

1200V, 50A, IGBT Module

General Description

Using NCE's proprietary trench design and advanced FS (Field Stop) generation technology, the 1200V IGBT Module offers superior conduction and switching performances, and easy parallel operation.

Electrical Features

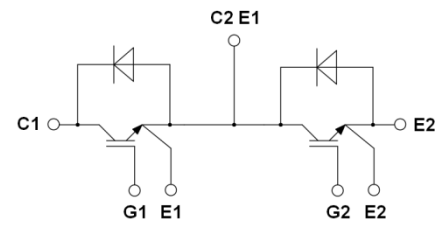
- Trench FS Technology Offering
- Very low $V_{CE(sat)}$
- High speed switching
- Positive temperature coefficient in $V_{CE(sat)}$
- Very tight parameter distribution
- High ruggedness, temperature stable behavior

Mechanical Features

- Isolated BasePlate
- Al_2O_3 Basic Insulation

Typical Applications

- Welding



Schematic diagram



Absolute Maximum Ratings ($T_c=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate- Emitter Voltage	± 30	V
I_C	Collector Current @ $T_c = 25^\circ C$	100	A
	Collector Current @ $T_c = 100^\circ C$	50	A
I_{CRM}	Peak Collector Current@ $t_p=1ms$	100	A
-	turn off safe operating area, $V_{CE}=1200V$, $T_j=150^\circ C$	150	A
I_F	Diode Continuous Forward Current @ $T_c = 100^\circ C$	25	A
I_{FM}	Diode Maximum Forward Current	75	A
P_D	Power Dissipation @ $T_c = 25^\circ C$	535	W
	Power Dissipation @ $T_c = 100^\circ C$	268	W
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55 to +175	$^\circ C$
T_L	Maximum Temperature for Soldering	260	$^\circ C$

IGBT Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
Static Characteristics						
V _{(BR)CES}	Collector-Emitter Breakdown Voltage	V _{GE} =0V, I _{CE} =1mA	1200	--	--	V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =1200V	--	--	0.10	mA
I _{GES(F)}	Gate to Emitter Forward Leakage	V _{GE} =+20V, V _{CE} =0V	--	--	100	nA
I _{GES(R)}	Gate to Source Reverse Leakage	V _{GE} =-20V, V _{CE} =0V	--	--	100	nA
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =50A, T _J =25°C	--	2.0	2.4	V
		V _{GE} =15V, T _J =150°C	--	2.4	--	V
V _{GE(th)}	Gate Threshold Voltage	I _C =1mA, V _{CE} =V _{GE}	5.0	--	6.5	V
Dynamic Characteristics						
C _{ies}	Input Capacitance	V _{CE} =30V, V _{GE} =0V, f=1MHz	--	8789	--	pF
C _{oes}	Output Capacitance		--	214	--	
C _{res}	Reverse Transfer Capacitance		--	161	--	
Q _g	Total Gate Charge	V _{CC} =960V, I _C =50A, V _{GE} =15V	--	294	--	nC
Q _{ge}	Gate to Emitter Charge		--	61	--	
Q _{gc}	Gate to Collector Charge		--	127	--	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time	V _{CE} =600V, I _C =50A, V _{GE} =0/15V, R _g =8Ω Inductive Load	--	19	--	ns
t _r	Rise Time		--	17	--	
t _{d(OFF)}	Turn-Off Delay Time		--	170	--	
t _f	Fall Time		--	18	--	
E _{on}	Turn-On Switching Loss		--	2.5	--	mJ
E _{off}	Turn-Off Switching Loss		--	1.6	--	
E _{ts}	Total Switching Loss	--	4.1	--		

Diode Characteristics (T_C= 25°C unless otherwise specified):

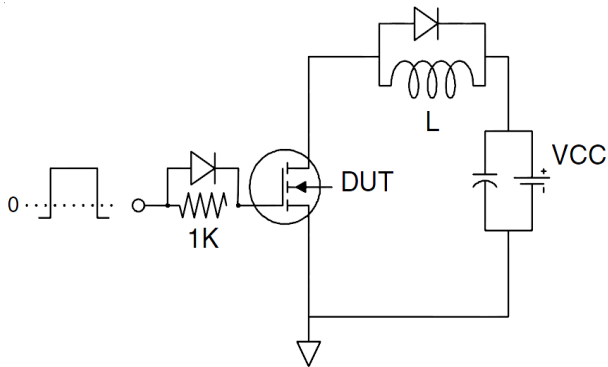
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V _{FM}	Diode Forward Voltage	I _F =25A	--	2.1	2.8	V
T _{rr}	Reverse Recovery Time	I _F =25A, di/dt=500A/us	--	180	--	ns
I _{RRM}	Diode Peak Reverse Recovery Current		--	10	--	A
Q _{rr}	Reverse Recovery Charge		--	2.4	--	uC
Pulse width t _{tp} ≤380μs, δ≤2%						

Module Characteristics (T_c=25°C unless otherwise noted)

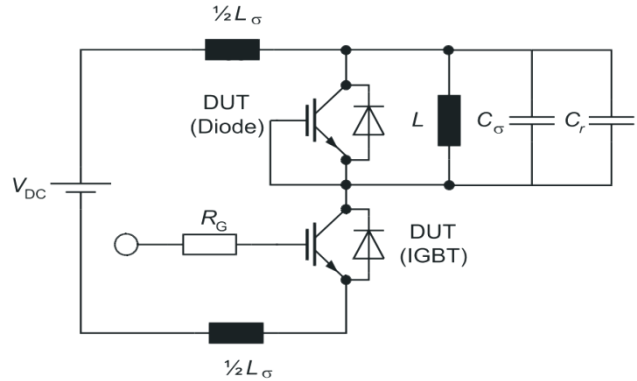
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V _{isol}	Isolation Voltage	f=50Hz, t=1min	2500	--	--	V
	Material of Module Baseplate		Cu			
T _{jmax}	Maximum Junction Temperature		--	--	150	°C
T _{vj op}	Operating Junction Temperature		-40	--	125	°C
T _{stg}	Storage Temperature		-40	--	125	°C
L _{SCE}	Stray-inductance-module		--	30	--	nH
R _{CC'+EE'}	Module lead resistance	T _c =25°C, per switch	--	0.75	--	mΩ
R _{θJC}	Junction to case	pro IGBT/per IGBT	--	0.28	--	K/W
R _{θJC}	Junction to case	pro Diode/per Diode	--	0.61	--	K/W
R _{θCS}	Case to Sink	Conductive grease applied	--	0.05	--	K/W
M _t	Module Electrodes Torque	Recommended(M5)	2.5	--	5.0	Nm
M _s	Module-to-Sink Torque	Recommended(M6)	3.0	--	5.0	Nm
G	Weight of Module		--	150	--	g

Test Circuit

1) Gate Charge Test Circuit

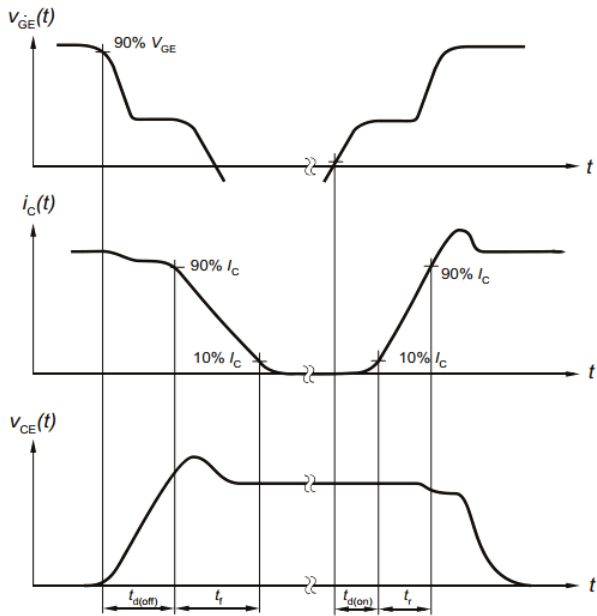


2) Switch Time Test Circuit

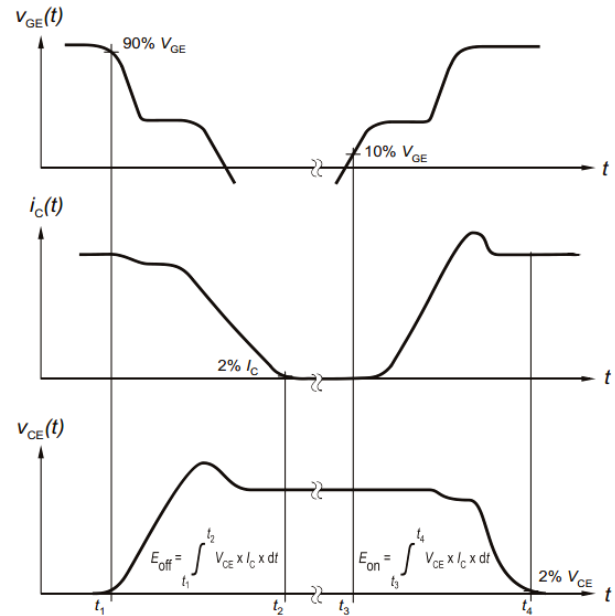


Switching characteristics

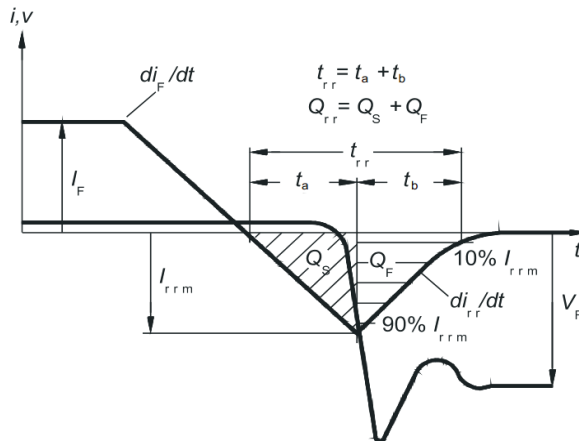
1) Definition of switching times



2) Definition of switching losses



3) Definition of diode switching characteristics



Typical Electrical and Thermal Characteristics

Figure 1 Output Characteristics

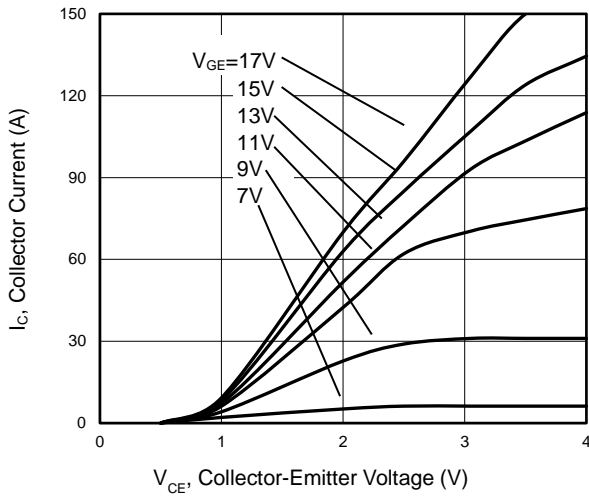


Figure 2 Transfer Characteristics

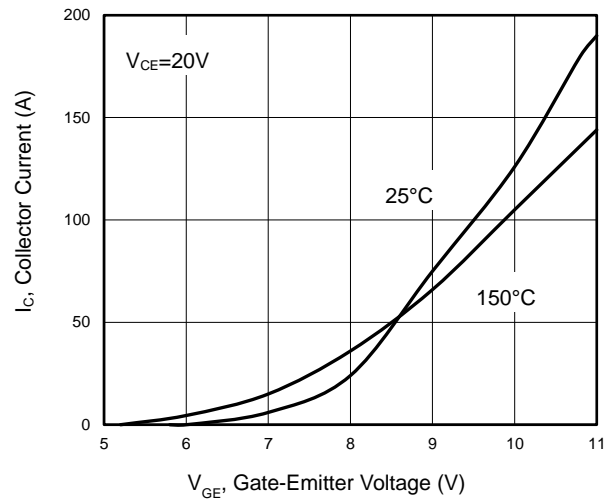


Figure 3 $V_{CE(sat)}$ vs. Case Temperature

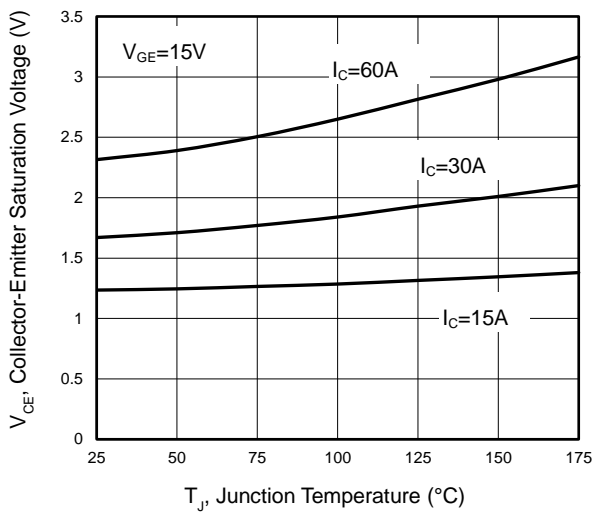


Figure 4 Saturation Voltage vs. V_{GE}

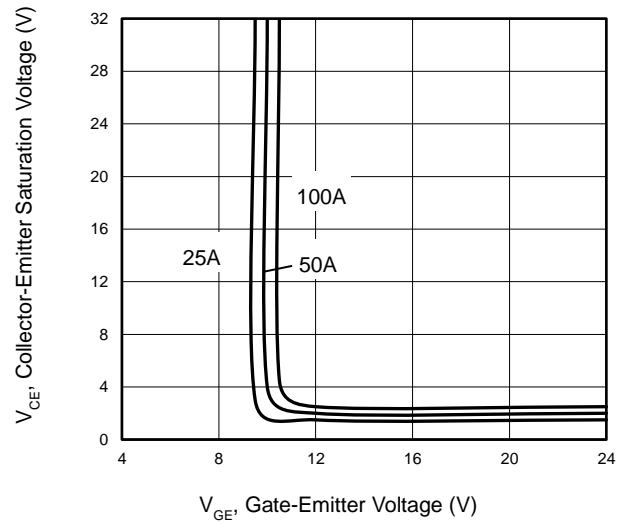


Figure 5 Forward Characteristics

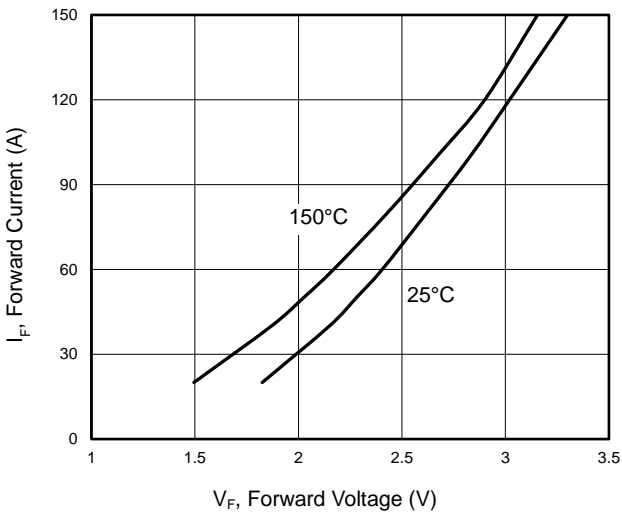
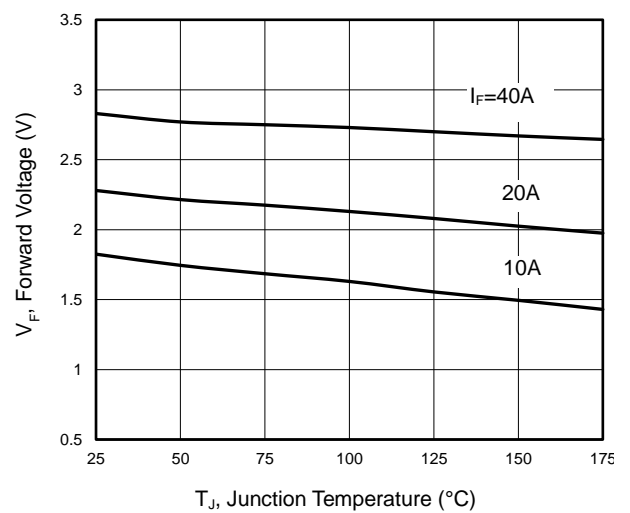


Figure 6 V_F vs. Temperature



Typical Electrical and Thermal Characteristics

Figure 7 Gate-emitter Threshold Voltage as a Function of Junction Temperature

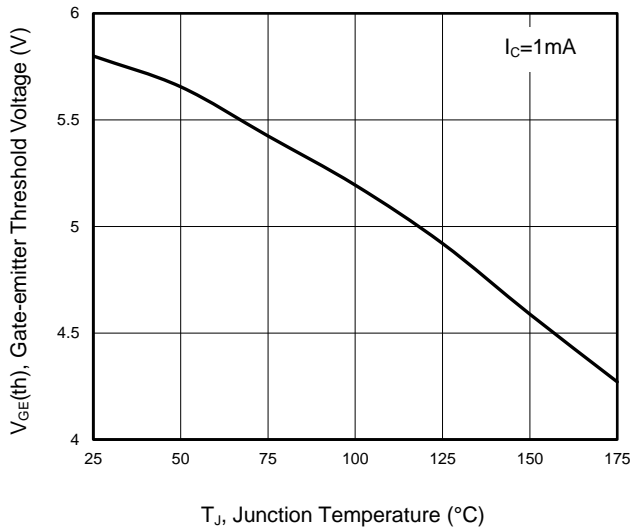
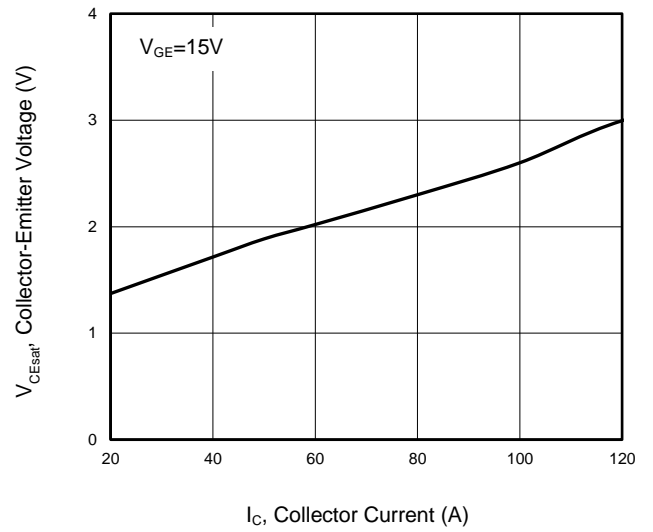
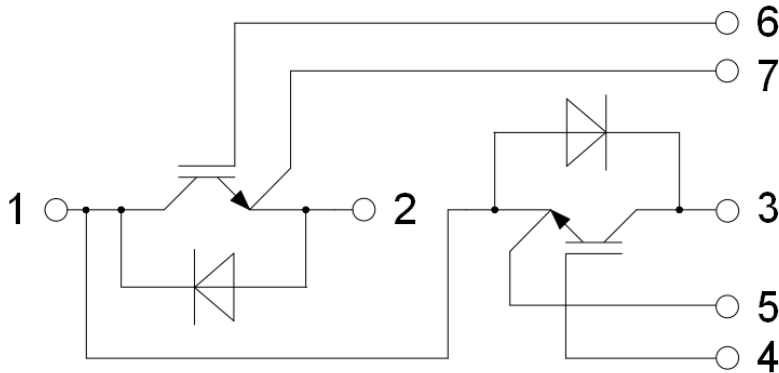


Figure 8 Typical Collector-emitter Saturation Voltage as a function of Collector Current

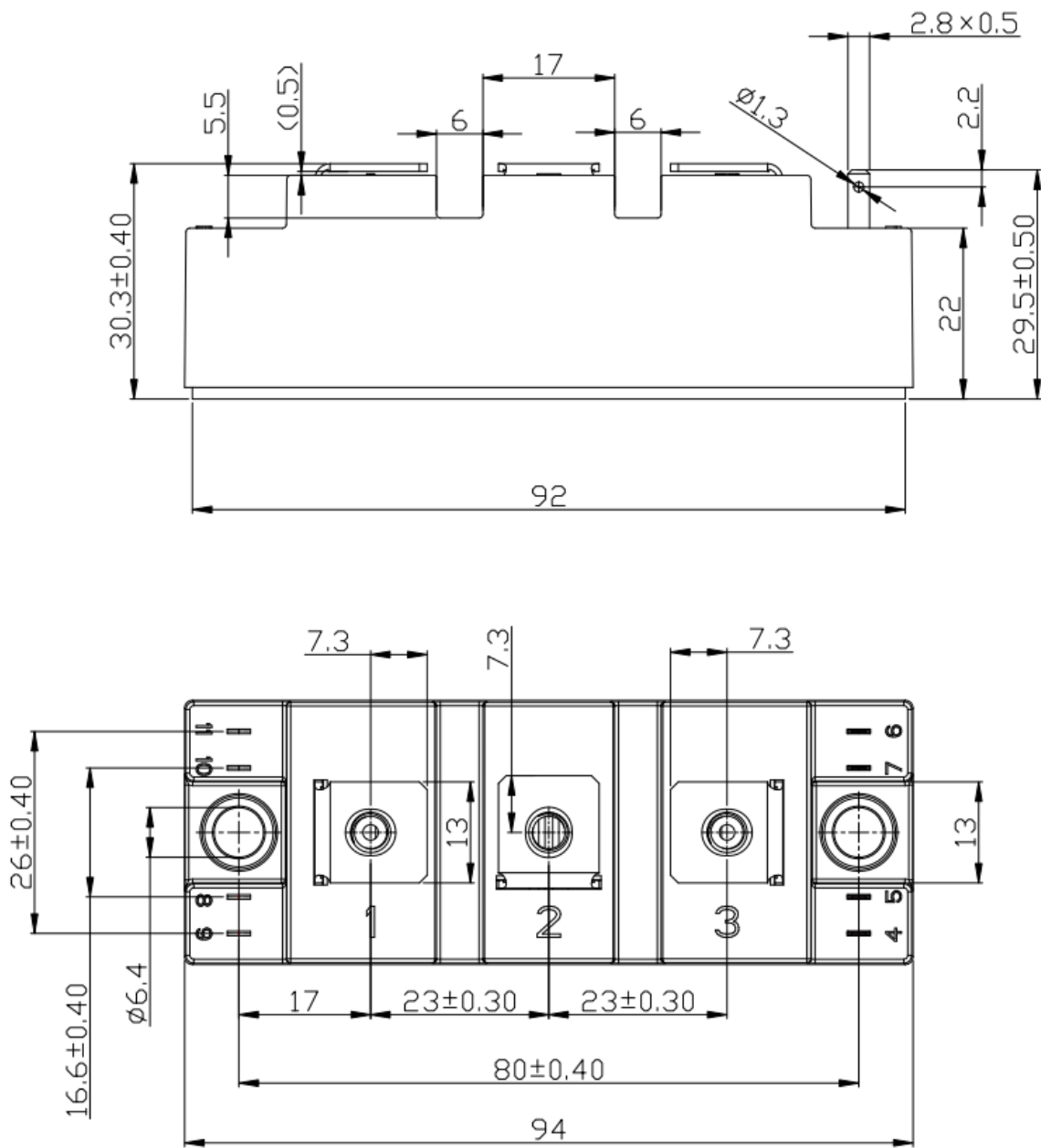


Circuit Diagram



Package Dimensions

Dimensions in Millimeters



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