FUJI ELECTRIC

Econo-Diode modules

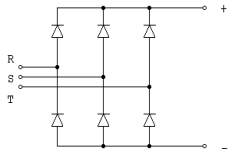
Sep 2002

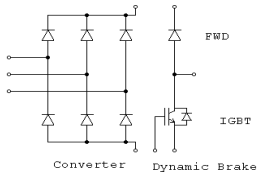
Fuji Electric Co.,Ltd

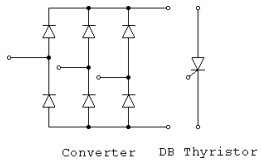
1.Features

1) Same terminal height as Pc-Pack and Econo IPM (17mm)
2) Compact and Light-weight package
   -Area size : 40% Down
   -DBC substrate
3) Sodering terminals for PC-board assembly
4) 2 products Line up
   - Diode module and Diode module with Brake -

2.Econo diode modules

Equivalent circuit	Type name	Device Rating				Note
		Conv. Part		Brake part		
		VRRM	Io	VCES	IC	
	6Ri50P-080*	800V	50A	-	-	Under development
	6Ri75P-080*	800V	75A	-	-	*E-Sample 'Sep-01
	6Ri100P-080*	800V	100A	-	-	Mass production
	6Ri50P-160*	1600V	50A	-	-	'Nov-02
	6Ri75P-160	1600V	75A	-	-	Mass production
	6Ri100P-160	1600V	100A	-	-	

Equivalent circuit	Type name	Device Rating				Note
		Conv. Part		Brake(IGBT) part		
		VRRM	Io	VCES	IC	
	6R1MBi50P-080*	800V	50A	600V	30A	Under development
	6R1MBi75P-080*	800V	75A	600V	50A	*E-Sample 'Sep-01
	6R1MBi100P-080	800V	100A	600V	50A	Mass production
	6R1MBi50P-160*	1600V	50A	1400V	25A	'Nov-02
	6R1MBi75P-160*	1600V	75A	1400V	35A	Mass production
	6R1MBi100P-160*	1600V	100A	1400V	50A	'Oct-02

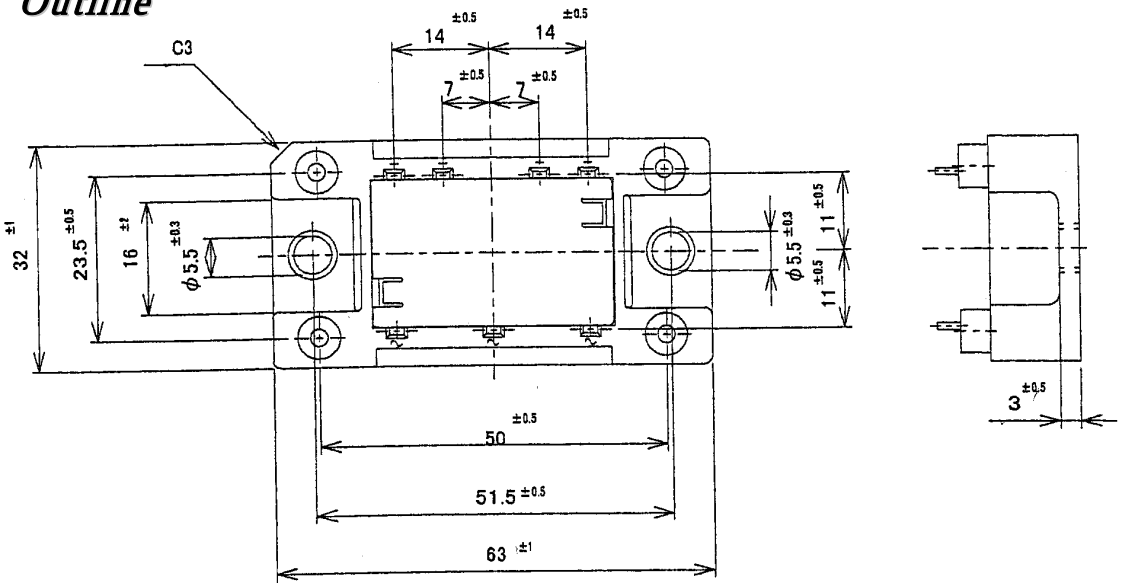
Equivalent circuit	Type name	Device Rating				Note
		Conv. Part		Brake(Thy) part		
		VRRM	Io	VRRM	IT	
	6R1Ti30P-080*	800V	30A	600V	20A	Under development
						*E-Sample 'Sep-01
						Mass production
						'Dec-02

Quality is our message

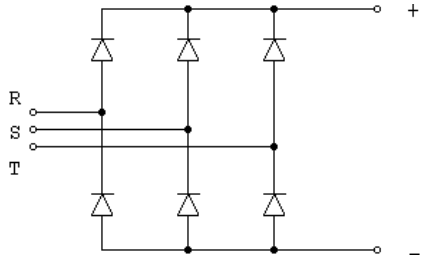
3-1.Out view and eqivalent circuit(Diode Module)

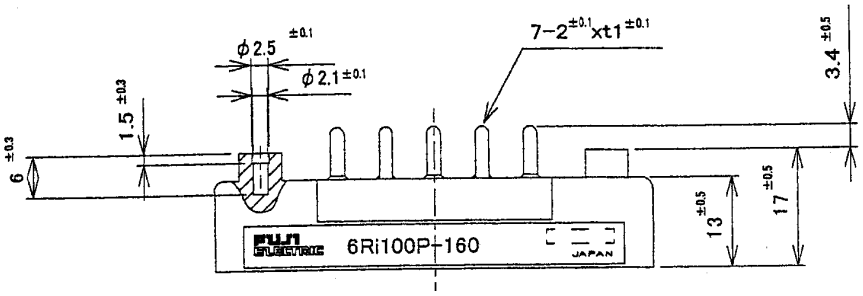
Out view

Outline



Equivalent circuit





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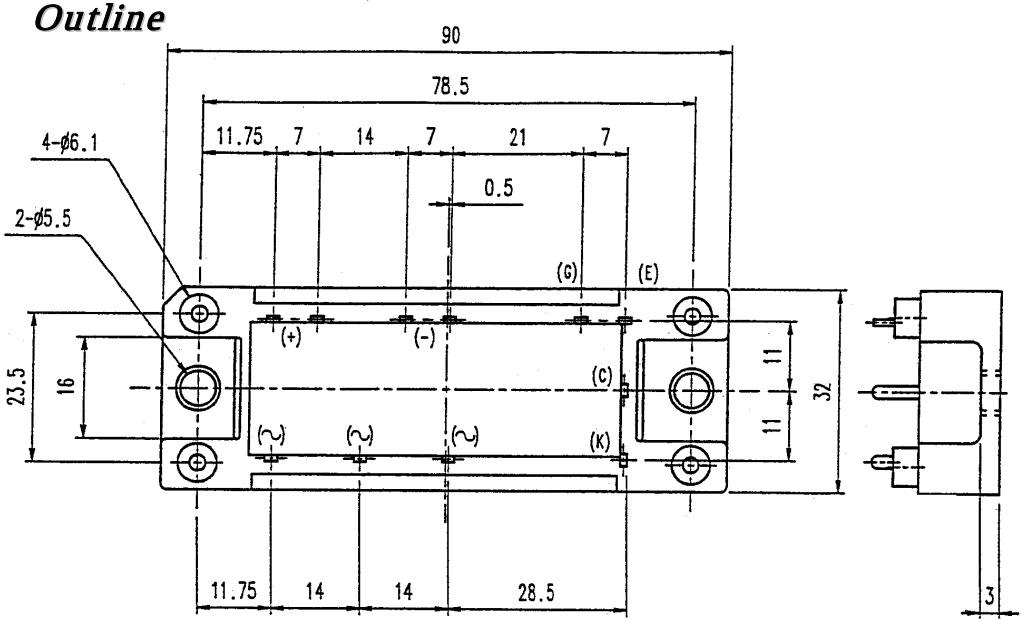
3-2. Diode Module with Brake(IGBT)

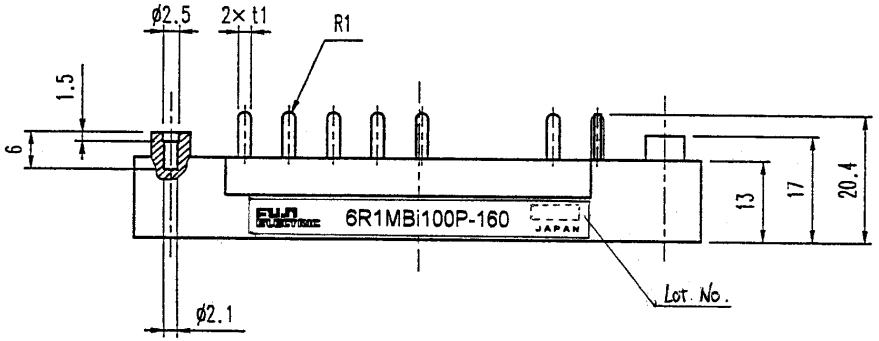
Out view

Dynamic Brake Part

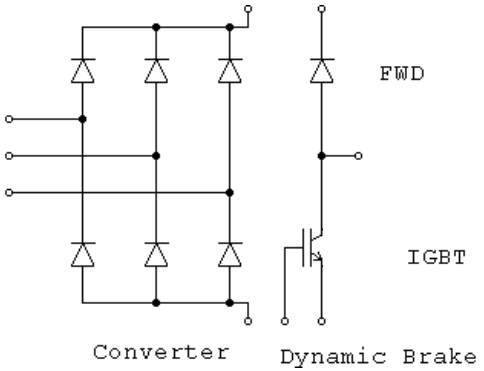
Converter Part

Outline





Equivalent circuit



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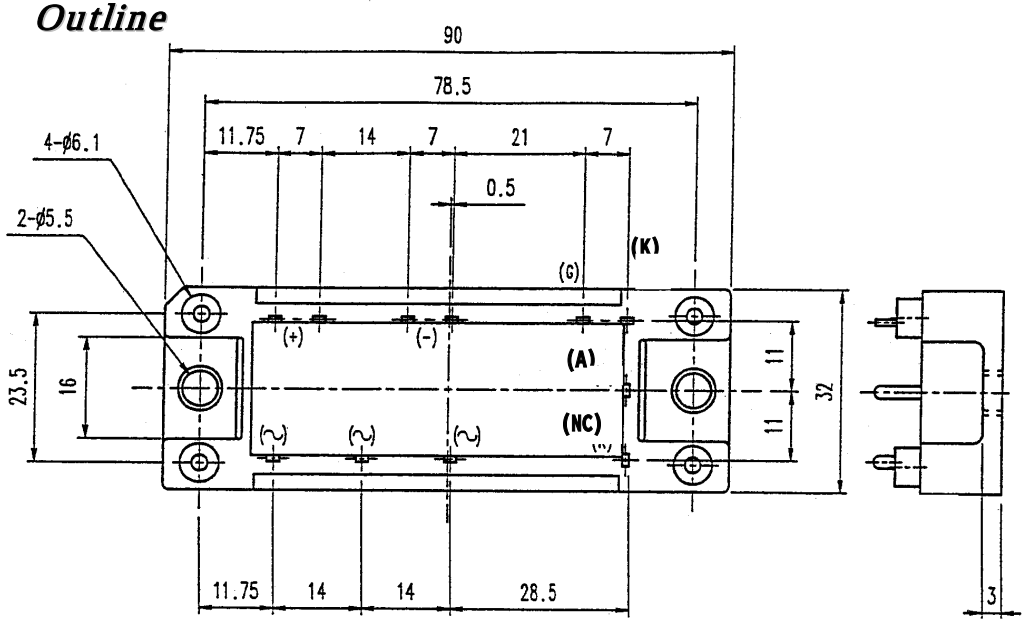
3-3 Diode Module with Brake(Thy)

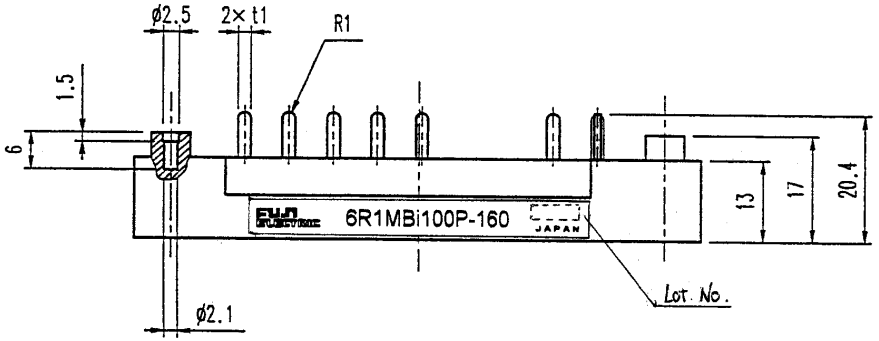
Out view

Dynamic Brake Part

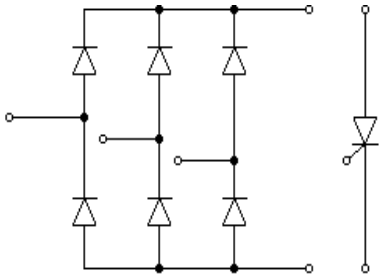
Converter Part

Outline





Equivalent circuit



Converter DB Thyristor

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4.Detail specifications

4.1 Diode module

VRRM=800Vseries

Item	Symbol	Conditions	6Ri50P-080	6Ri75P-080	6Ri100P-080	Unit
Voltage Ratings	V_{RRM}			800		V
	V_{RSM}			880		V
Current Ratings	Io		50 (Tc=109deg)	75 (Tc=94deg)	100 (Tc=110deg)	A
	I_{FSM}	From rated load	480	600	1000	A
	I^2t		920	1440	4000	A^2s
Temperature Ratings	Tj			-40~+150		deg
	Tstg			-40~+125		deg
Isolation voltage	Viso			AC3000V/1min		
Mounting screw torque				2.0~2.5		Nm
Forward voltage	V_{FM}	Tj=25deg, I_{FM}=Io	1.20	1.25	1.25	V
Reverse current	I_{RRM}	Tj=150deg,V_R=V_{RRM}	5.0	10.0	10.0	mA
Thetmal resistance	$Rth_{(j-c)}$	Per total loss	0.30	0.25	0.16	K/W
Thermal resistance(Case to Fin)	$Rth_{(c-f)}$	With thermal compound	0.08	0.08	0.08	K/W

VRRM=1600Vseries

Item	Symbol	Conditions	6Ri50P-160	6Ri75P-160	6Ri100P-160	Unit
Voltage Ratings	V_{RRM}			1600		V
	V_{RSM}			1760		V
Current Ratings	Io		50 (Tc=97deg)	75 (Tc=115deg)	100 (Tc=110deg)	A
	I_{FSM}	From rated load	320	600	1000	A
	I^2t		400	1440	4000	A^2s
Temperature Ratings	Tj			-40~+150		deg
	Tstg			-40~+125		deg
Isolation voltage	Viso			AC3000V/1min		
Mounting screw torque				2.0~2.5		Nm
Forward voltage	V_{FM}	Tj=25deg, I_{FM}=Io	1.50	1.35	1.30	V
Reverse current	I_{RRM}	Tj=150deg,V_R=V_{RRM}	10.0	10.0	20.0	mA
Thetmal resistance	$Rth_{(j-c)}$	Per total loss	0.30	0.16	0.14	K/W
Thermal resistance(Case to Fin)	$Rth_{(c-f)}$	With thermal compound	0.08	0.08	0.08	K/W

4.2 Diode Module with Brake

VRRM=800V series

Item		Symbol	Conditions	6R1MBi50P -080	6R1MBi75P -080	6R1MBi100P -080	Unit
Voltage Ratings	Conv.	V_{RRM}		800			V
		V_{RSM}		880			V
	Brake.	V_{CES}		600			V
		V_{GES}		+20/-20			V
		V_{RRM}		600			V
Current Ratings	Conv.	Io	50/60Hz	50 (Tc=109deg)	75 (Tc=94deg)	100 (Tc=110deg)	A
		I_{FSM}	From rated	480	600	1000	A
		I^2t	load	920	1440	4000	A^2s
	Brake.	Ic	DC	30	50	50	A
		Icp	1ms	60	100	100	A
Dissipation Ratings		Pc		96	140	140	W
Temp Ratings	Conv.	Tj		-40~+150			deg
		Tstg		-40~+125			deg
	Brake.	Tj		-40~+125			deg
		Tstg		-40~+125			deg
Isolation voltage		Viso		AC3000V/1min			
Mounting screw torque				2.0~2.5			Nm
Forward Voltage		V_{FM}	I_{FM}=Io	1.20	1.25	1.25	V
Reverse current		I_{RRM}	Tj=150deg $V_R=V_{RRM}$	5	10	10	mA
Zero gare voltage Collector current		I_{CES}	V_{GE}=0V $V_{CE}=V_{CES}$	1.0	1.0	1.0	mA
Gate-Emitter leakage current		I_{GES}	V_{CE}=0V V_{GE}=+15/-15V	200	200	200	nA
Collector-Emitter saturation voltage		$V_{CE(sat)}$	V_{GE}=+15V	2.40 (Ic=30A)	2.40 (Ic=50A)	2.40 (Ic=50A)	V
Turn-on time		ton	Vcc=300V	1.20	1.20	1.20	us
		tr	+V_{GE}=15V	0.60	0.60	0.60	
Turn-off time		toff	-V_{GE}=15V	1.00	1.00	1.00	
		tf		0.35	0.35	0.35	
Thermal resistance	Conv.	$Rth_{(j-c)}$	Per total loss	0.3	0.25	0.16	K/W
	Brake.		Brake IGBT (1 device)	1.30	0.90	0.90	K/W
Thermal resistance (Case to Fin)		$Rth_{(c-f)}$	With thermal compound	0.08	0.08	0.08	K/W

VRRM=1600V series

Item		Symbol	Conditions	6R1MBi50P -160	6R1MBi75P -160	6R1MBi100P -160	Unit
Voltage Ratings	Conv.	V_{RRM}		1600			V
		V_{RSM}		1760			V
	Brake.	V_{CES}		1400			V
		V_{GES}		+20/-20			V
		V_{RRM}		1400			V
Current Ratings	Conv.	Io	50/60Hz	50 (Tc=97deg)	75 (Tc=115deg)	100 (Tc=110deg)	A
		I_{FSM}	From rated	320	600	1000	A
		I^2t	load	400	1440	4000	A^2s
	Brake.	Ic	DC	25	35(Tc=75deg)	50(Tc=75deg)	A
		Icp	1ms	50	70(Tc=75deg)	100(Tc=75deg	A
Dissipation Ratings		Pc		126	180	230	W
Temp Ratings	Conv.	Tj		-40~+150			deg
		Tstg		-40~+125			deg
	Brake.	Tj		-40~+125			deg
		Tstg		-40~+125			deg
Isolation voltage		Viso		AC3000V/1min			
Mounting screw torque				2.0~2.5			Nm
Forward Voltage		V_{FM}	I_{FM}=Io	1.50	1.35	1.3	V
Reverse current		I_{RRM}	Tj=150deg $V_R=V_{RRM}$	10	10	20	mA
Zero gare voltage Collector current		I_{CES}	V_{GE}=0V $V_{CE}=V_{CES}$	1.0	1.0	1.0	mA
Gate-Emitter leakage current		I_{GES}	V_{CE}=0V V_{GE}=+15/-15V	200	200	200	nA
Collector-Emitter saturation voltage		$V_{CE(sat)}$	V_{GE}=+15V	2.75 (Ic=25A)	2.75 (Ic=35A)	2.60 (Ic=50A)	V
Turn-on time		ton	Vcc=600V	1.20	1.20	1.20	us
		tr	+V_{GE}=15V	0.60	0.60	0.60	
Turn-off time		toff	-V_{GE}=15V	1.00	1.00	1.00	
		tf		0.35	0.35	0.35	
Thermal resistance	Conv.	$Rth_{(j-c)}$	Per total loss	0.30	0.16	0.15	K/W
	Brake.		Brake IGBT (1 device)	0.90	0.70	0.55	K/W
Thermal resistance (Case to Fin)		$Rth_{(c-f)}$	With thermal compound	0.08	0.08	0.08	K/W

(at Tj=25deg/Tc=25deg unless otherwise specified)

4.3 Diode Module with Brake(Thy)

VRRM=800Vseries

1.Maximum ratings.

Item			symbol	Condition	Rated Value	unit
Voltage	Conv.part	Repetitive peak reverse voltage	V_{RRM}		800	V
		Non-repetitive peak reverse voltage	V_{RSM}		880	V
	Brake(Thy) part	Repetitive peak reverse voltage	V_{RRM}		800	V
		Repetitive peak off-state voltage	V_{DRM}		800	V
		Peak gate reverse voltage	V_{RGM}		5	V
Current	Conv.part	Averege output current	Io	50/60Hz, sine wave Tc=115deg	30	A
		Surge forward current	I_{FSM}	From rated load	480	A
		I^2t	I^2t	From rated load	920	A^2s
	Brake(Thy) part	Agerage on-state current	$I_{T(AV)}$	50/60Hz,sine wave	20	A
		Surge on-state current	I_{TSM}	From rated load	270	A
		Critical rate of rise of on-state current	di/dt	Tj=125deg,f=50Hz V_D=1/2V_{DRM},I_T=60A	100	A/us
Temp.	Conv.part	Operating junction temperature	Tj		-40~+150	deg
		Storage junction temperature	Tstg		-40~+125	deg
	Brake(Thy) part	Operating junction temperature	Tj		-40~+125	deg
		Storage junction temperature	Tstg		-40~+125	deg
Isolation voltage			Viso	AC:1min	3000	V
Mounting toque					2.0~2.5	N・m

2.Electrical characteristics.

Item		symbol	Condition	min.	typ.	max.	unit
Conv.part	Forward voltage	V_{FM}	Tj=25deg,I_{FM}=30A			1.10	V
	Reverse current	I_{RRM}	Tj=150deg,V_R=V_{RRM}			3.0	mA
Brake(Thy) part	On-state voltage	V_{TM}	Tj=25deg,I_{TM}=30A			1.40	V
	Off-state current	I_{DRM}	Tj=125deg,V_D=V_{DRM}			4.0	mA
	Reverse current	I_{RRM}	Tj=125deg,VR=VRRM			4.0	mA
	Holding current	I_H	Tj=25deg			150	mA
	Gate trigger voltage	V_{GT}	Tj=25deg,			2.5	V
	Gate trigger current	I_{GT}	V_D=6V,I_T=1A			50	mA
	Gate non-trigger voltage	V_{GD}	Tj=125deg,VD=1/2VDRM	0.2			V
	Critical rate of rise of off-state voltage	dv/dt	Tj=125deg,VD=2/3VDRM	500			V/us
	Turn-on time	tgt	Tj=25deg		3		us
	turn-off time	tq	Tj=125deg		100		us

3.Thermal characteristics.

Item		symbol	Condition	min.	typ.	max.	unit
Conv.part	Thermal resistance (junction to case)	$R_{th(j-c)}$	Per total loss			0.30	K/W
	Thermal resistance (case to heat sink)	$R_{th(c-f)}$	Per total loss With compound			0.08	K/W
Brake(Thy) part	Thermal resistance (junction to case)	$R_{th(j-c)}$	Per 1chip			1.8	K/W