

GCU15AA-130

HIGH POWER INVERTER USE
PRESS PACK TYPE

GCU15AA-130



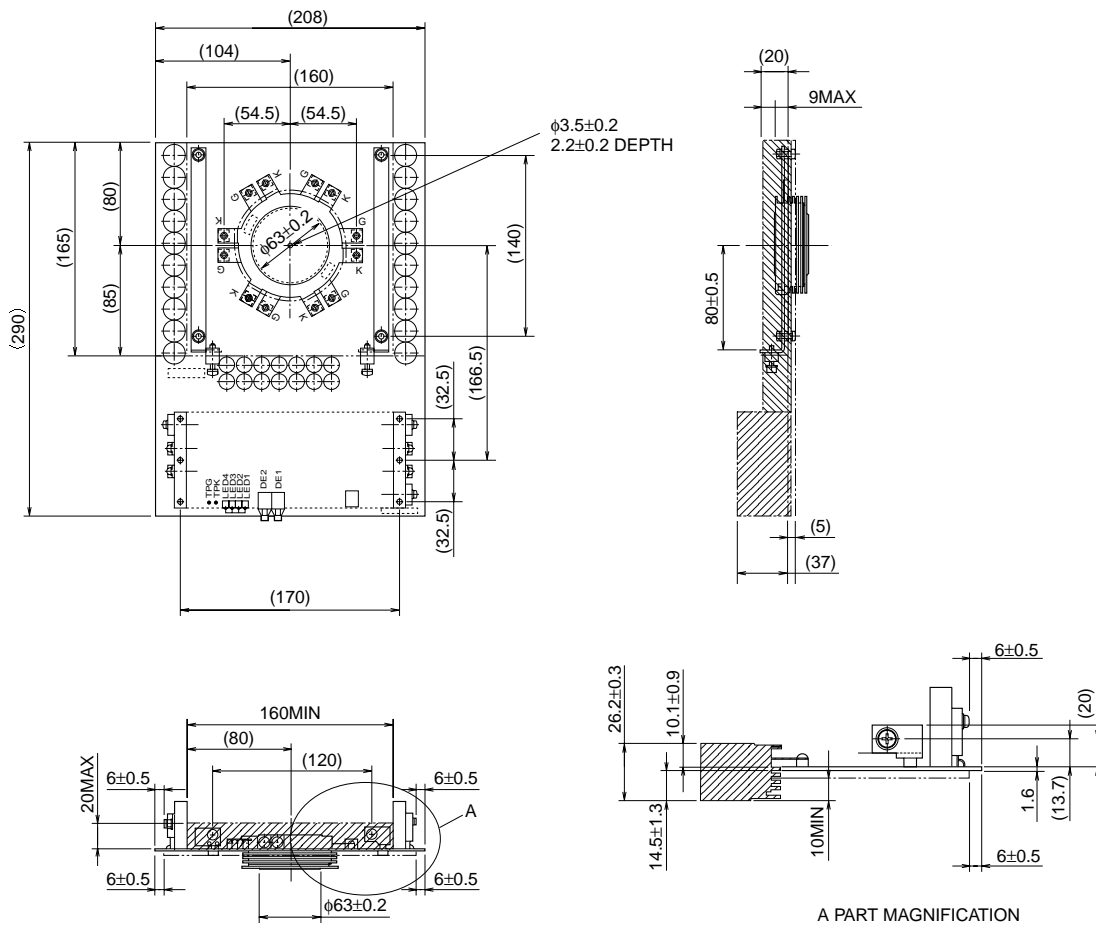
- Symmetrical GCT unit
- GCT and Gate driver are connected
- I_{TQRM} Repetitive controllable on-state current 1500A
- $I_{T(AV)}$ Average on-state current 500A
- V_{DRM} Repetitive peak off-state voltage 6500V
- V_{RRM} Repetitive peak reverse voltage 6500V

APPLICATION

Current source inverters, DC choppers, Induction heaters, DC to DC converters.

OUTLINE DRAWING

Dimensions in mm



GCU15AA-130

HIGH POWER INVERTER USE
PRESS PACK TYPE

GCT PART (Type name : FGC1500A-130DS)

MAXIMUM RATINGS

Symbol	Parameter	Conditions	Voltage class	Unit
VRRM	Repetitive peak reverse voltage	—	6500	V
VRSM	Non-repetitive peak reverse voltage	—	6500	V
VDRM	Repetitive peak off-state voltage	VGK = -2V	6500	V
VDSM	Non-repetitive peak off-state voltage	VGK = -2V	6500	V
VLTS	Long term DC stability voltage	VGK = -2V, λ = 100 Fit	3600	V

Symbol	Parameter	Conditions	Ratings	Unit
ITQRM	Repetitive controllable on-state current	VDM = 3/4 VDRM, VD = 3000V, LC = 0.3μH Tj = 25/115°C, With GU-D15 (see Fig. 1, 3)	1500	A
IT(RMS)	RMS on-state current	Applied for all conduction angles	780	A
IT(AV)	Average on-state current	f = 60Hz, sinewave θ = 180°, Tf = 55°C	500	A
ITSM	Surge on-state current	One half cycle at 60Hz, Tj = 115°C Start	8	kA
I ² t	Current-squared, time integration		2.7 × 10 ⁵	A ² s
diT/dt	Critical rate of rise of on-state current	VD = 3000V, IT = 1500A, Cs = 0.2μF, Rs = 5Ω Tj = 25/115°C, f = 60Hz, With GU-D15 (see Fig. 1,2)	1000	A/μs
VFGM	Peak forward gate voltage		10	V
VRGM	Peak reverse gate voltage		21	V
IFGM	Peak forward gate current		900	A
IRGM	Peak reverse gate current		1500	A
PFGM	Peak forward gate power dissipation		9	kW
PRGM	Peak reverse gate power dissipation		32	kW
PFG(AV)	Average forward gate power dissipation		180	W
PRG(AV)	Average reverse gate power dissipation		230	W
Tj	Junction temperature		-20 ~ +115	°C
Tstg	Storage temperature		-20 ~ +150	°C
—	Mounting force required	(Recommended value 20kN)	18 ~ 24	kN
—	Weight	Typical value	760	g

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	Limits			Unit
			Min	Typ	Max	
V _{TM}	On-state voltage	IT = 1500A, Tj = 115°C	—	—	7.0	V
I _{RRM}	Repetitive peak reverse current	VRM = 6500V, Tj = 115°C	—	—	220	mA
I _{DRM}	Repetitive peak off-state current	VDM = 6500V, VGK = -2V, Tj = 115°C	—	—	150	mA
I _{GRM}	Reverse gate current	VRG = 21V, Tj = 115°C	—	—	100	mA
dV/dt	Critical rate of rise of off-state voltage	VD = 3000V, VGK = -2V, Tj = 115°C (Expo. wave)	3000	—	—	V/μs
t _{gt}	Turn-on time	IT = 1500A, VD = 3000V, di/dt = 1000A/μs, Tj = 115°C	—	—	5.0	μs
t _d	Delay time	Cs = 0.2μF, Rs = 5Ω	—	—	1.0	μs
E _{on}	Turn-on switching energy	With GU-D15 (see Fig. 1, 2)	—	—	2.15	J/P
t _s	Storage time	IT = 1500A, VDM = 3/4 VDRM, VD = 3000V Cs = 0.2μF, Rs = 5Ω, Tj = 115°C	—	—	3.0	μs
E _{off}	Turn-off switching energy	With GU-D15 (see Fig. 1, 5)	—	—	12	J/P
Q _{RR}	Reverse recovery charge	VR = 3000V, IT = 1500A, di/dt = 1000A/μs	—	—	2800	μC
E _{rec}	Reverse recovery energy	Cs = 0.2μF, Rs = 5Ω, Tj = 115°C (see Fig. 4, 5)	—	—	7	J/P
I _{GT}	Gate trigger current	DC METHOD : VD = 24V, RL = 0.1Ω, Tj = 25°C	—	—	0.75	A
V _{GT}	Gate trigger voltage		—	—	1.5	V
R _{th(j-f)}	Thermal resistance	Junction to fin	—	—	0.016	K/W

GCU15AA-130

HIGH POWER INVERTER USE
PRESS PACK TYPE

GATE DRIVER PART (Type name : GU-D15)

Symbol	Parameter	Conditions	Limits			Unit
			Min	Typ	Max	
VC	Power supply (Note 1)	DC power supply	19	20	21	V
P	Power consumption (Note 2)	—	2.5	—	—	W
		$I_T = 500A_{rms}$, $f = 780Hz$, duty = 0.33	—	—	50	
—	Control signal (Note 3)	Optical fiber data link Transmitter : HFBR-1521 (HP) Receiver : HFBR-2521 (HP)	—	—	—	—
f	Frequency	$I_T = 500A_{rms}$, duty = 0.33	—	—	780	Hz
tfd	Delay time of on gate current		—	—	3.0	μs
trd	Delay time of off gate current		—	—	3.0	μs
diG/dt	Critical rate of rise of on gate current		50	—	—	A/ μs
IGM	Peak on gate current		—	90	—	A
tw	Width of on high gate current		3.0	—	—	μs
IG	On gate current	$T_j \geq -10^\circ C$	1.9	—	—	A
diGO/dt	Critical rate of rise of off gate current	VRG= 20V	—	2250	—	A/ μs
Dmax	Maximum duty		—	—	100	%
Ta	Temperature	Operation temperature (Recommend : $\leq 40^\circ C$)	-10	—	+60	$^\circ C$
—	Weight	With FGC1500A-130DS	—	1500	—	g
—	Status signal (Note 4)			—	—	—

VIBRATION TEST (Note 9)

Test Items	Conditions and Test method
Vibration variable frequency	f = 5~100Hz, 15min/cycle, non-operation x, y, z, direction ; 150min, acceleration = 2.5G stack assembly with GCT

GCU15AA-130

HIGH POWER INVERTER USE
PRESS PACK TYPE

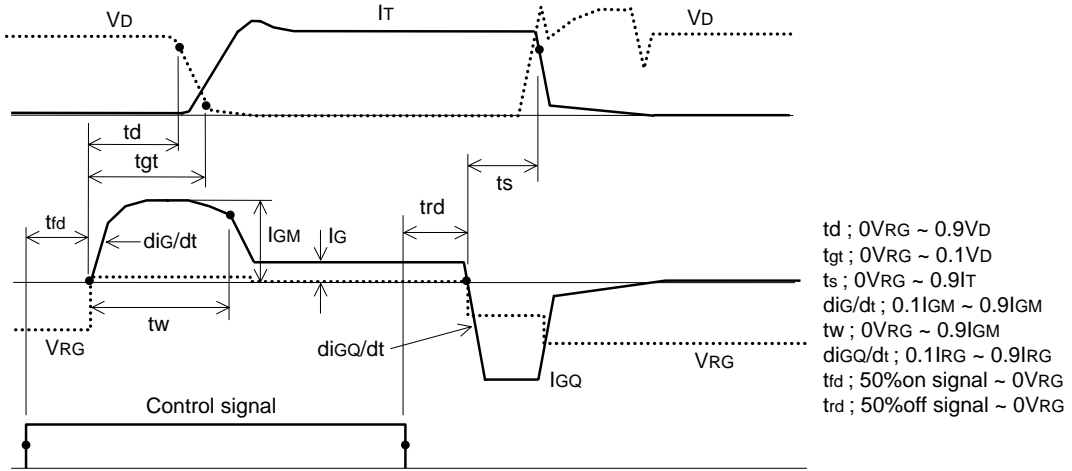


Fig. 1 Turn-on and Turn-off waveform

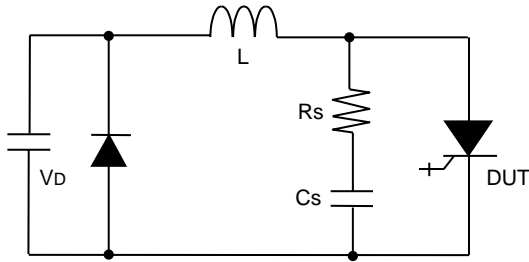


Fig. 2 Turn-on test circuit

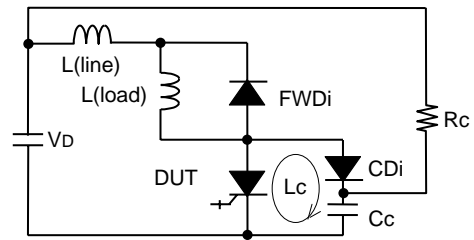


Fig. 3 Turn-off test circuit
(With clamp circuit)

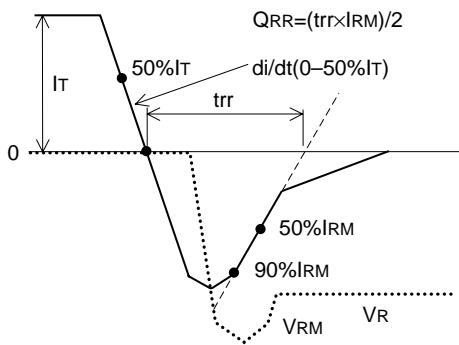


Fig. 4 Reverse recovery waveform

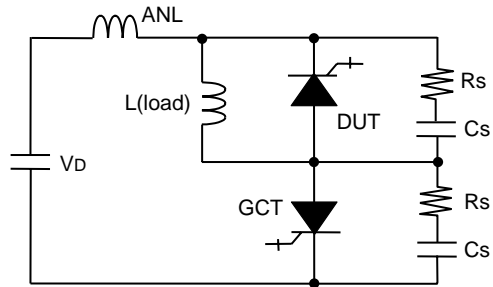


Fig. 5 Turn-off and Reverse recovery test circuit
(With CR snubber circuit)

GCU15AA-130

HIGH POWER INVERTER USE
PRESS PACK TYPE

- Note 1. (1) Guaranteed power supply voltage for operation is 19V minimum and 21V maximum.
 (2) When over voltage occurs, GDU voltage bus (G-K voltage for GCT) is clamped to be 21V if mamimum voltage for input gata voltage from power supply is 25V and maximum duration of over voltage higher than 21V from power supply is 0.4 sec when control signal is on (Please see Fig. 8).
 (3) When over voltage occurs, GDU voltage bus is clamped to be 21V with no time limitation if maximum voltage from power supply is 25V and control signal is off (Please see Fig. 8).

Note 2. GCT is off state and no gate signal is supplied for gate driver. No leakage current flows between gate and cathode of GCT.

Note 3. Optic fiber data link HFBR-1521 and HFBR-2521 are interlocked each other.

Note 4.

1. Status signal from LED

(1) Status signal

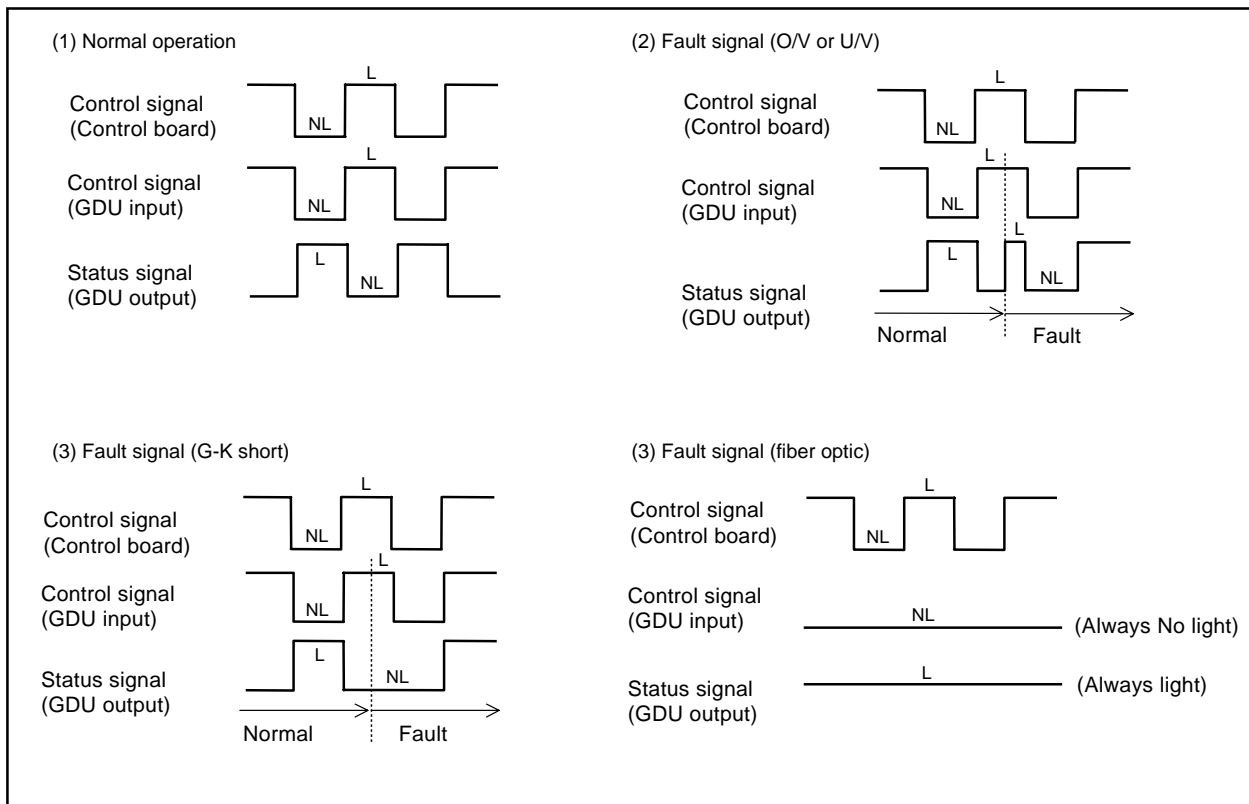
Status of GCT	LED 1 (Red)	LED 2 (Yellow)
On state	OFF	ON
Off state	ON	OFF

(2) Fault signal

Status	G-K	PS	PS LED (LED 4)	G-K LED (LED 3)
Normal	Normal	20±1V	On	On
Fault	Normal	Voltage down	Off, V < 17.5V (Typ.)	Off (If V > 12.5V (Typ.) then LED 3 is on)
Fault	G-K short	20±1V	On	Off
Fault	G-K short	Voltage down	Off, V < 17.5V (Typ.)	Off

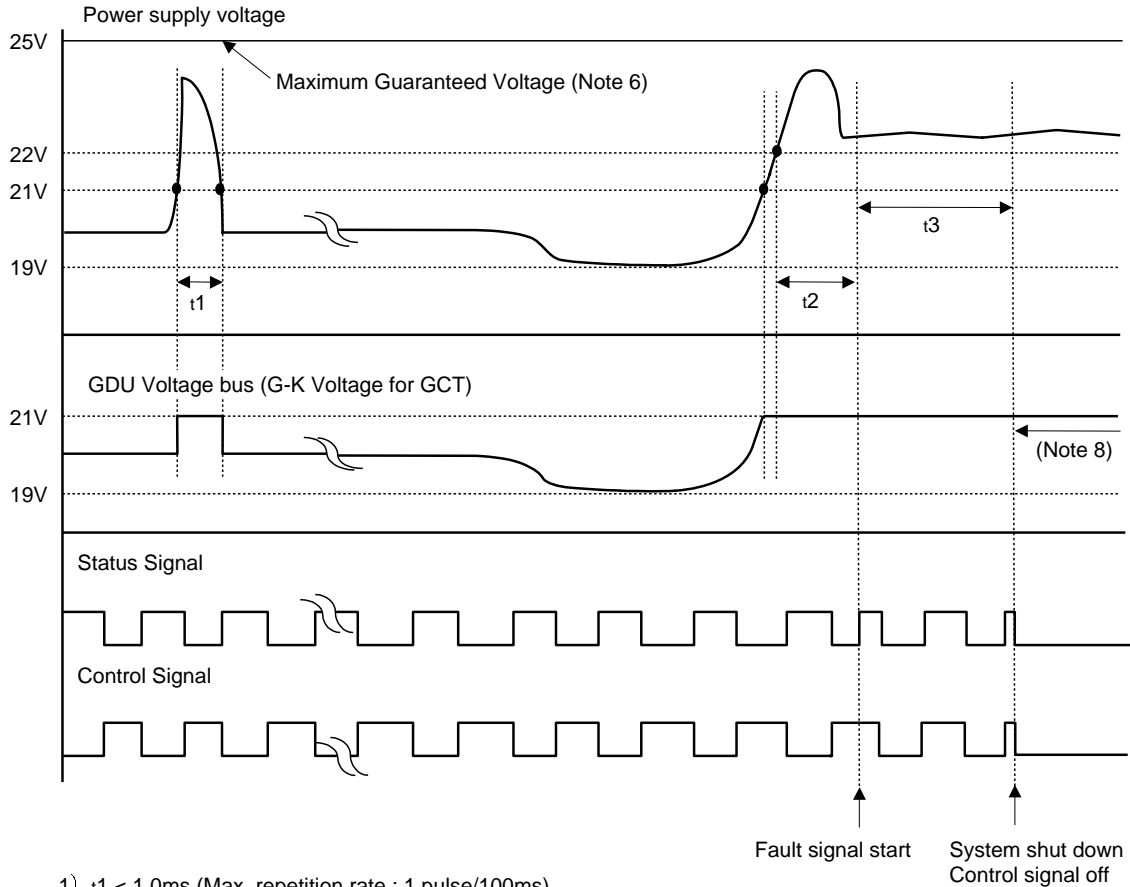
2. Status signal from Transmitter (Note 5)

(L : Light NL : No light)



Note 5. About over voltage fault signal, please see Fig. 6.

Fig. 6 Over voltage fault signal timing chart



- 1) $t_1 < 1.0\text{ms}$ (Max. repetition rate ; 1 pulse/100ms)
- 2) $t_2 \geq 1.0\text{ms}$
- 3) $t_3 < 0.4\text{sec}$

Note 6. Maximum peak voltage of GDU input voltage from power supply should be lower than 25V.

Note 7. If the period for over voltage $< 1.0\text{ms}$ (period t_1), no fault signal is sent.

If the period for over voltage $\geq 1.0\text{ms}$, fault signal starts after period t_2 from 22V of power supply voltage. System should be shut down (Control signal should be off) within period t_3 from fault signal start.

Note 8. GDU Voltage bus (G-K Voltage for GCT) is clamped to be 21V if power supply voltage is higher than 21V after system shut down (control signal off).

GCU15AA-130

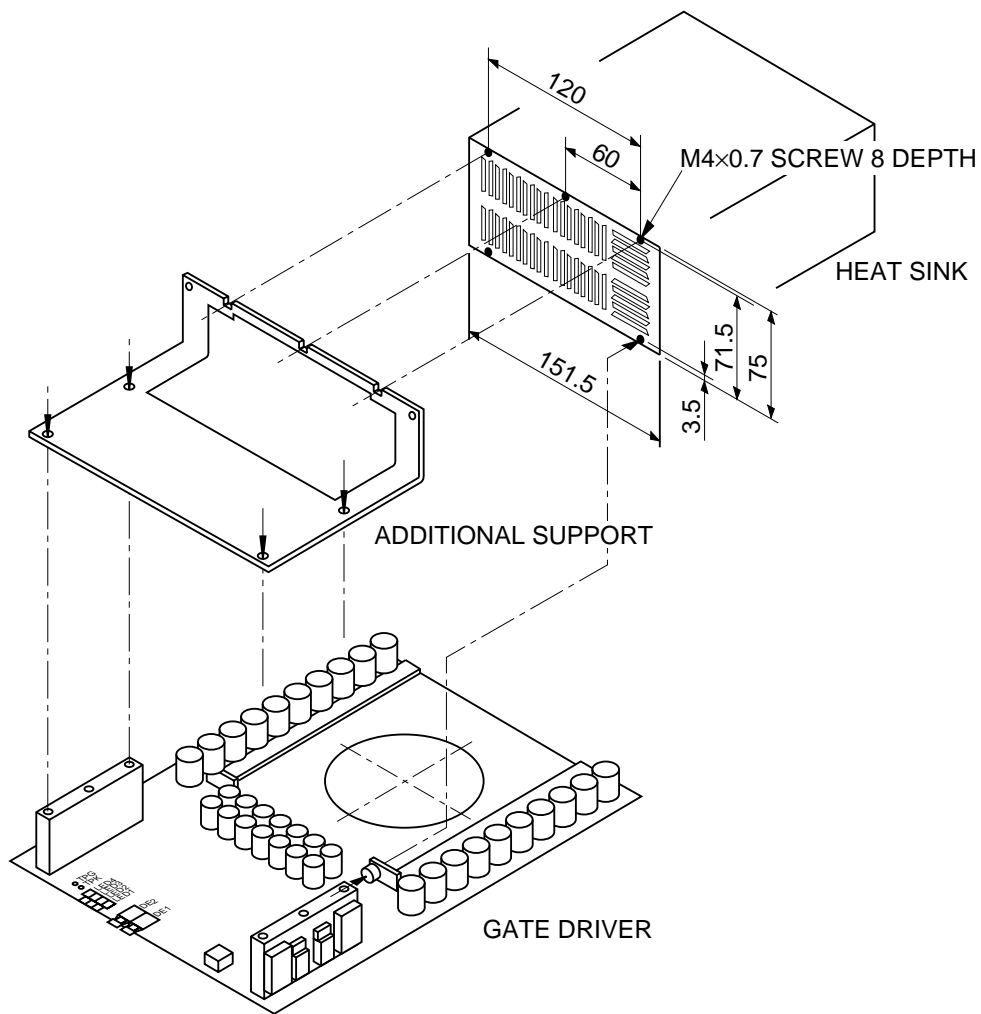
HIGH POWER INVERTER USE
PRESS PACK TYPE

Note 9. Additional support for vibration test

Additional support is necessary for vibration test of GCU15AA-130.

Fig. 7 shows detailed figure about connection method between gate driver and heat sink by additional support.

Fig. 7

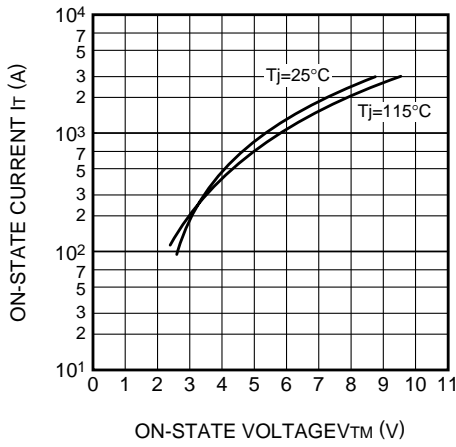


GCU15AA-130

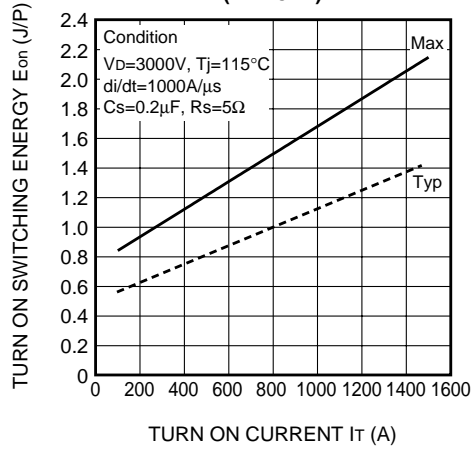
HIGH POWER INVERTER USE
PRESS PACK TYPE

PERFORMANCE CURVES

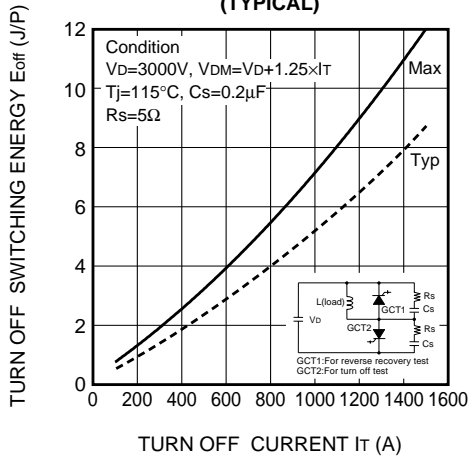
MAXIMUM ON-STATE CHARACTERISTIC



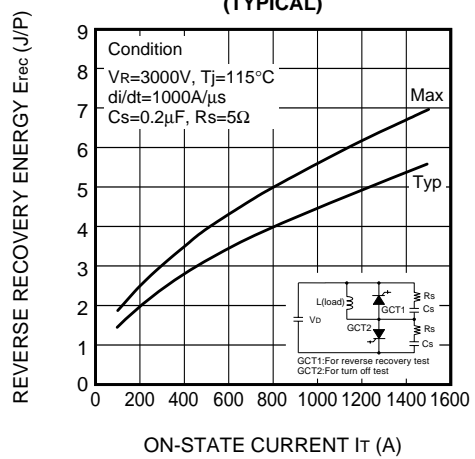
E_{on} VS I_T
(TYPICAL)



E_{off} VS I_T
(TYPICAL)



E_{rec} VS I_T
(TYPICAL)



MAXIMUM THERMAL IMPEDANCE
CHARACTERISTIC
(JUNCTION TO FIN)

