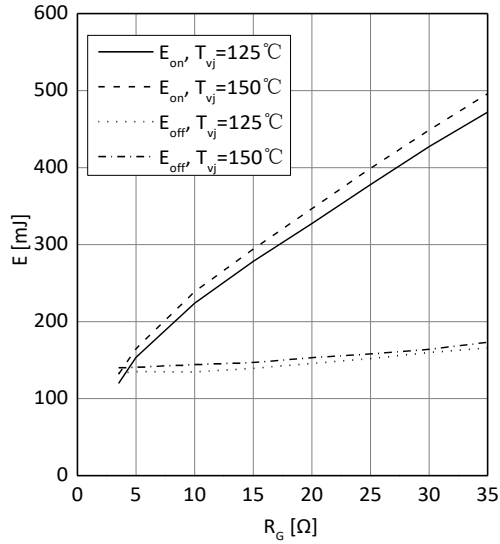


Fig.5 IGBT Switching Energy Loss
E_{on}, E_{off} vs R_G, I_C=450A, V_{CE}=900V, V_{GE}=±15V

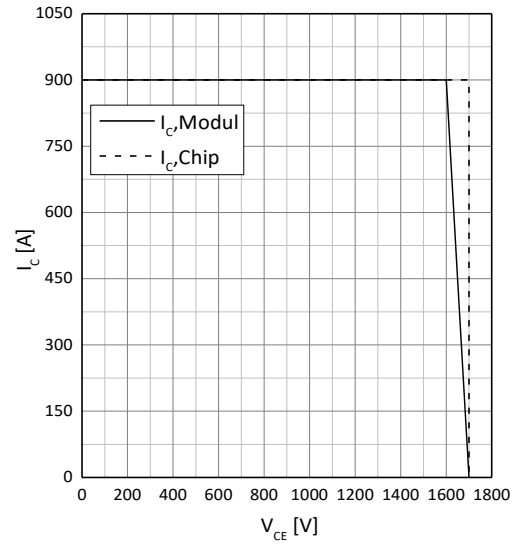


Fig.6 Reverse bias safe operating area IGBT
V_{GE}=±15V, R_{Goff}=3.3Ω, T_{vj}=150°C

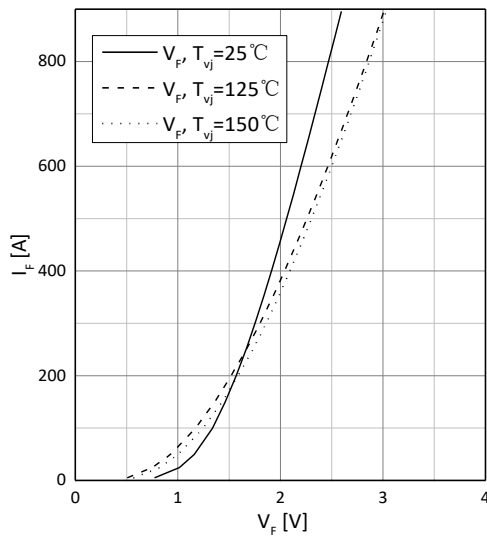


Fig.7 Forward characteristic Diode
I_F vs V_F

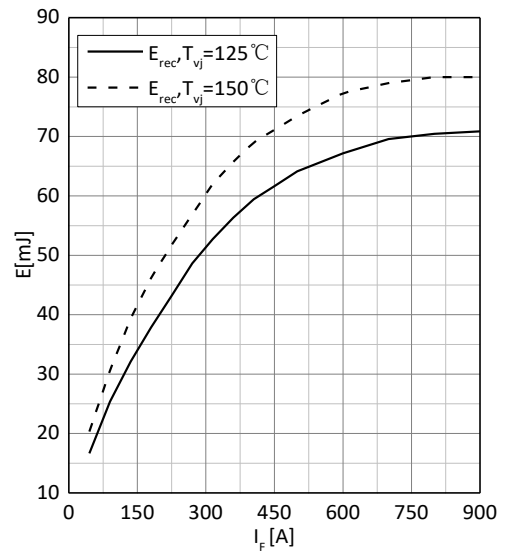


Fig.8 Switching losses Diode
E_{rec} vs I_F, R_{Gon}=3.3Ω, V_{CE}=900V

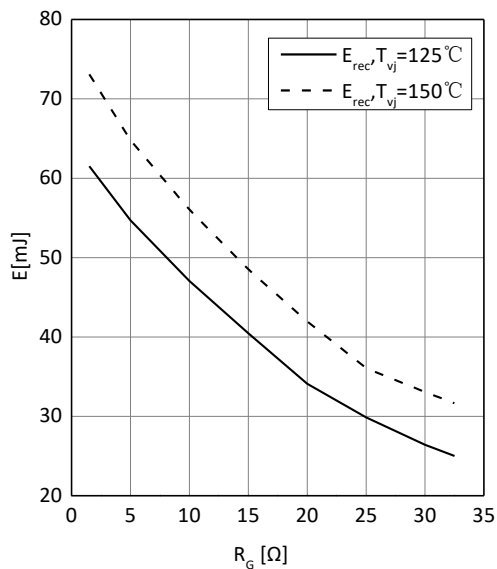


Fig.9 Switching losses Diode
 E_{rec} vs R_G , $V_{CE}=900V$

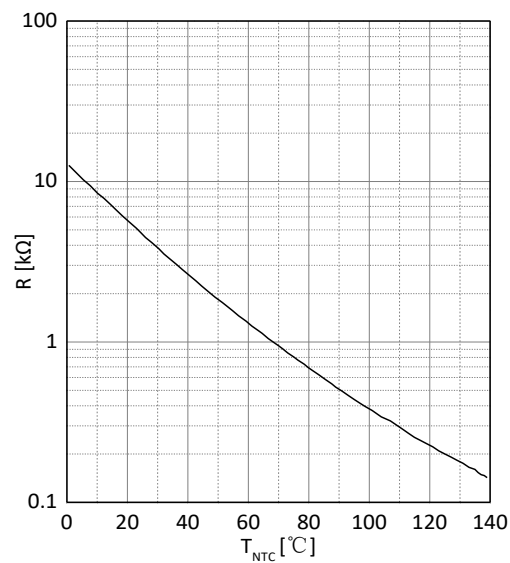


Fig.10 NTC temperature characteristic (typical)
 R vs T_{NTC}

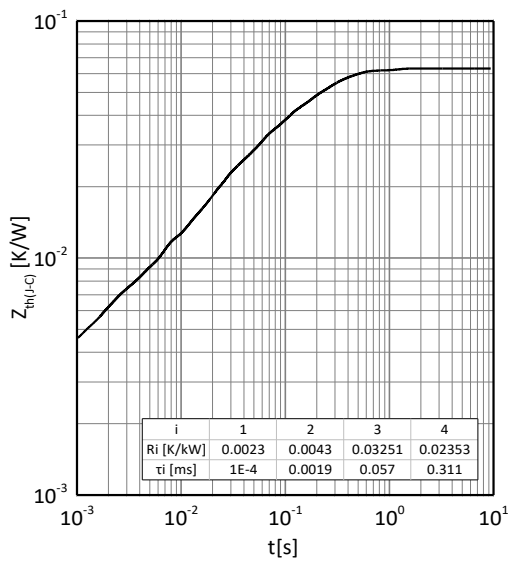


Fig.11 Transient thermal impedance IGBT
 $Z_{th(J-C)}$ vs t

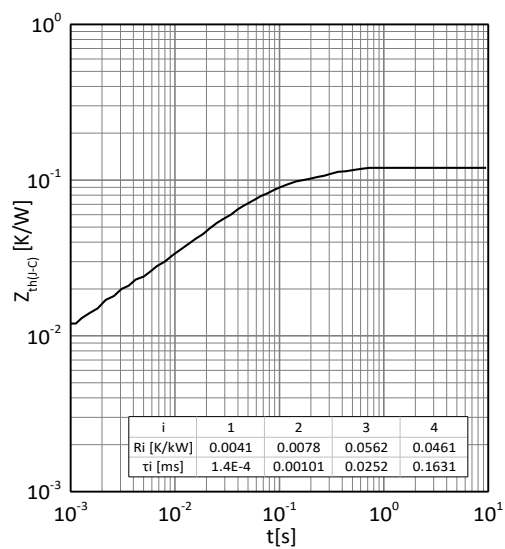
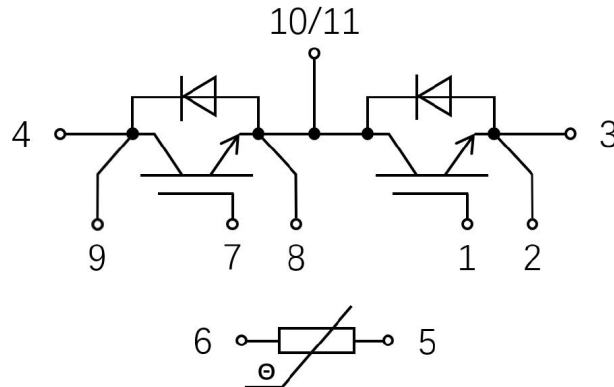


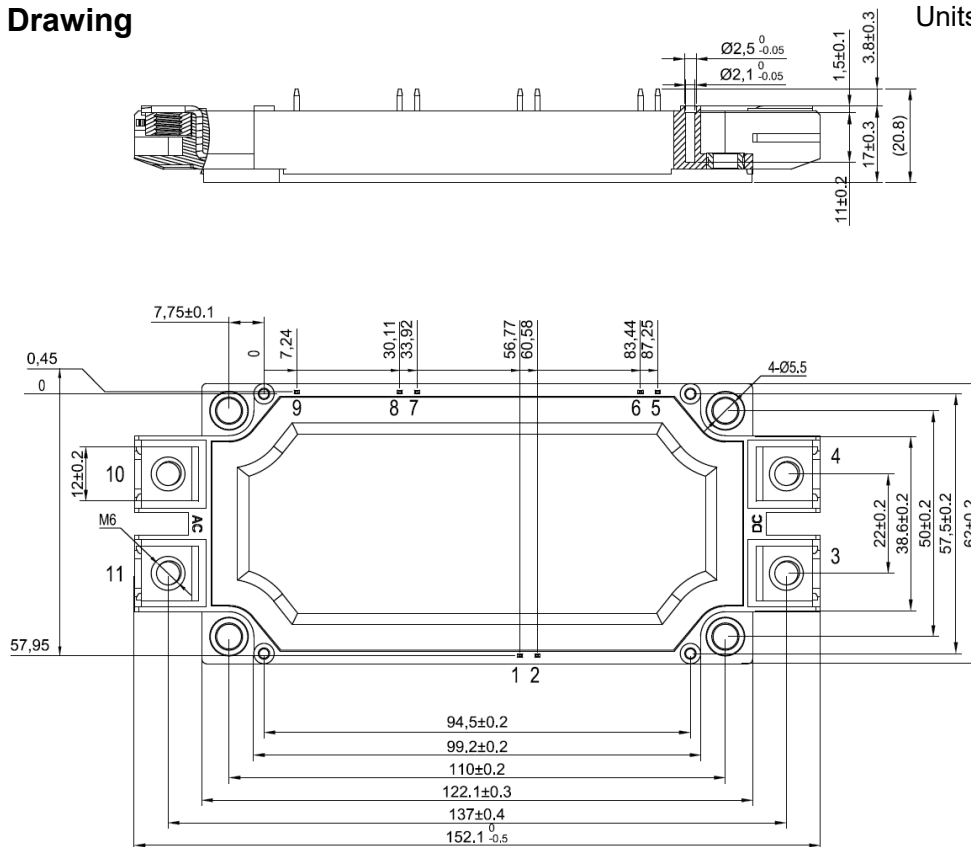
Fig.12 Transient thermal impedance Diode
 $Z_{th(J-C)}$ vs t

Circuit Diagram



Outline Drawing

Units:mm



Revision History

Version	Date	Description
v1.0	2022-04-30	Preliminary Version
v2.0	2022-06-18	Formal Version