

The GP1600FSS18-AAB is a single switch 1800V, robust n channel enhancement mode insulated gate bipolar transistor (IGBT) module. Designed for low power loss, the module is suitable for a variety of high voltage applications in motor drives and power conversion. The high impedance gate simplifies gate drive considerations enabling operation directly from low power control circuitry.

Fast switching times allow high frequency operation making the device suitable for the latest drive designs employing pwm and high frequency switching. The IGBT has a wide reverse bias safe operating area (RBSOA) for ultimate reliability in demanding applications.

These modules incorporate electrically isolated base plates and low inductance construction enabling circuit designers to optimise circuit layouts and utilise earthed heat sinks for safety.

The powerline range of high power modules includes dual and single switch configurations with a range of current and voltage capabilities to match customer system demands.

Typical applications include dc motor drives, ac pwm drives, main traction drives and auxiliaries, large ups systems and resonant inverters.

Features

- n - Channel.
- Enhancement Mode.
- High Input Impedance.
- Optimised For High Power High Frequency Operation.
- Isolated Base.
- Full 1800V Capability.
- 1600A Per Module

Applications

- High Power Switching.
- Motor Control.
- Inverters
- Traction Systems.

Key Parameters

V_{CES}		1800V
$V_{CE(sat)}$	(typ)	3.5V
I_C	(max)	1600A
$I_{C(PK)}$	(max)	3200A

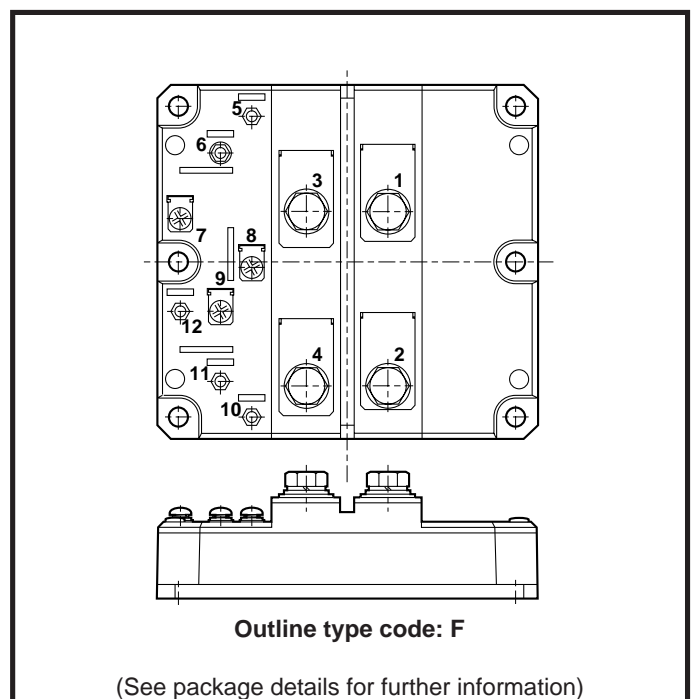


Fig. 1 Electrical connections - (not to scale)

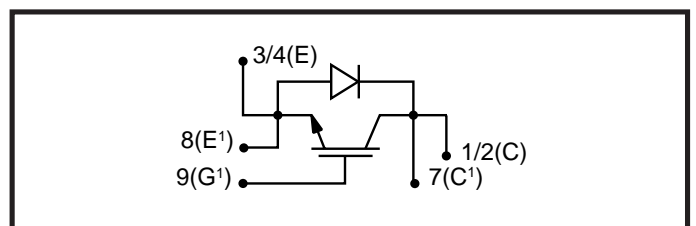


Fig.2 Single switch circuit diagram

Ordering Information

Order As: **GP1600FSS18-AAB**

Note: When ordering, please use the whole part number.

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

GP1600FSS18-AAB

Absolute Maximum Ratings - Per Arm

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to Absolute Maximum Ratings for extended periods may affect device reliability.

$T_{case} = 25^{\circ}\text{C}$ unless stated otherwise.

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	$V_{GE} = 0\text{V}$	1800	V
V_{GES}	Gate-emitter voltage	-	± 20	V
I_C	Collector current	DC, $T_{case} = 25^{\circ}\text{C}$	1600	A
		DC, $T_{case} = 75^{\circ}\text{C}$	1200	A
$I_{C(PK)}$		1ms, $T_{case} = 25^{\circ}\text{C}$	3200	A
		1ms, $T_{case} = 75^{\circ}\text{C}$	2400	A
P_{max}	Maximum power dissipation	$T_{case} = 25^{\circ}\text{C}$ (Transistor)	11400	W
V_{isol}	Isolation voltage	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V

Thermal And Mechanical Ratings

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - transistor (per arm)	DC junction to case	-	11	$^{\circ}\text{C}/\text{kW}$
	Thermal resistance - diode (per arm)	DC junction to case	-	20	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	Thermal resistance - Case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	8	$^{\circ}\text{C}/\text{kW}$
T_j	Junction temperature	Transistor	-	150	$^{\circ}\text{C}$
		Diode	-	125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-	-40	125	$^{\circ}\text{C}$
-	Screw torque	Mounting - M6	-	5	Nm
		Electrical connections - M4	-	2	Nm
		Electrical connections - M8	-	10	Nm

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

Electrical Characteristics

$T_{\text{case}} = 25^{\circ}\text{C}$ unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_{CES}	Collector cut-off current	$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = V_{\text{CES}}$	-	-	2	mA
		$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = V_{\text{CES}}, T_{\text{case}} = 125^{\circ}\text{C}$	-	-	50	mA
I_{GES}	Gate leakage current	$V_{\text{GE}} = \pm 20\text{V}, V_{\text{CE}} = 0\text{V}$	-	-	8	μA
$V_{\text{GE(TH)}}$	Gate threshold voltage	$I_{\text{C}} = 40\text{mA}, V_{\text{GE}} = V_{\text{CE}}$	4	-	7.5	V
$V_{\text{CE(SAT)}}$	Collector-emitter saturation voltage	$V_{\text{GE}} = 15\text{V}, I_{\text{C}} = 1600\text{A}$	-	3.5	4.0	V
		$V_{\text{GE}} = 15\text{V}, I_{\text{C}} = 1600\text{A}, T_{\text{case}} = 125^{\circ}\text{C}$	-	4.3	5.0	V
I_{F}	Diode forward current	DC	-	-	1600	A
I_{FM}	Diode maximum forward current	$t_{\text{p}} = 1\text{ms}$	-	-	3200	A
V_{F}	Diode forward voltage	$I_{\text{F}} = 1600\text{A}$	-	2.2	2.5	V
		$I_{\text{F}} = 1600\text{A}, T_{\text{case}} = 125^{\circ}\text{C}$	-	2.3	2.6	V
C_{ies}	Input capacitance	$V_{\text{CE}} = 25\text{V}, V_{\text{GE}} = 0\text{V}, f = 1\text{MHz}$	-	180	-	nF
L_{M}	Module inductance	-	-	15	-	nH

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Inductive Switching Characteristics

For definition of switching waveforms, refer to figure 3 and 4.

$T_{\text{case}} = 25^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{\text{d(off)}}$	Turn-off delay time	$I_{\text{C}} = 1600\text{A}$ $V_{\text{GE}} = \pm 15\text{V}$ $V_{\text{CE}} = 900\text{V}$ $R_{\text{G(ON)}} = R_{\text{G(OFF)}} = 2.2\Omega$ $L \sim 100\text{nH}$	-	1150	1250	ns
t_{f}	Fall time		-	200	250	ns
E_{OFF}	Turn-off energy loss		-	460	575	mJ
$t_{\text{d(on)}}$	Turn-on delay time		-	1100	1200	ns
t_{r}	Rise time		-	330	400	ns
E_{ON}	Turn-on energy loss		-	400	500	mJ
Q_{rr}	Diode reverse recovery charge	$I_{\text{F}} = 1600\text{A}$ $V_{\text{R}} = 50\%V_{\text{CES}}$ $dI_{\text{F}}/dt = 3500\text{A}/\mu\text{s}$	-	300	400	μC

$T_{\text{case}} = 125^{\circ}\text{C}$ unless stated otherwise.

$t_{\text{d(off)}}$	Turn-off delay time	$I_{\text{C}} = 1600\text{A}$ $V_{\text{GE}} = \pm 15\text{V}$ $V_{\text{CE}} = 900\text{V}$ $R_{\text{G(ON)}} = R_{\text{G(OFF)}} = 2.2\Omega$ $L \sim 100\text{nH}$	-	1350	1450	ns
t_{f}	Fall time		-	250	320	ns
E_{OFF}	Turn-off energy loss		-	600	750	mJ
$t_{\text{d(on)}}$	Turn-on delay time		-	1220	1350	ns
t_{r}	Rise time		-	350	420	ns
E_{ON}	Turn-on energy loss		-	600	750	mJ
Q_{rr}	Diode reverse recovery charge	$I_{\text{F}} = 1600\text{A}$ $V_{\text{R}} = 50\%V_{\text{CES}}$ $dI_{\text{F}}/dt = 3500\text{A}/\mu\text{s}$	-	450	500	μC

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

Switching Definitions

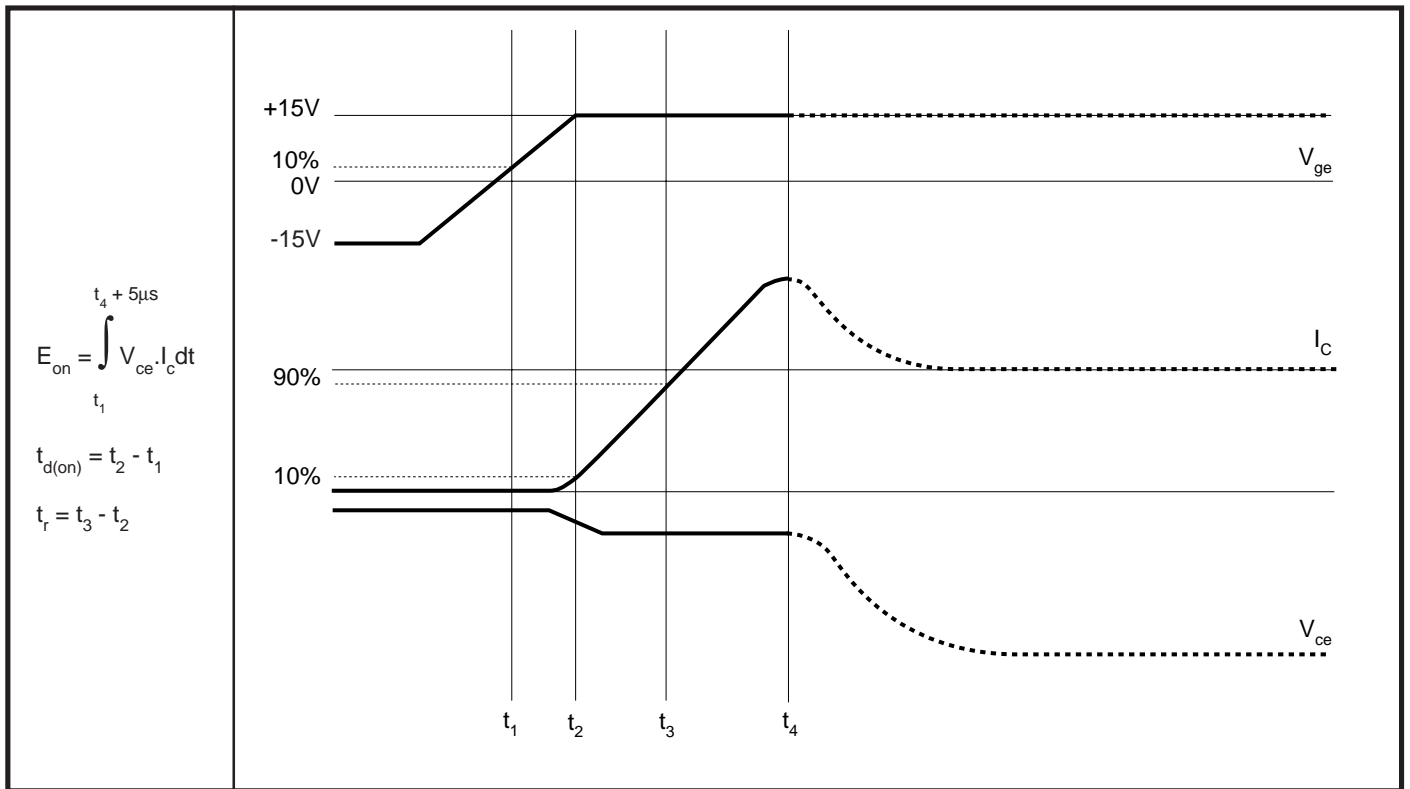


Fig.3 Definition of turn-on switching times

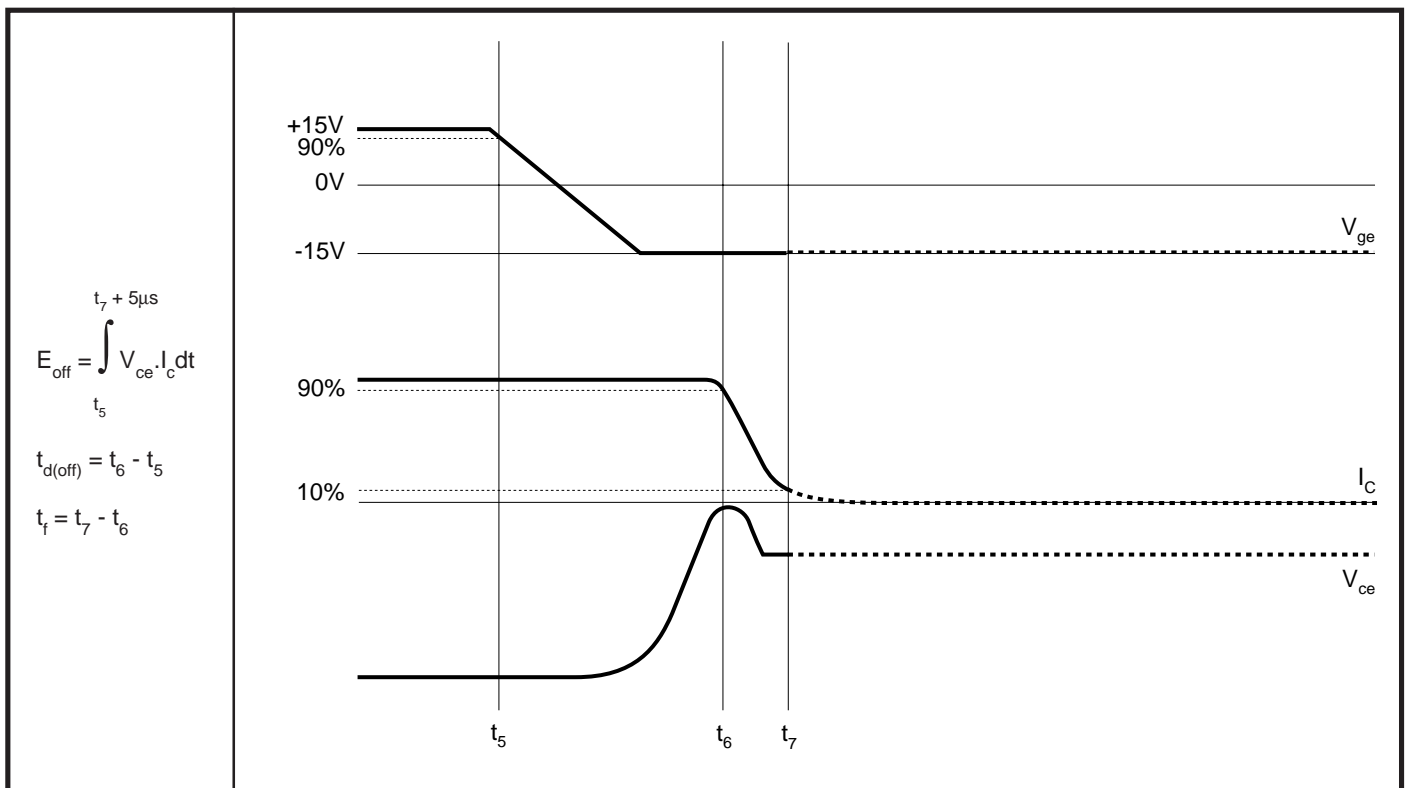


Fig.4 Definition of turn-off switching times

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Curves

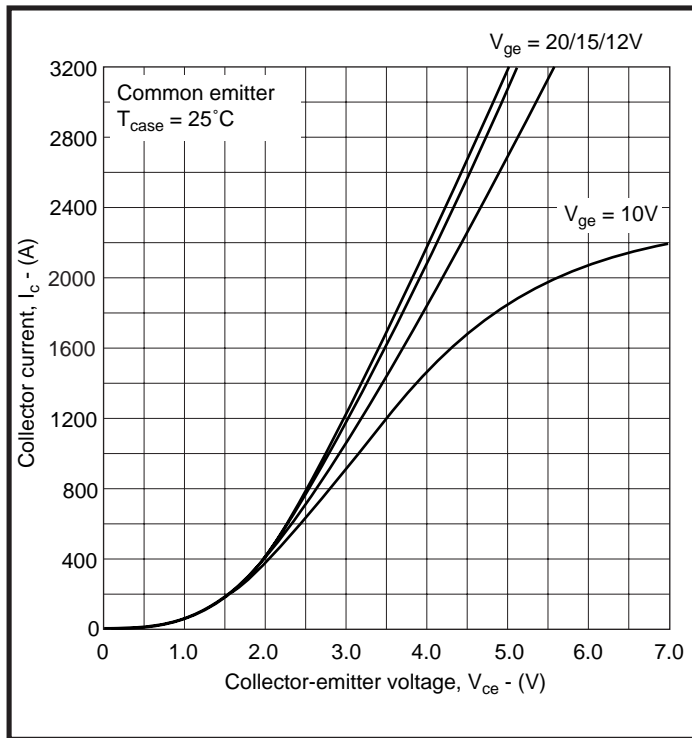


Fig.5 Typical output characteristics

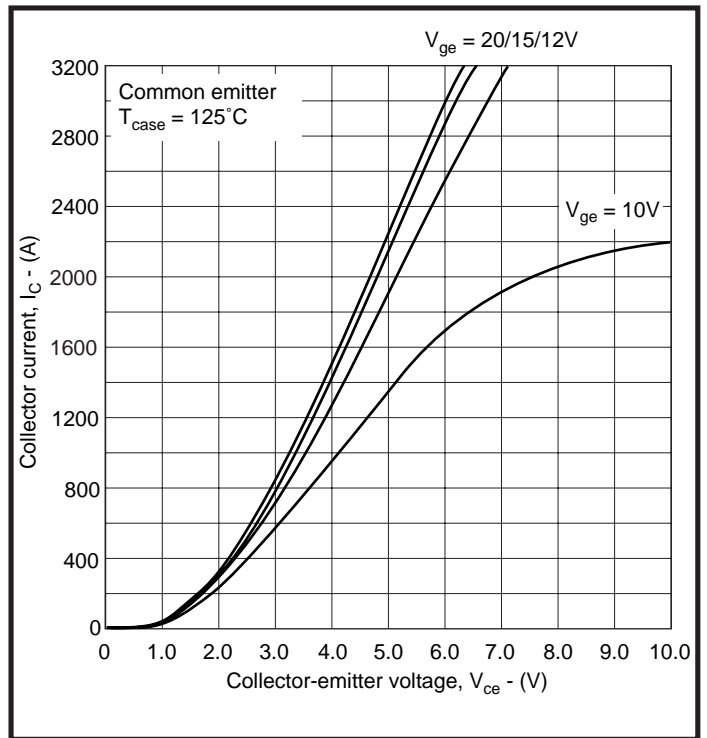


Fig.6 Typical output characteristics

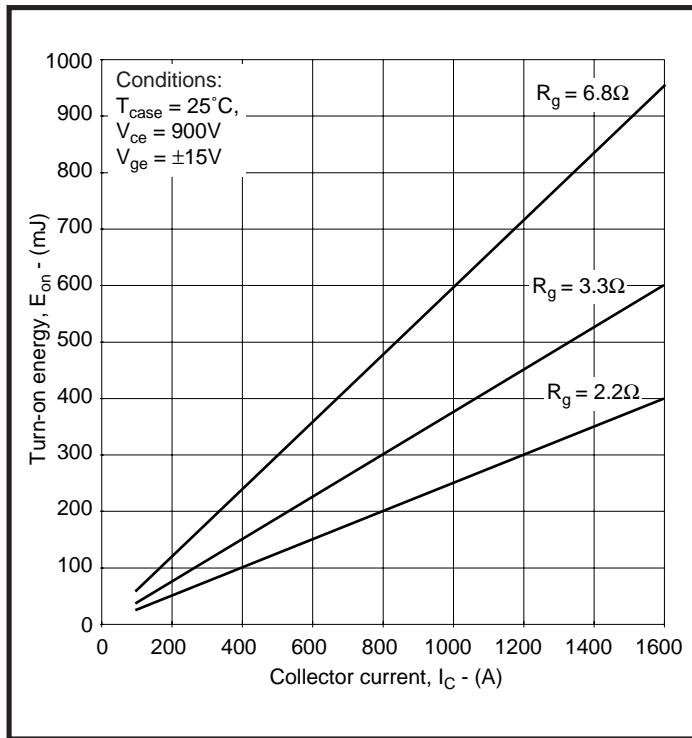


Fig.7 Typical turn-on energy vs collector current

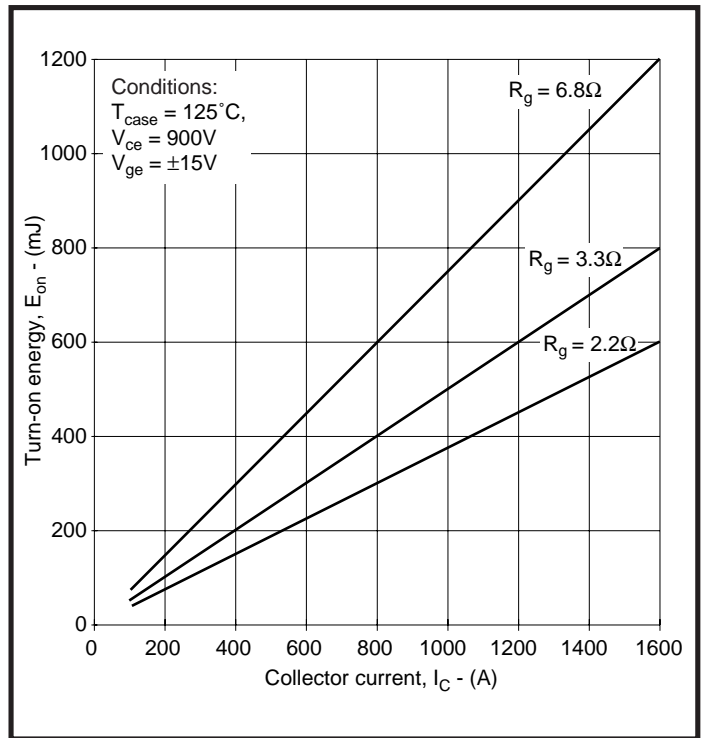


Fig.8 Typical turn-on energy vs collector current

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

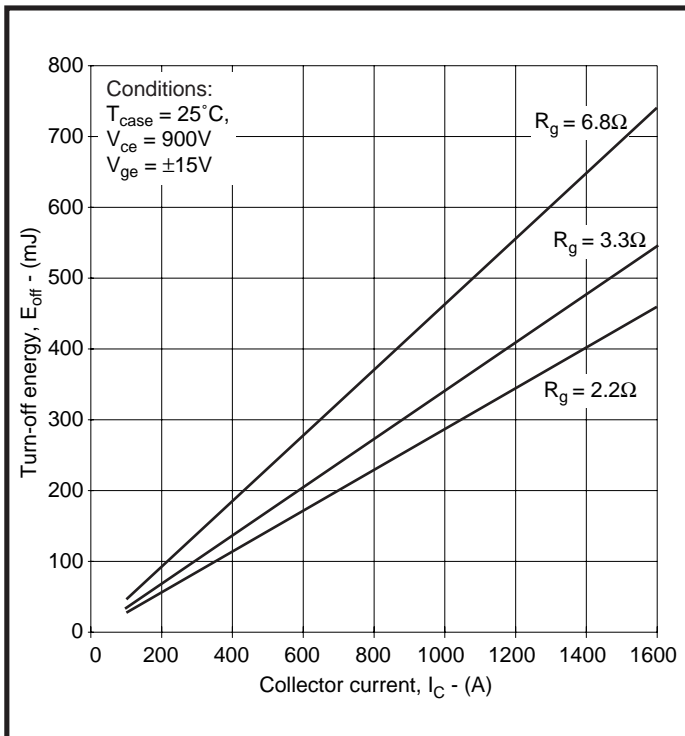


Fig.9 Typical turn-off energy vs collector current

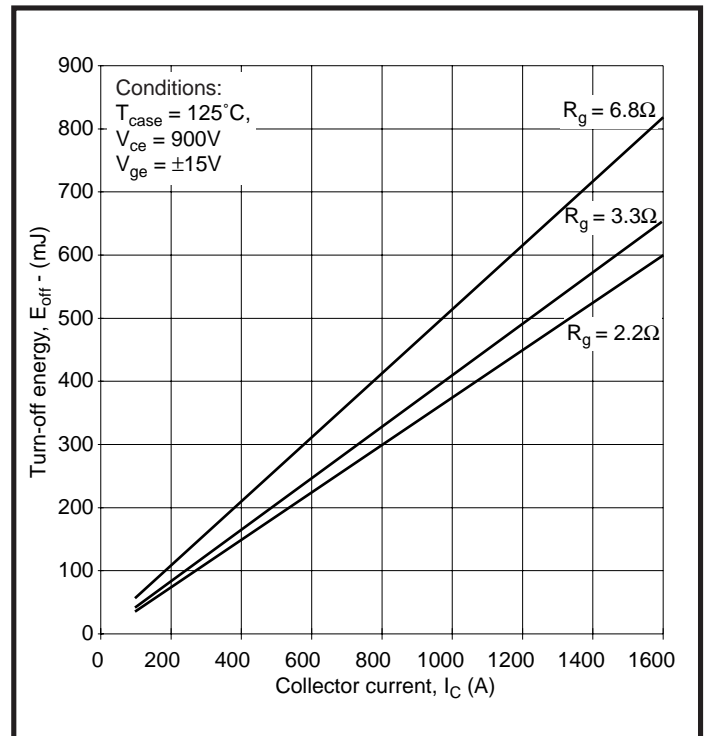


Fig.10 Typical turn-off energy vs collector current

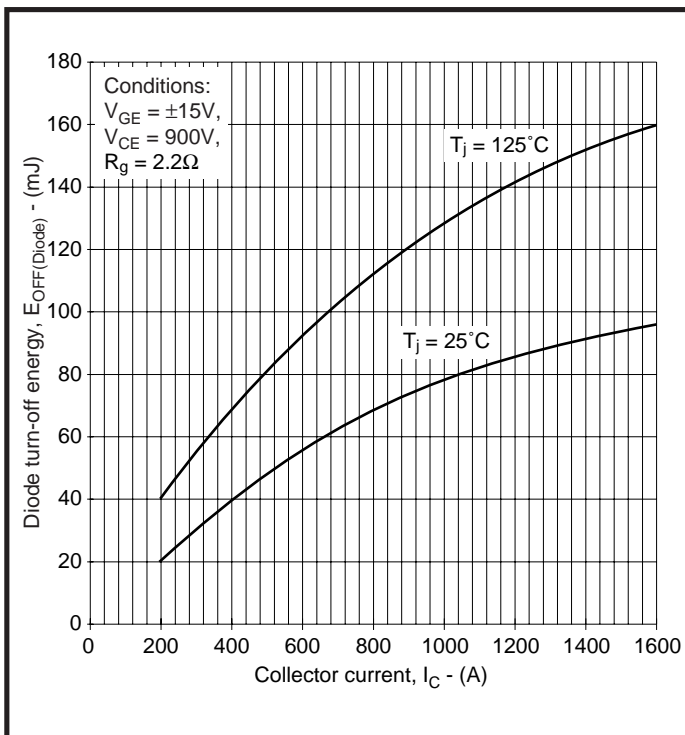


Fig.11 Typical diode reverse recovery energy vs collector current

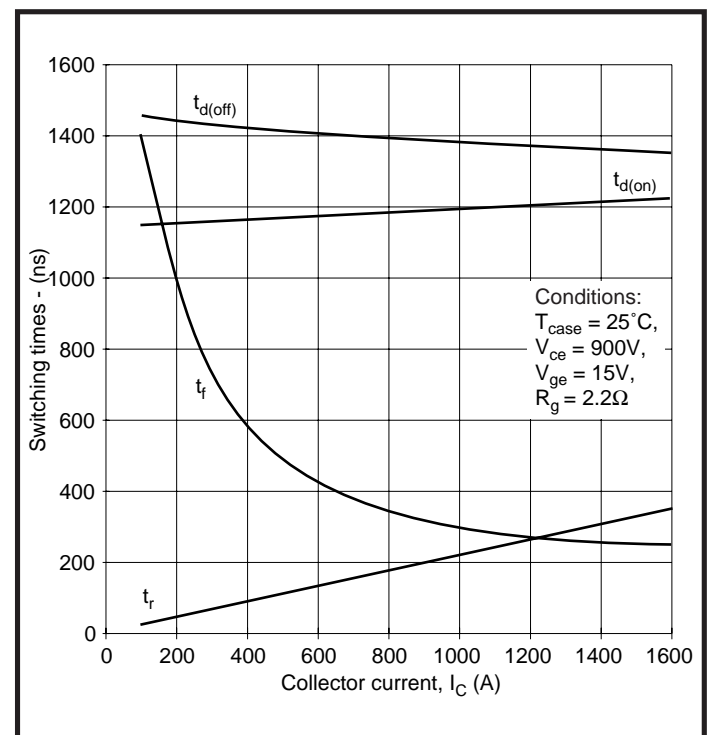


Fig.12 Typical switching characteristics

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

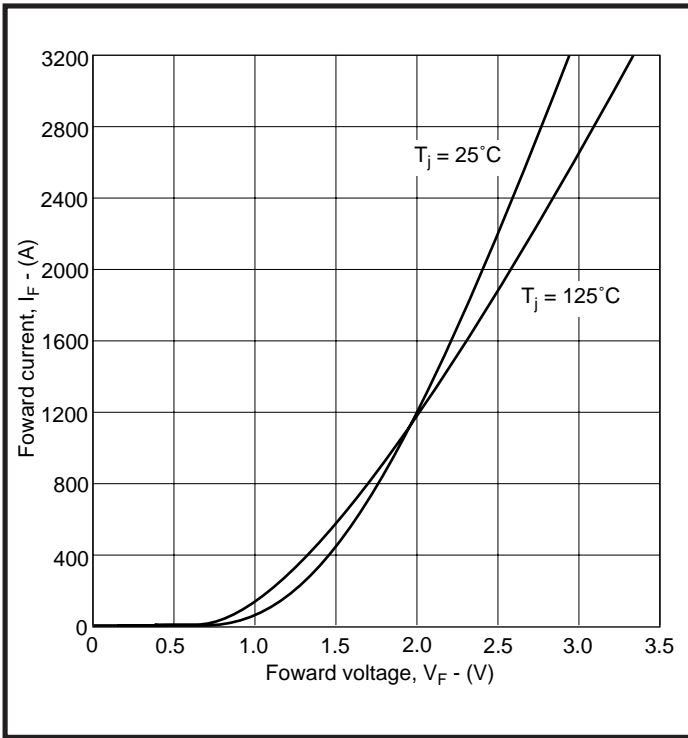


Fig.13 Diode typical forward characteristics

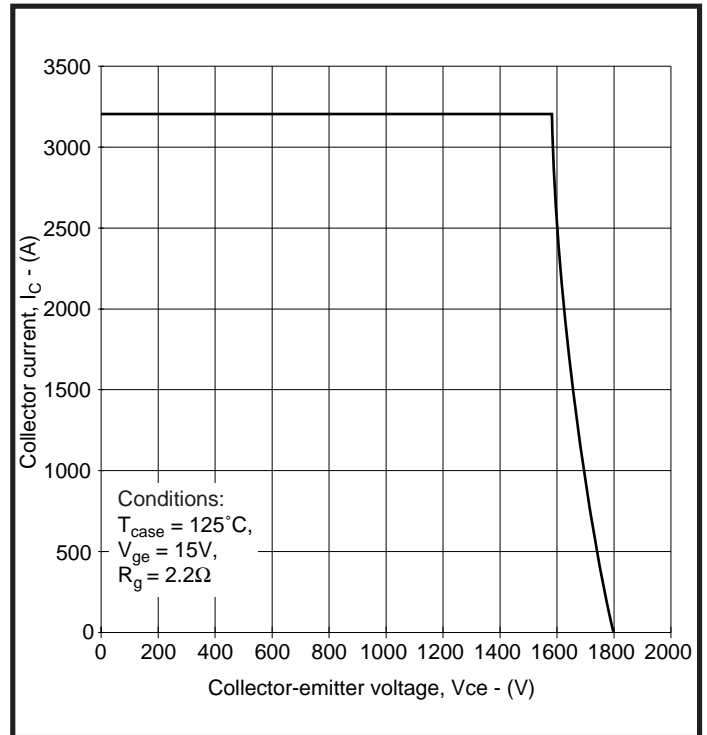


Fig.14 Reverse bias safe operating area

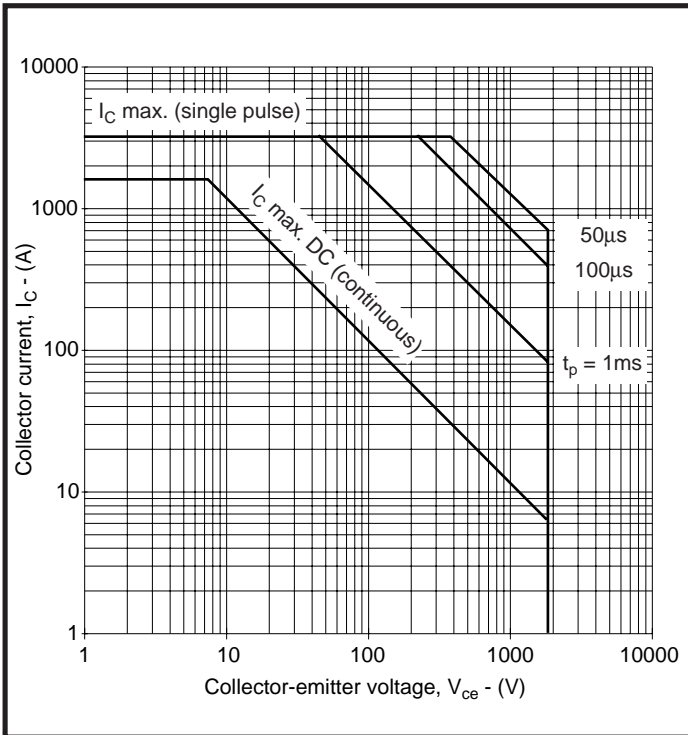


Fig.15 Forward bias safe operating area

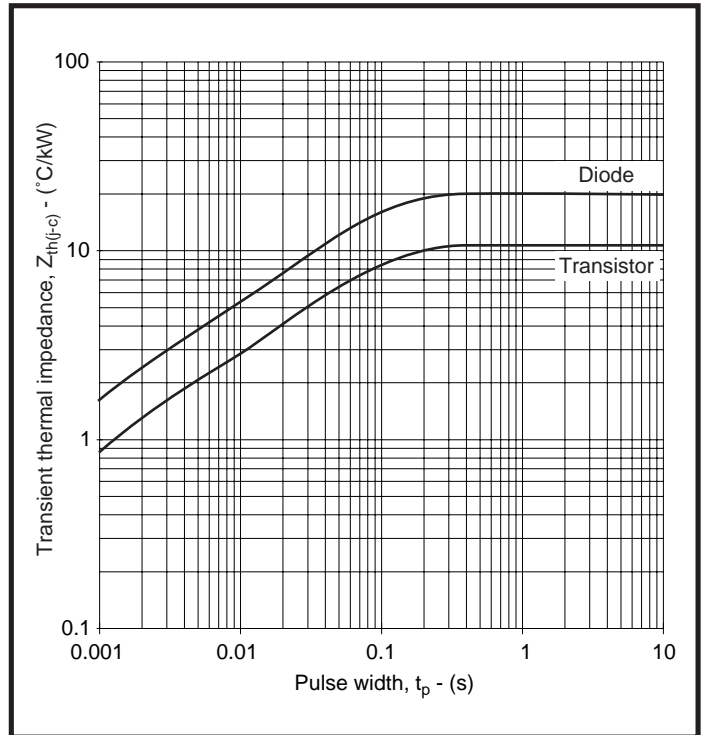


Fig.16 Transient thermal impedance

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

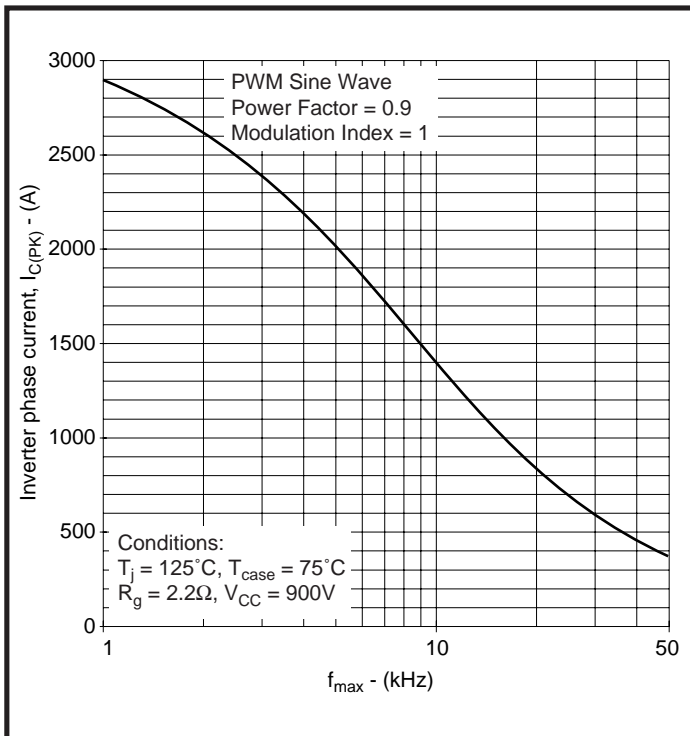


Fig.17 3-Phase inverter operating frequency

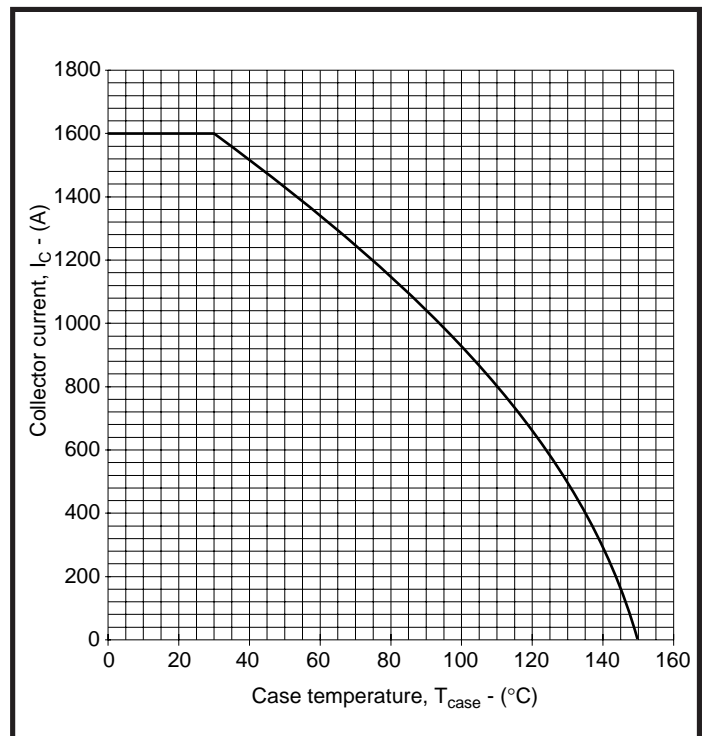


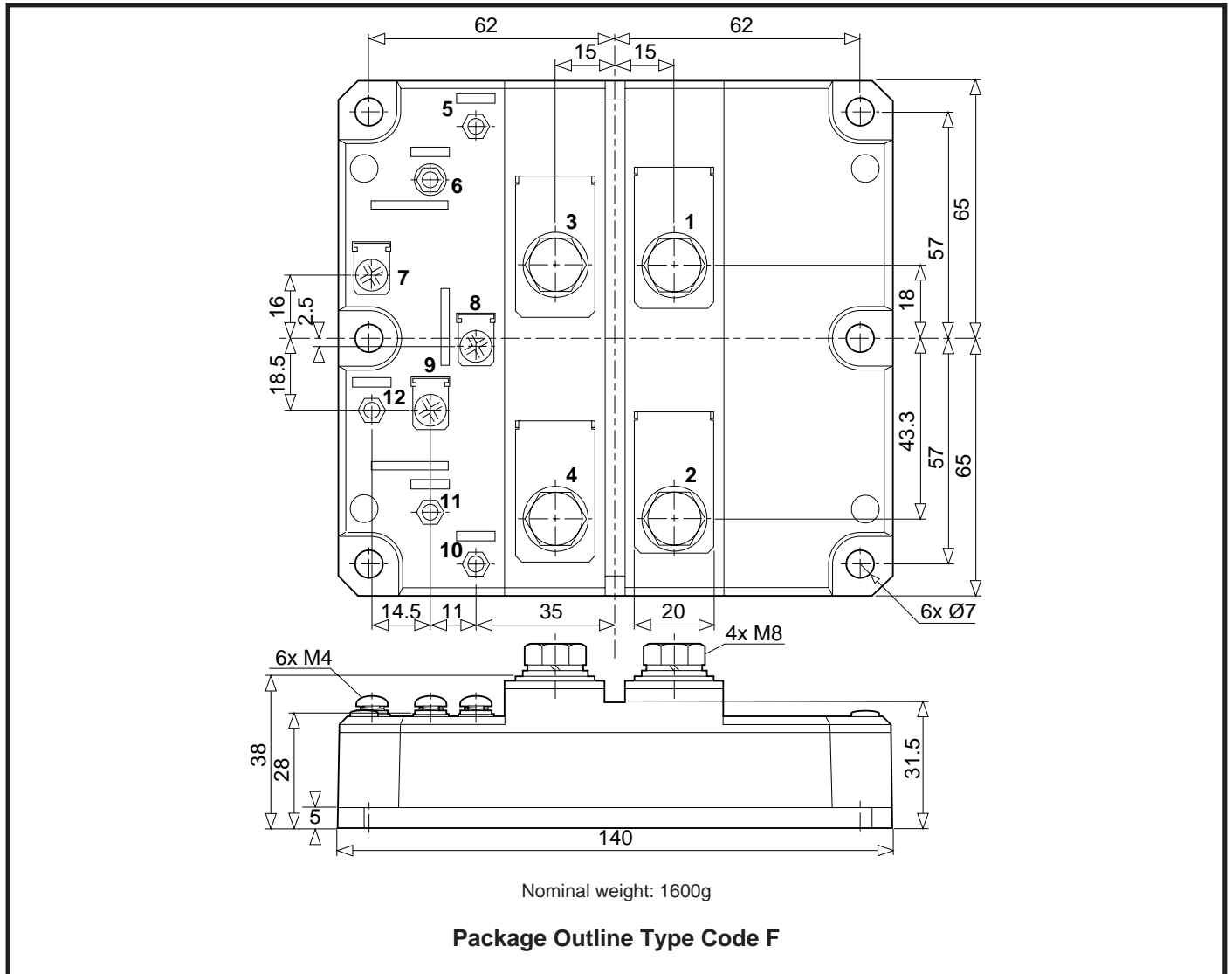
Fig.18 DC current rating vs case temperature

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

GP1600FSS18-AAB

Package Details

For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



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