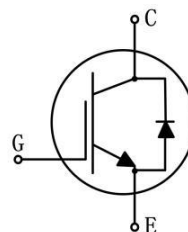


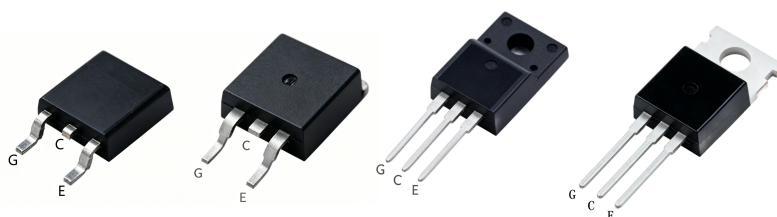
Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	650	V
I_C	10	A
$V_{CE(sat)}$	1.6	V



Features

- Positive temperature coefficient
- Fast Switching
- Low $V_{CE(sat)}$
- Reliable and Rugged



TO-252

TO-263

TO-220F

TO-220

Applications

- UPS
- Motor drives
- General purpose inverters

Key Performance and Package Parameters

Part No.	V_{CE}	I_C	T_{vjmax}	Package	Packing form
HT10T65FX100	650V	10A	175°C	TO-252	Reel
HT10T65SX100	650V	10A	175°C	TO-263	Reel
HT10T65TX100	650V	10A	175°C	TO-220	Tube
HT10T65TFX100	650V	10A	175°C	TO-220F	Tube

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CES}	650	V
Gate-emitter voltage	V_{GES}	±20	V
Continuous collector current($T_C=25^\circ\text{C}$)	I_C	20	A
Continuous collector current($T_C=100^\circ\text{C}$)		10	A
Pulsed Collector Current (Note 1)	I_{CM}	40	A
Diode continuous forward current($T_C=25^\circ\text{C}$)	I_F	20	A
Diode continuous forward current($T_C=100^\circ\text{C}$)		10	A
Diode maximum current, tp limited by T_{vjmax}	I_{FM}	40	A
Maximum Power Dissipation ($T_C=25^\circ\text{C}$) (Note 2)	P_{tot}	141	W
Maximum Power Dissipation ($T_C=100^\circ\text{C}$) (Note 2)		79	W
Short Circuit Withstand Time	t_{sc}	7	us
Operating Junction Temperature Range	T_J	-40 to+175	°C
Storage Temperature Range	T_{STG}	-55 to+150	°C

Thermal Characteristics

Parameter	Symbol	Conditions	Max.	Unit
Thermal Resistance, Junction to Case for IGBT	$R_{\theta JC}$	TO-252	2.0	$^{\circ}\text{C}/\text{W}$
		TO-263	1.1	$^{\circ}\text{C}/\text{W}$
		TO-220	1.1	$^{\circ}\text{C}/\text{W}$
		TO-220F	1.2	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Case for Diode	$R_{\theta JC}$	TO-252	4.2	$^{\circ}\text{C}/\text{W}$
		TO-263	2.1	$^{\circ}\text{C}/\text{W}$
		TO-220	2.4	$^{\circ}\text{C}/\text{W}$
		TO-220F	2.5	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	TO-252	75	$^{\circ}\text{C}/\text{W}$
		TO-263	60	$^{\circ}\text{C}/\text{W}$
		TO-220	62	$^{\circ}\text{C}/\text{W}$
		TO-220F	65	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics of IGBT ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector-Emitter Breakdown Voltage	$B_{V_{CES}}$	$V_{GE}=0\text{V}$, $I_C=200\mu\text{A}$	650	-	-	V
Collector-Emitter Leakage Current	I_{CES}	$V_{CE}=650\text{V}$, $V_{GE}=0\text{V}$	-	-	40	μA
Gate Leakage Current, Forward	I_{GES}	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$	-	-	100	nA
Gate Leakage Current, Reverse		$V_{GE}=-20\text{V}$, $V_{CE}=0\text{V}$	-	-	100	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$, $I_C=200\mu\text{A}$	4.0	5.0	6.0	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15\text{V}$, $I_C=10\text{A}$, $T_J=25^{\circ}\text{C}$	-	1.6	2.0	V
		$V_{GE}=15\text{V}$, $I_C=10\text{A}$, $T_J=150^{\circ}\text{C}$	-	1.9	-	V
Total Gate Charge	Q_g	$V_{CC}=400\text{V}$ $V_{GE}=15\text{V}$ $I_C=10\text{A}$	-	19.3	-	nC
Gate-Emitter Charge	Q_{ge}		-	3.0	-	nC
Gate-Collector Charge	Q_{gc}		-	10.6	-	nC
Turn-on Delay Time	$t_{d(on)}$	$V_{CC}=400\text{V}$ $V_{GE}=\pm 15\text{V}$ $I_C=10\text{A}$ $R_G=10\Omega$ Inductive Load $T_C=25^{\circ}\text{C}$	-	11	-	ns
Turn-on Rise Time	t_r		-	15	-	ns
Turn-off Delay Time	$t_{d(off)}$		-	41	-	ns
Turn-off Fall Time	t_f		-	65	-	ns
Turn-on Switching Loss	E_{on}		-	0.275	-	mJ
Turn-off Switching Loss	E_{off}		-	0.11	-	mJ
Total Switching Loss	E_{ts}		-	0.385	-	mJ
Input Capacitance	C_{ies}	$V_{CE}=25\text{V}$ $V_{GE}=0\text{V}$ $f=1\text{MHz}$	-	529	-	pF
Output Capacitance	C_{oes}		-	39	-	pF
Reverse Transfer Capacitance	C_{res}		-	5.8	-	pF
Short Circuit Collector Current	I_{SC}	$V_{GE}=15\text{V}$, $V_{CC}=400\text{V}$, $T_{J,start}\leq 25^{\circ}\text{C}$	-	100	-	A

Diode Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	$I_F=10A, T_J=25^{\circ}C$	-	1.7	2.1	V
		$I_F=10A, T_J=150^{\circ}C$	-	1.4	-	V
Diode Reverse Recovery Time	t_{rr}	$V_R=400V, I_F=10A$ $dI_F/dt=100A/us, T_C=25^{\circ}C$	-	53	-	ns
Diode peak Reverse Recovery Current	I_{rr}		-	2	-	A
Diode Reverse Recovery Charge	Q_{rr}		-	39	-	nC

Note1: Repetitive rating, pulse width limited by maximum junction temperature

Note2: For TO-263

Typical Characteristics

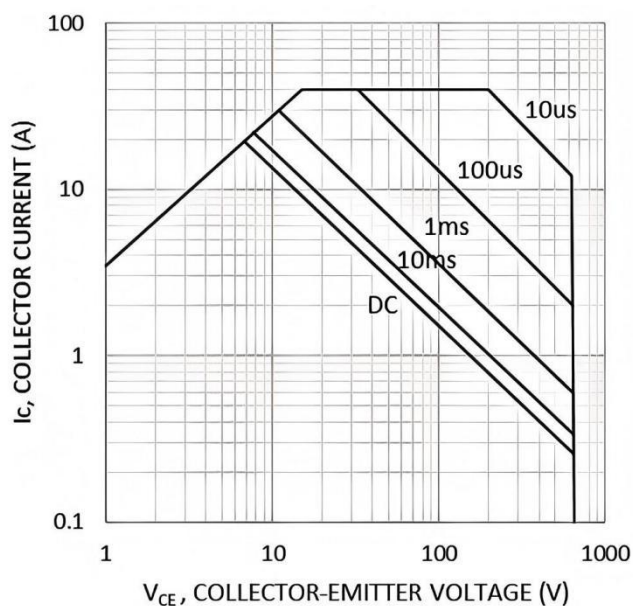


Fig. 1 Forward bias safe operating area
($T_C=25^{\circ}C, T_J=175^{\circ}C$, Single Pulse)

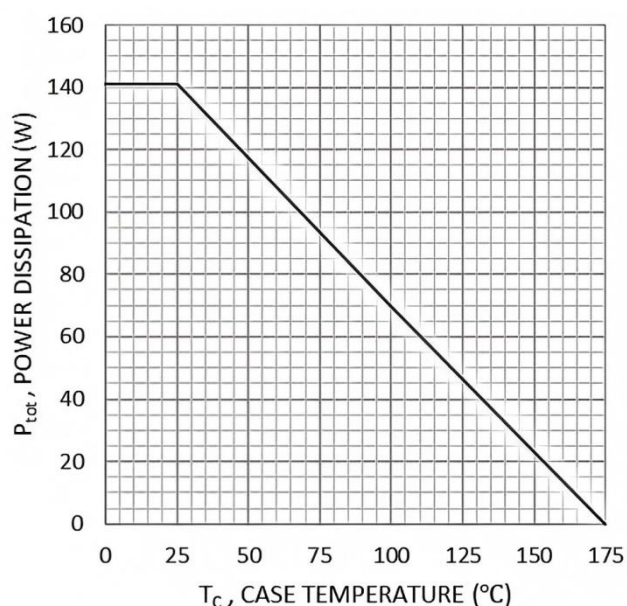


Fig. 2 Power dissipation as a function of case
temperature ($T_J \leq 175^{\circ}C$)

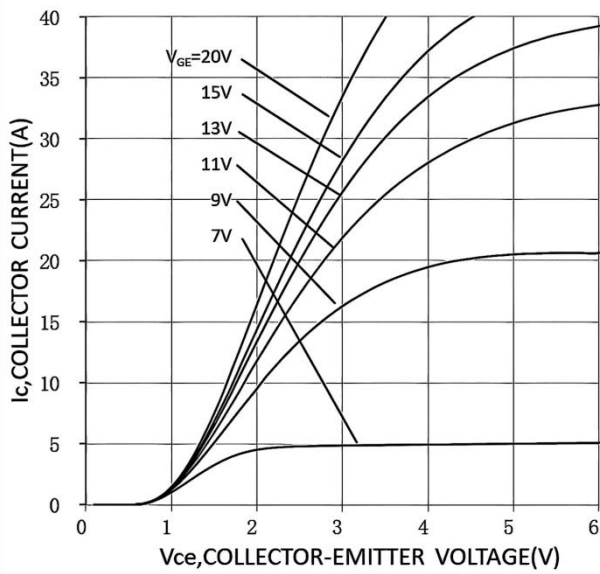


Fig. 3 Typical output characteristic ($T_{vj}=25^\circ\text{C}$)

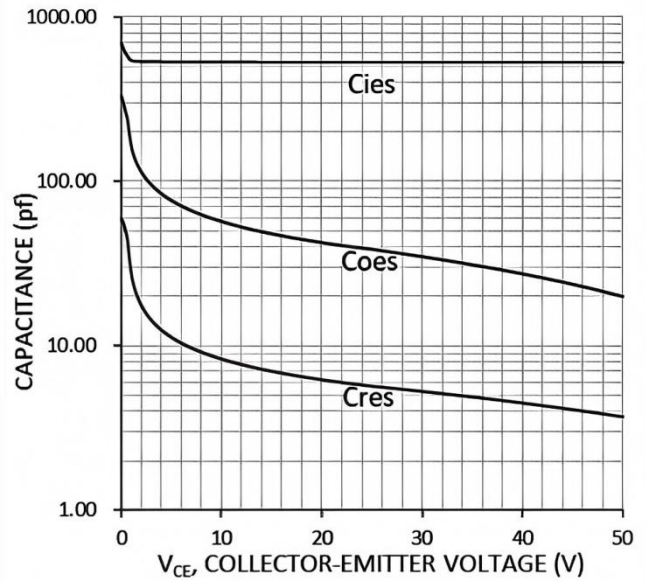


Fig. 4 Typical capacitance as a function of collector-emitter voltage ($V_{ge}=0\text{V}$, $f=1\text{MHz}$)

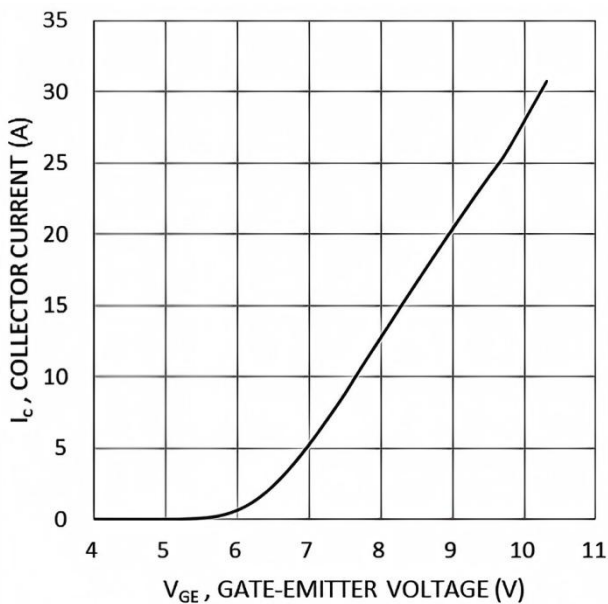


Fig. 5 Typical transfer characteristics ($V_{ce}=10\text{V}$)

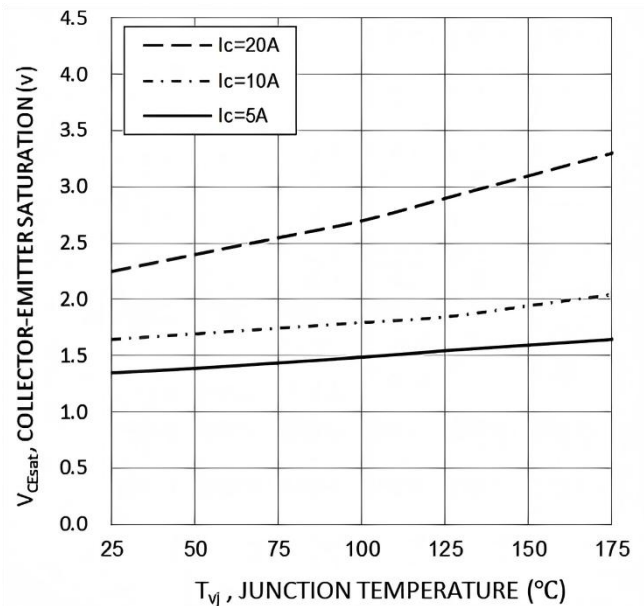


Fig. 6 Typical collector-emitter saturation voltage as a function of junction temperature ($V_{ge}=15\text{V}$)

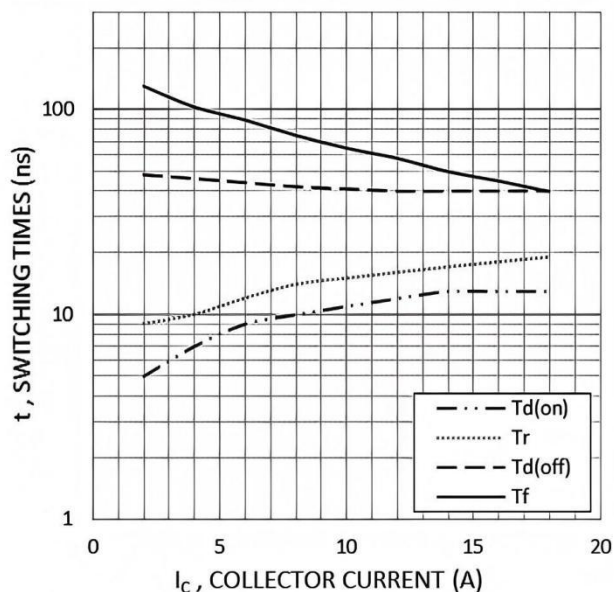


Fig. 7 Typical switching times as a function of collector current (inductive load, $T_{vj}=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $R_G=10\Omega$)

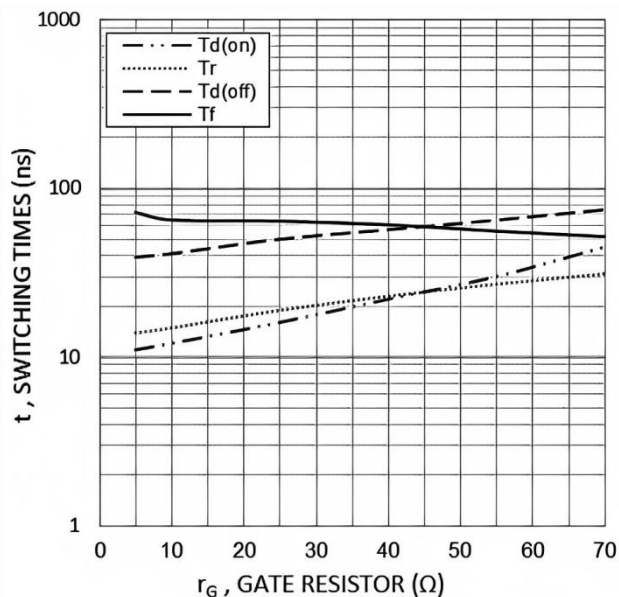


Fig. 8 Typical switching times as a function of gate resistor (inductive load, $T_{vj}=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=10\text{A}$)

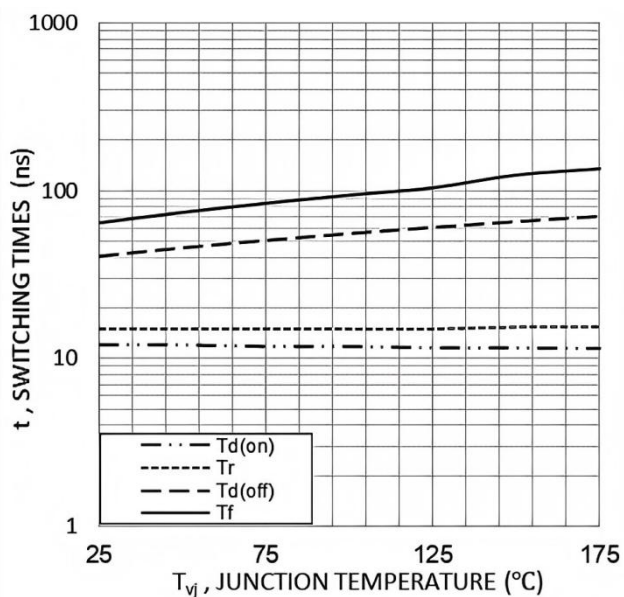


Fig. 9 Typical switching times as a function of junction temperature (inductive load, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=10\text{A}$, $R_G=10\Omega$)

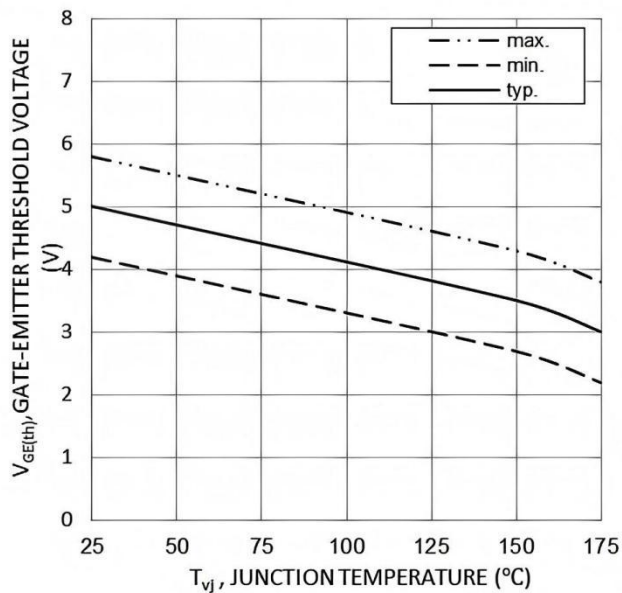


Fig. 10 Gate-emitter threshold voltage as a function of junction temperature ($I_C=0.2\text{mA}$)

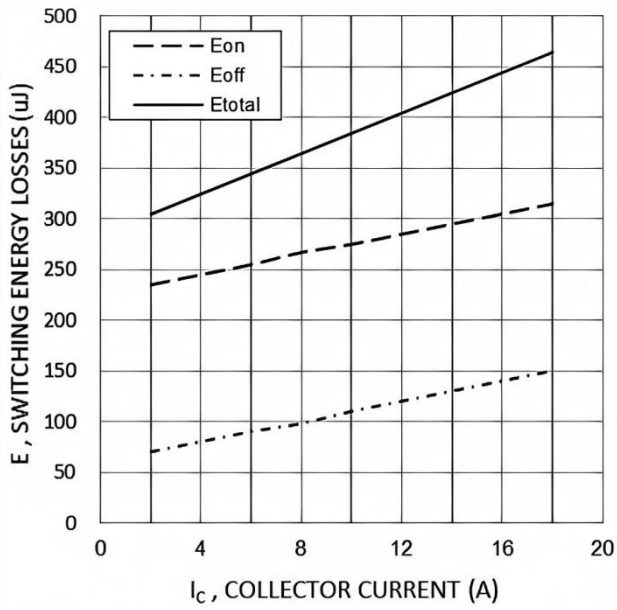


Fig. 11 Typical switching energy losses as a function of collector current (inductive load, $T_{vj}=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $R_G=10\Omega$)

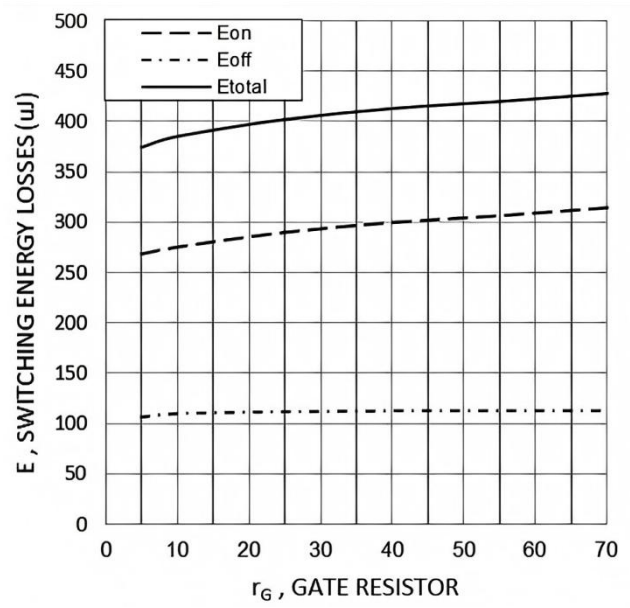


Fig. 12 Typical switching energy losses as a function of gate resistor (inductive load, $T_{vj}=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=10\text{A}$)

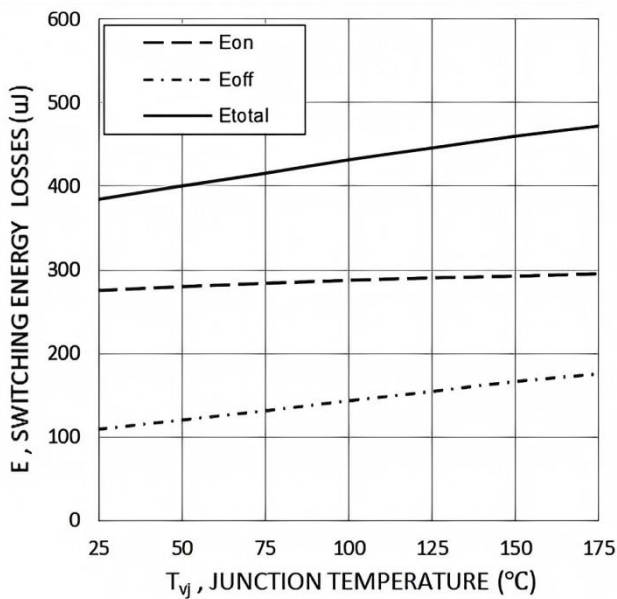


Fig. 13 Typical switching energy losses as a function of junction temperature (inductive load, $V_{CE}=400\text{V}$, $V_{GE}=15/0\text{V}$, $I_C=10\text{A}$, $R_G=10\Omega$)

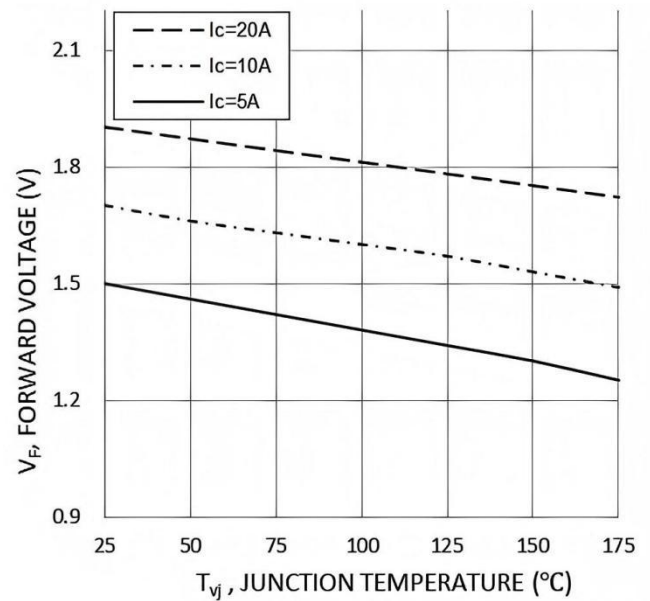


Fig. 14 Typical diode forward voltage as a function of junction temperature

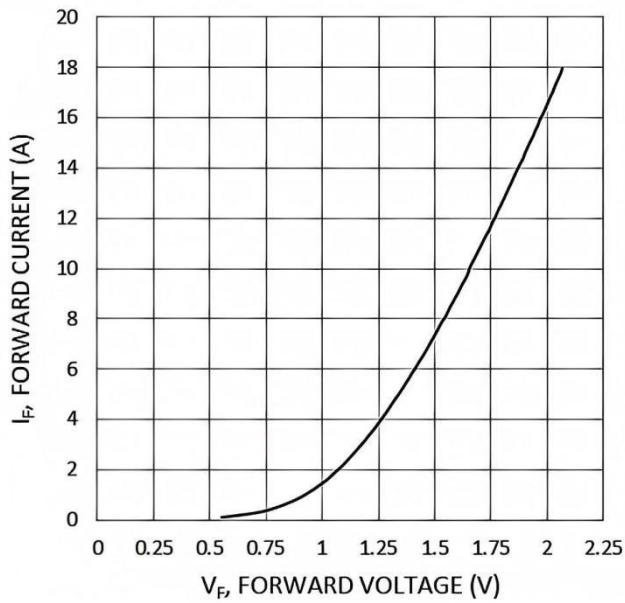


Fig. 15 Typical diode forward current as a function of forward voltage

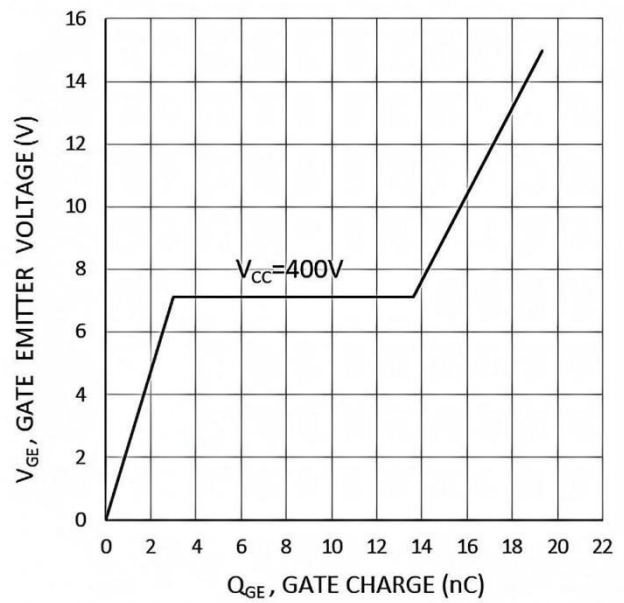


Fig. 16 Typical gate charge ($I_C=10A$)

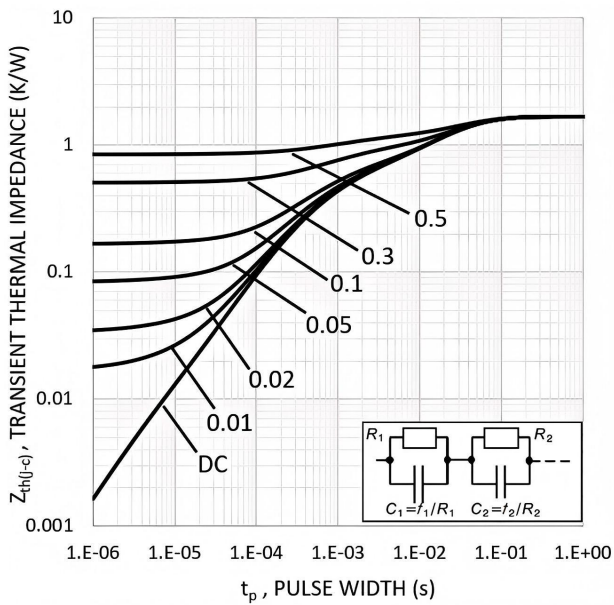


Fig. 17 IGBT transient thermal impedance ($D=tp/T$) (TO-263)

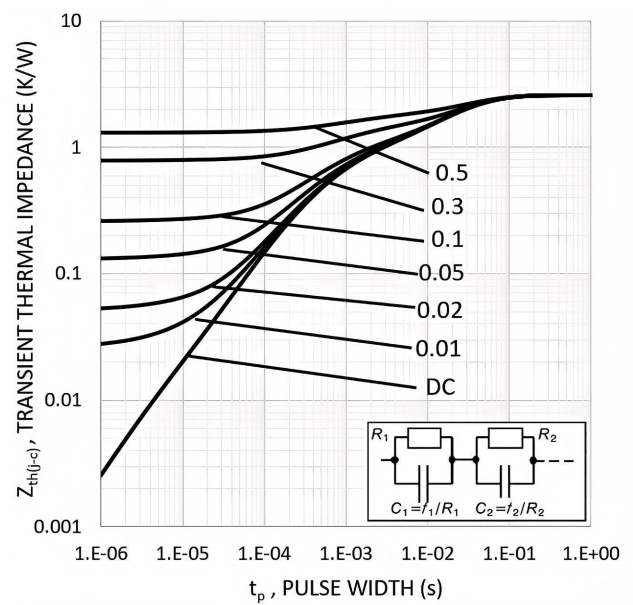
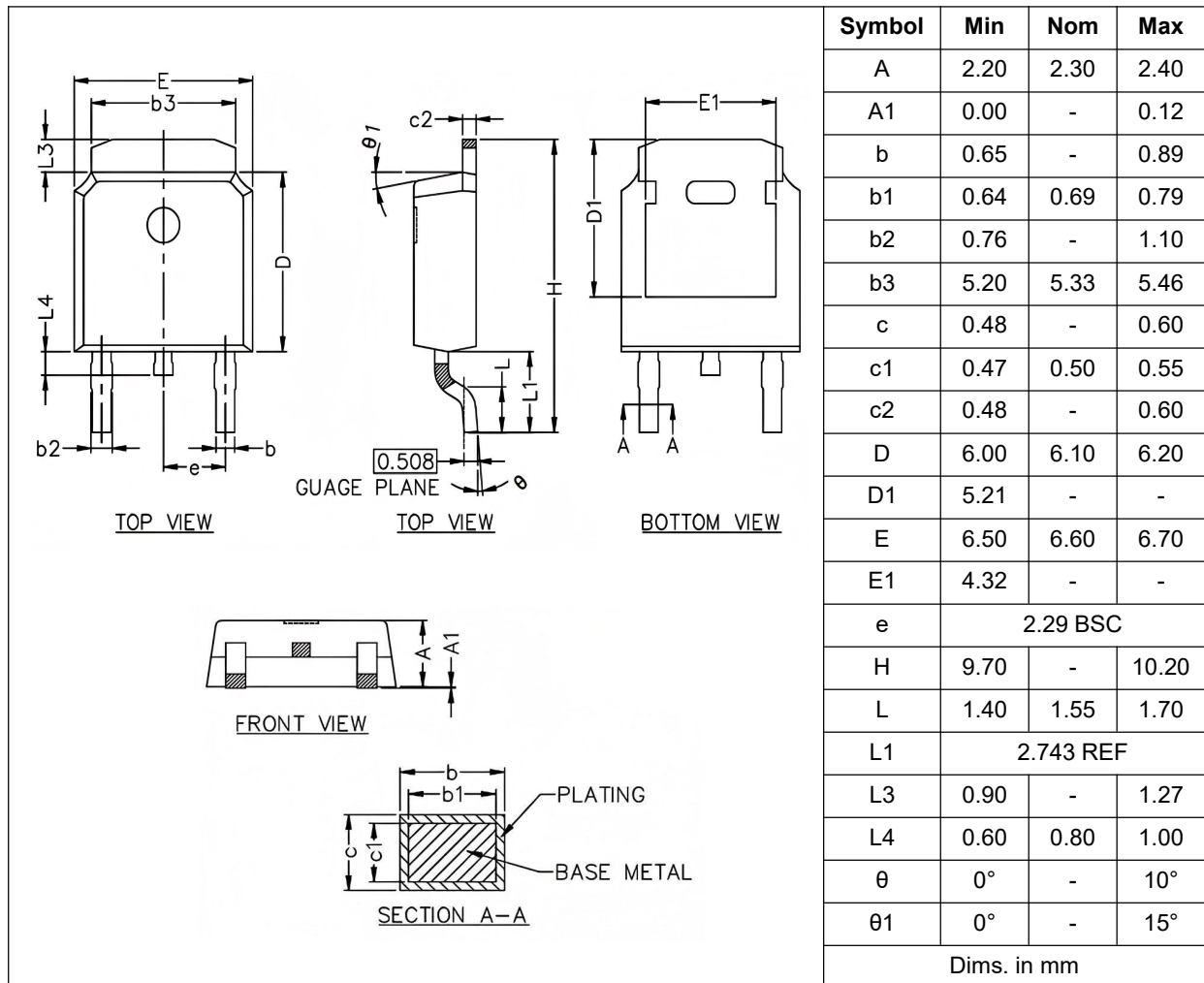


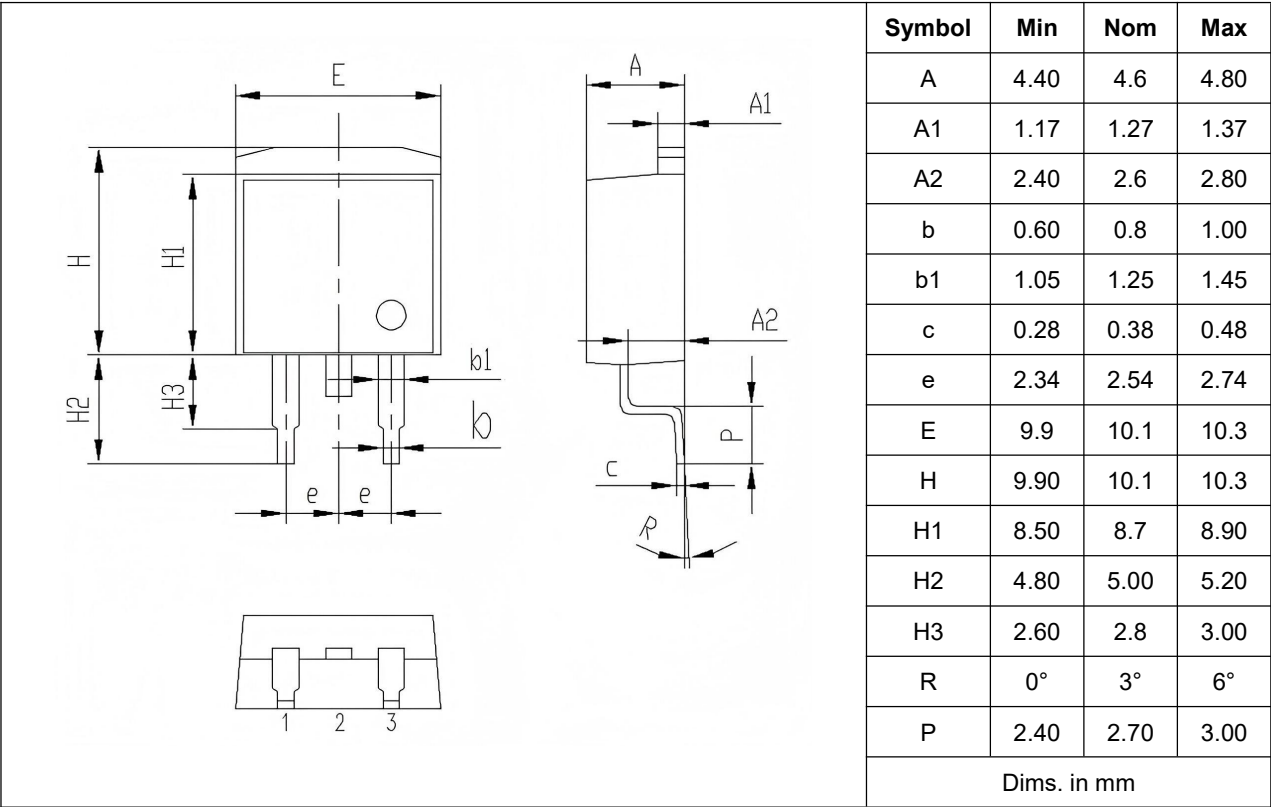
Fig. 18 FRD transient thermal impedance ($D=tp/T$) (TO-263)

Package Outlines (Unit: mm)

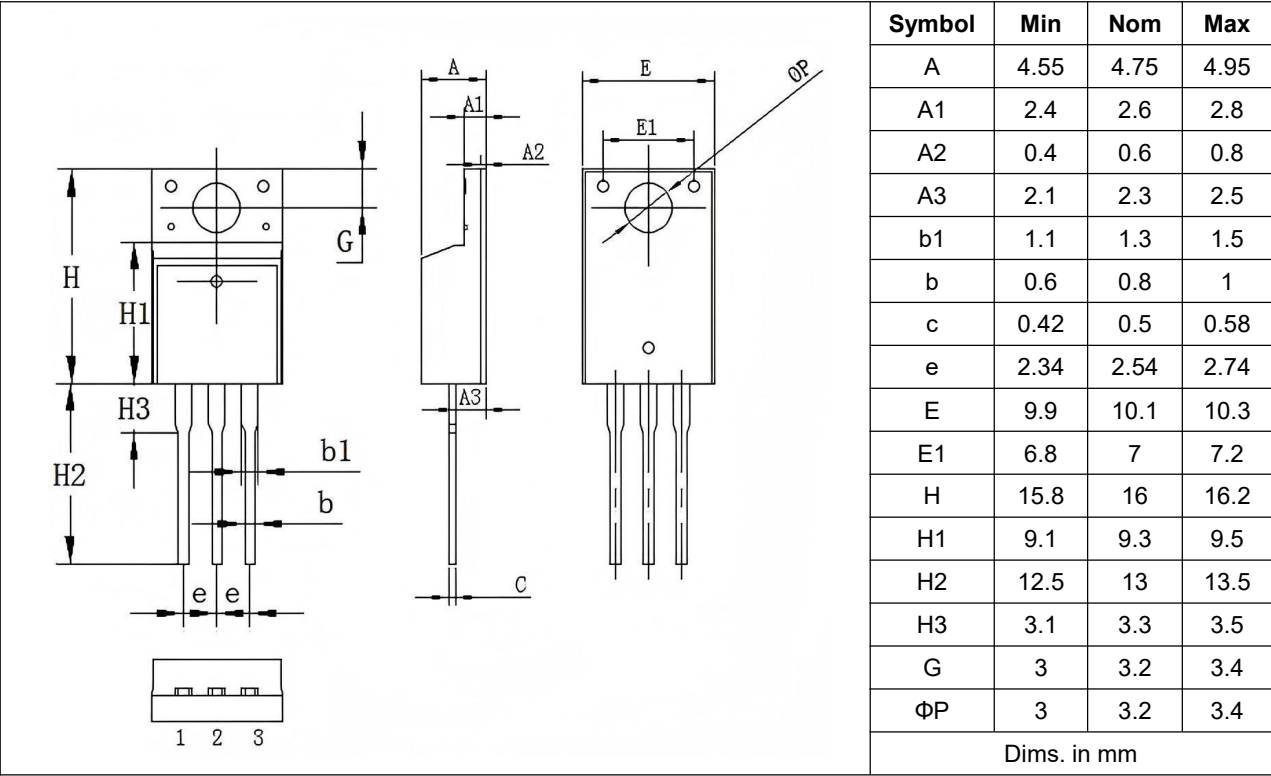
TO-252



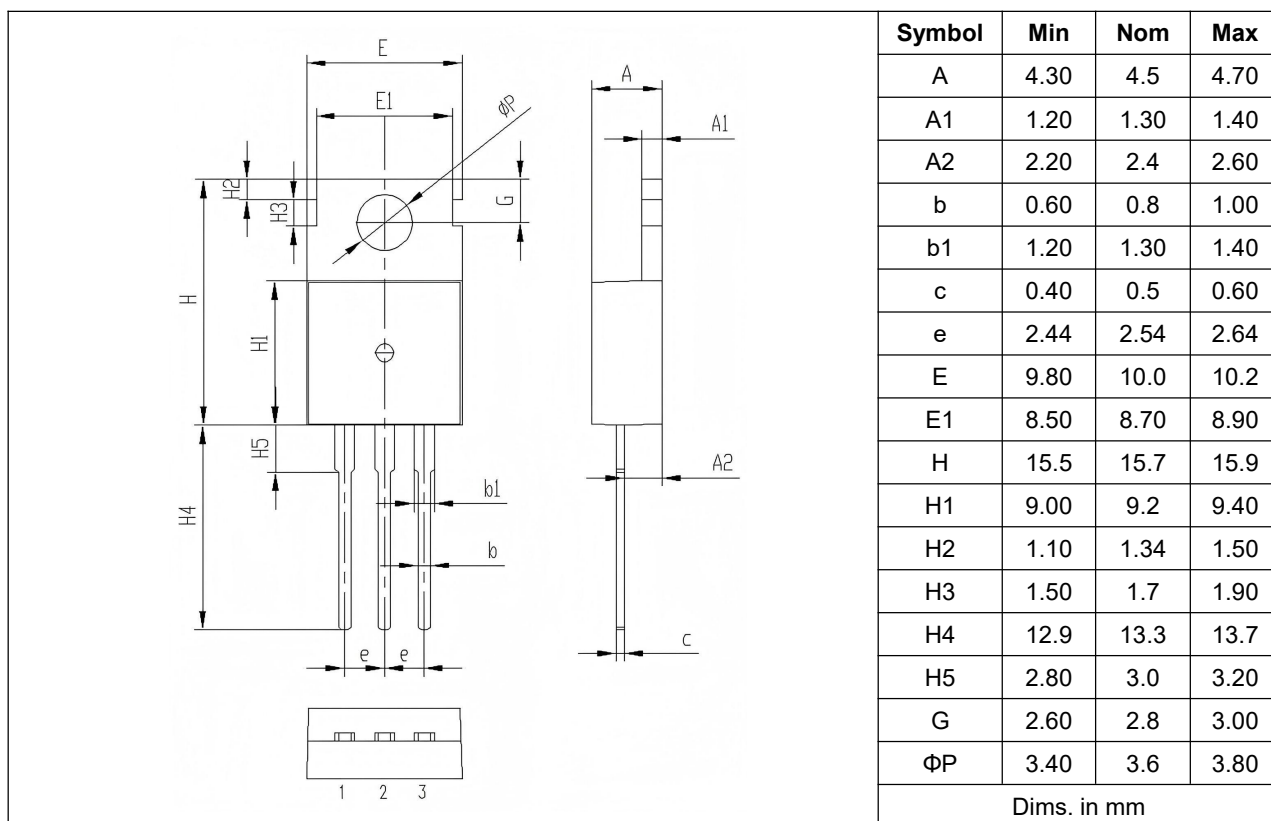
TO-263



TO-220F



TO-220



***Important Usage Information and Disclaimer**

The specifications of Zhuhai Hypersemi Co., Ltd. products are not guarantees of product characteristics. They reflect typical performance expected in standard applications, which may vary with specific uses. Users must conduct prior testing for their applications and make necessary adjustments.

Users are responsible for the safety of applications utilizing our products and must implement adequate safety measures to prevent physical injury, fire, or other risks in case of product failure. It is the user's duty to ensure that application designs comply with all applicable laws and standards. Our products must not be used in any applications where a product failure could reasonably result in personal injury, unless specifically authorized in a signed document by Zhuhai Hypersemi Co., Ltd.

No representations or warranties are made regarding the accuracy or completeness of this information, including any claims of non-infringement of third-party intellectual property rights. Zhuhai Hypersemi Co., Ltd. assumes no liability for any applications or uses of its products and does not grant any licenses to its intellectual property rights or those of others. We also make no claims regarding non-infringement of third-party intellectual property rights that may arise from applications.

Due to technical requirements, our products may contain hazardous substances. For details, please contact your nearest sales office. This document replaces all previous information and may be updated. We reserve the right to make changes.