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March 2016

# FGH40T70SHD

## 700 V, 40 A Field Stop Trench IGBT

### Features

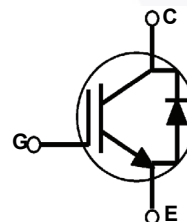
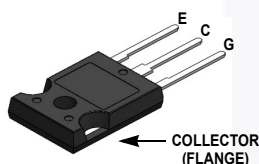
- Maximum Junction Temperature :  $T_J = 175^{\circ}\text{C}$
- Positive Temperature Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage:  $V_{CE(sat)} = 1.7\text{ V (Typ.) @ } I_C = 40\text{ A}$
- 100% of the Parts Tested for  $I_{LM}(1)$
- High Input Impedance
- Fast Switching
- Tighten Parameter Distribution
- RoHS Compliant

### General Description

Using novel field stop IGBT technology, Fairchild's new series of field stop 3<sup>rd</sup> generation IGBTs offer the optimum performance for solar inverter, UPS, welder, telecom, ESS and PFC applications where low conduction and switching losses are essential.

### Applications

- Solar Inverter, UPS, Welder, Telecom, ESS, PFC



### Absolute Maximum Ratings $T_C = 25^{\circ}\text{C}$ unless otherwise noted

Symbol	Description	FGH40T70SHD_F155	Unit
$V_{CES}$	Collector to Emitter Voltage	700	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 20$	V
	Transient Gate to Emitter Voltage	$\pm 30$	V
$I_C$	Collector Current @ $T_C = 25^{\circ}\text{C}$	80	A
	Collector Current @ $T_C = 100^{\circ}\text{C}$	40	A
$I_{LM(1)}$	Pulsed Collector Current @ $T_C = 25^{\circ}\text{C}$	120	A
$I_{CM(2)}$	Pulsed Collector Current	120	A
$I_F$	Diode Forward Current @ $T_C = 25^{\circ}\text{C}$	40	A
	Diode Forward Current @ $T_C = 100^{\circ}\text{C}$	20	A
$I_{FM(2)}$	Pulsed Diode Maximum Forward Current	120	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^{\circ}\text{C}$	268	W
	Maximum Power Dissipation @ $T_C = 100^{\circ}\text{C}$	134	W
$T_J$	Operating Junction Temperature	-55 to +175	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature Range	-55 to +175	$^{\circ}\text{C}$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^{\circ}\text{C}$

#### Notes:

1.  $V_{CC} = 400\text{ V}$ ,  $V_{GE} = 15\text{ V}$ ,  $I_C = 120\text{ A}$ ,  $R_G = 30\ \Omega$ , Inductive Load
2. Repetitive rating: Pulse width limited by max. junction temperature

## Thermal Characteristics

Symbol	Parameter	FGH40T70SHD_F155	Unit
$R_{\theta JC}$ (IGBT)	Thermal Resistance, Junction to Case, Max.	0.56	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$ (Diode)	Thermal Resistance, Junction to Case, Max.	1.71	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	$^{\circ}\text{C}/\text{W}$

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGH40T70SHD_F155	FGH40T70SHD	TO-247 G03	Tube	N/A	N/A	30

## Electrical Characteristics of the IGBT $T_C = 25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV <sub>CES</sub>	Collector to Emitter Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 1 mA	700	-	-	V
ΔBV <sub>CES</sub> / ΔT <sub>J</sub>	Temperature Coefficient of Breakdown Voltage	I <sub>C</sub> = 1 mA, Reference to 25°C	-	0.6	-	V/°C
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0 V	-	-	250	μA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0 V	-	-	±400	nA
On Characteristics						
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 40 mA, V <sub>CE</sub> = V <sub>GE</sub>	4.0	5.5	7.5	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 40 A, V <sub>GE</sub> = 15 V	-	1.7	2.15	V
		I <sub>C</sub> = 40 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 175°C	-	2.37	-	V
Dynamic Characteristics						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 30 V, V <sub>GE</sub> = 0 V, f = 1MHz	-	2028	-	pF
C <sub>oes</sub>	Output Capacitance		-	75	-	pF
C <sub>res</sub>	Reverse Transfer Capacitance		-	26	-	pF
Switching Characteristics						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 400 V, I <sub>C</sub> = 40 A, R <sub>G</sub> = 6 Ω, V <sub>GE</sub> = 15 V, Inductive Load, T <sub>C</sub> = 25°C	-	22	-	ns
t <sub>r</sub>	Rise Time		-	40	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	66	-	ns
t <sub>f</sub>	Fall Time		-	10	-	ns
E <sub>on</sub>	Turn-On Switching Loss		-	1150	-	μJ
E <sub>off</sub>	Turn-Off Switching Loss		-	271	-	μJ
E <sub>ts</sub>	Total Switching Loss		-	1421	-	μJ
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 400 V, I <sub>C</sub> = 40 A, R <sub>G</sub> = 6 Ω, V <sub>GE</sub> = 15 V, Inductive Load, T <sub>C</sub> = 175°C	-	20	-	ns
t <sub>r</sub>	Rise Time		-	36	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	68	-	ns
t <sub>f</sub>	Fall Time		-	13	-	ns
E <sub>on</sub>	Turn-On Switching Loss		-	1760	-	μJ
E <sub>off</sub>	Turn-Off Switching Loss		-	455	-	μJ
E <sub>ts</sub>	Total Switching Loss		-	2215	-	μJ

**Electrical Characteristics of the IGBT** (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Unit
$Q_g$	Total Gate Charge	$V_{CE} = 400\text{ V}$ , $I_C = 40\text{ A}$ , $V_{GE} = 15\text{ V}$	-	69	-	nC
$Q_{ge}$	Gate to Emitter Charge		-	13	-	nC
$Q_{gc}$	Gate to Collector Charge		-	26	-	nC

**Electrical Characteristics of the Diode**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max	Unit
V <sub>FM</sub>	Diode Forward Voltage	I <sub>F</sub> = 20 A	T <sub>C</sub> = 25°C	-	2.0	2.5	V
			T <sub>C</sub> = 175°C	-	1.73	-	
E <sub>rec</sub>	Reverse Recovery Energy	I <sub>F</sub> =20 A, dI <sub>F</sub> /dt = 200 A/μs	T <sub>C</sub> = 175°C	-	54	-	uJ
t <sub>rr</sub>	Diode Reverse Recovery Time		T <sub>C</sub> = 25°C	-	37	-	ns
			T <sub>C</sub> = 175°C	-	235	-	
Q <sub>rr</sub>	Diode Reverse Recovery Charge		T <sub>C</sub> = 25°C	-	65	-	nC
			T <sub>C</sub> = 175°C	-	944	-	

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

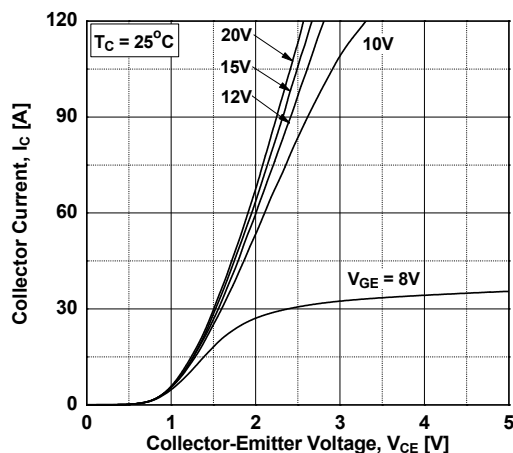


Figure 2. Typical Output Characteristics

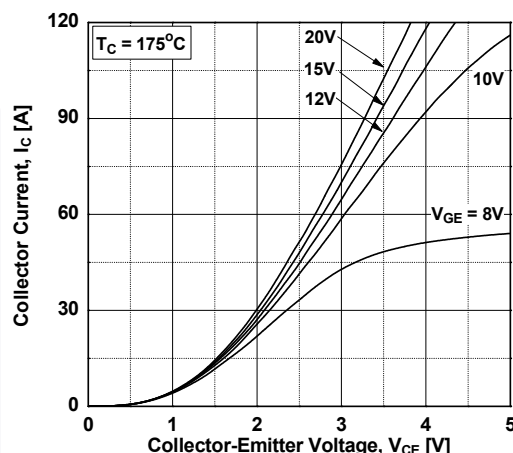


Figure 3. Typical Saturation Voltage Characteristics

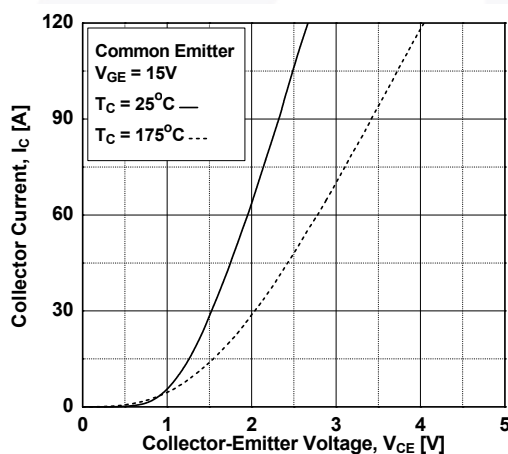


Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level

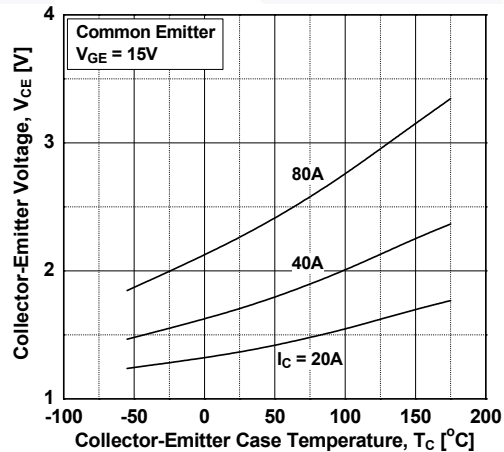


Figure 5. Saturation Voltage vs. Vge

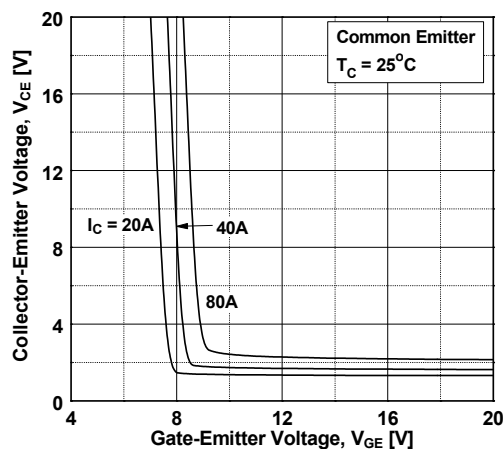
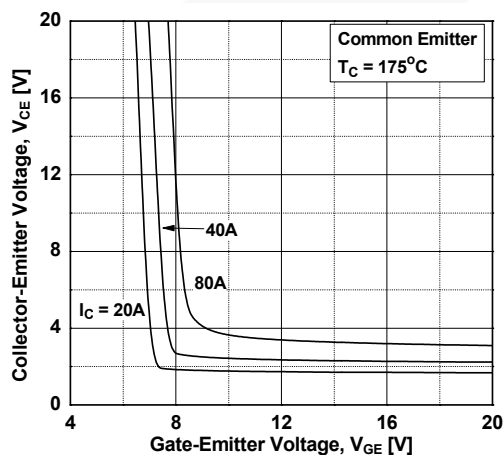


Figure 6. Saturation Voltage vs. Vge



## Typical Performance Characteristics

Figure 7. Capacitance Characteristics

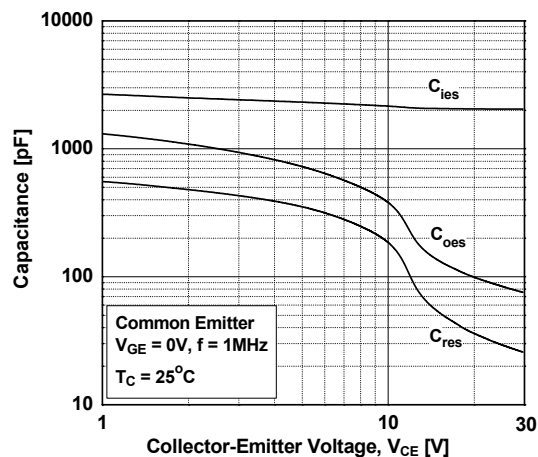


Figure 8. Gate charge Characteristics

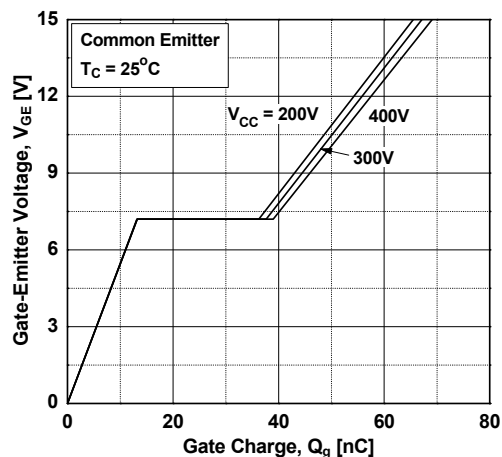


Figure 9. Turn-on Characteristics vs. Gate Resistance

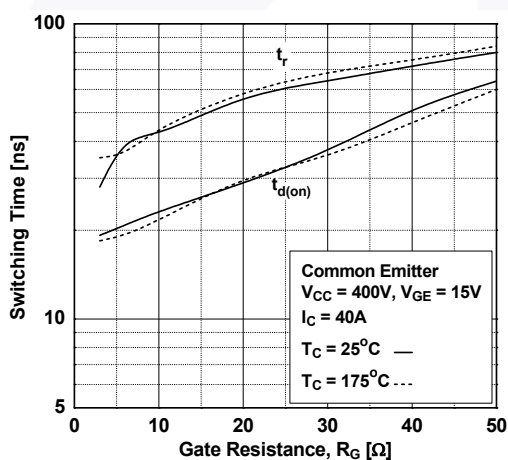


Figure 10. Turn-off Characteristics vs. Gate Resistance

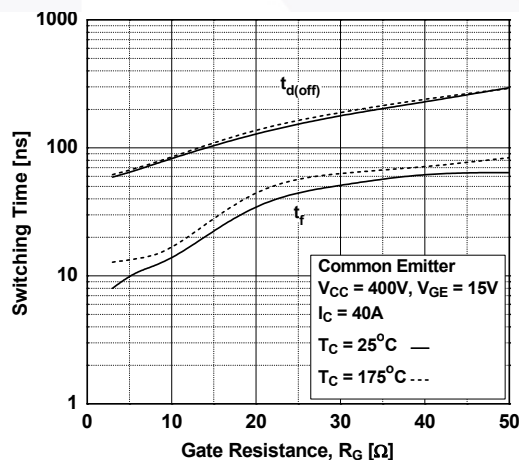


Figure 11. Switching Loss vs. Gate Resistance

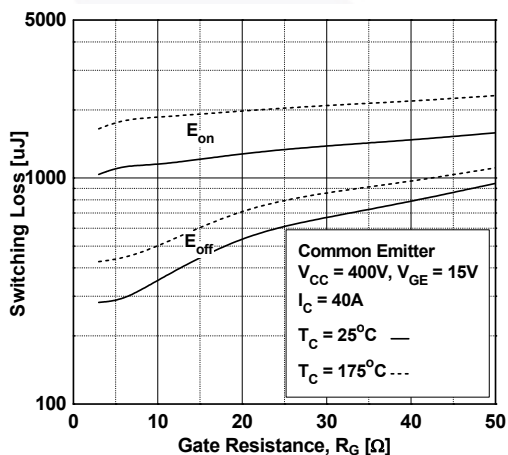
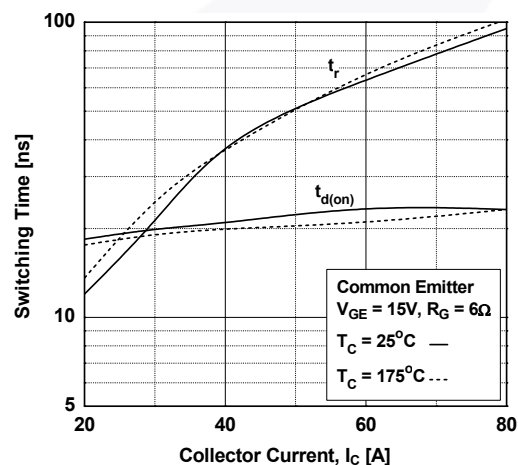


Figure 12. Turn-on Characteristics vs. Collector Current



## Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Collector Current

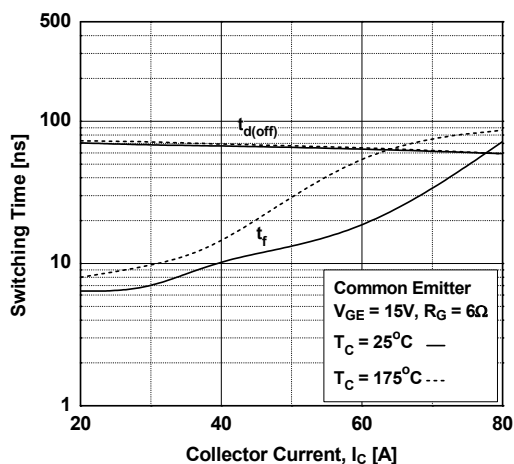


Figure 14. Switching Loss vs. Collector Current

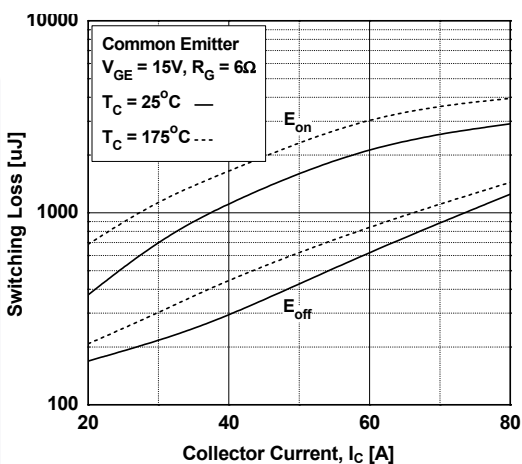


Figure 15. Load Current Vs. Frequency

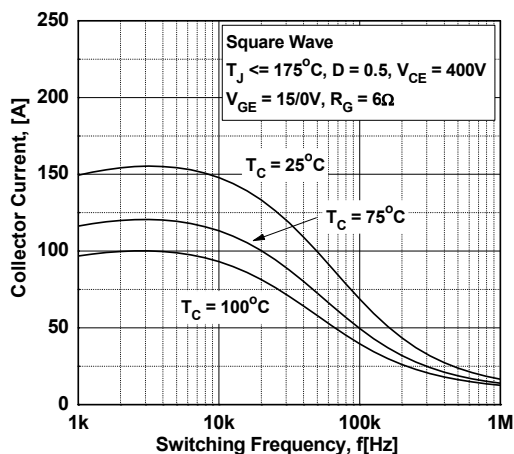


Figure 16. SOA Characteristics

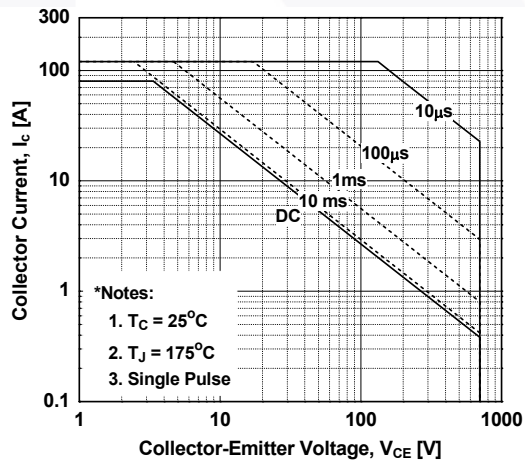


Figure 17. Forward Characteristics

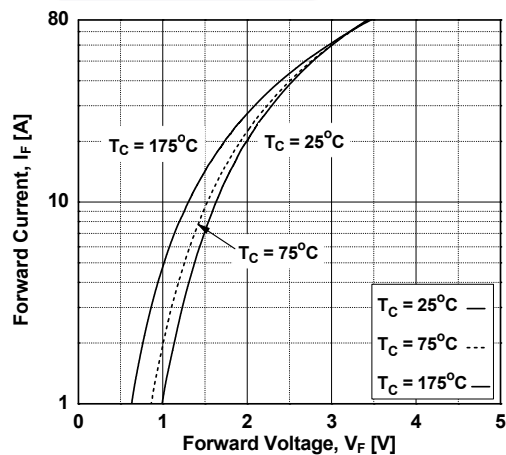
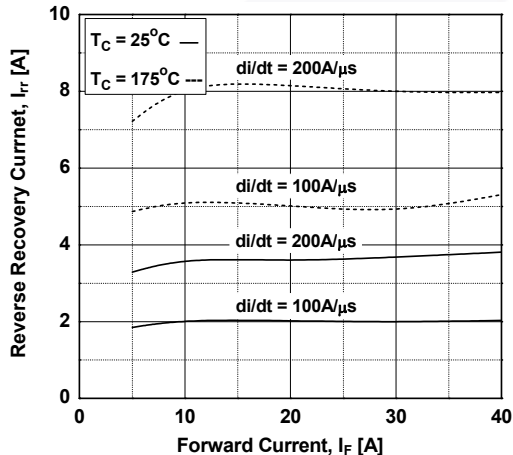


Figure 18. Reverse Recovery Current



## Typical Performance Characteristics

Figure 19. Reverse Recovery Time

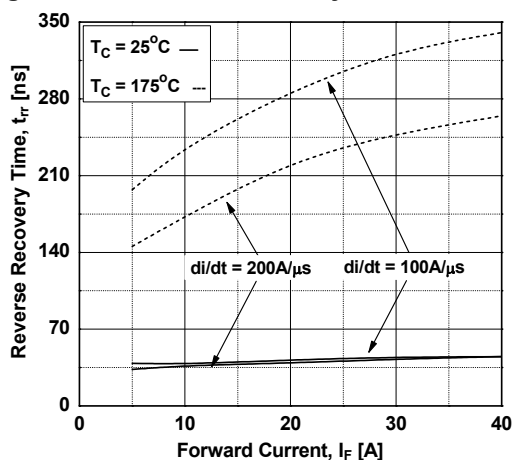


Figure 20. Stored Charge

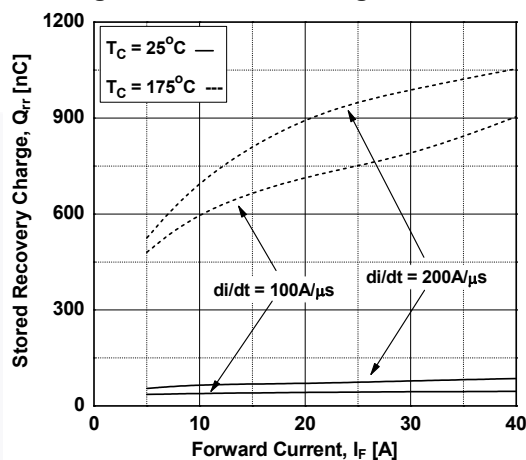


Figure 21. Transient Thermal Impedance of IGBT

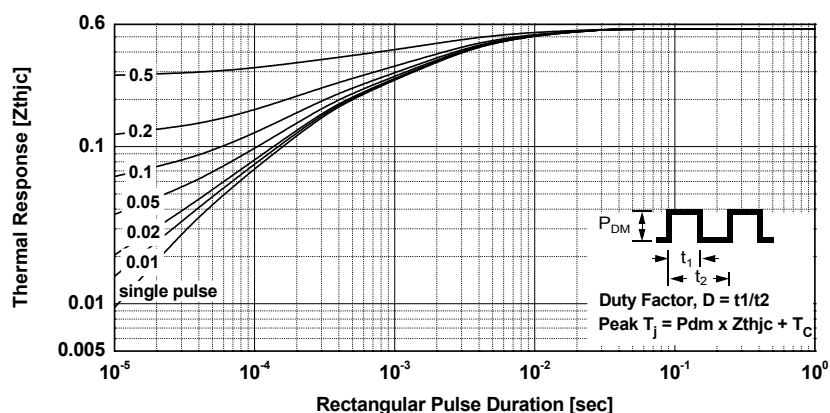
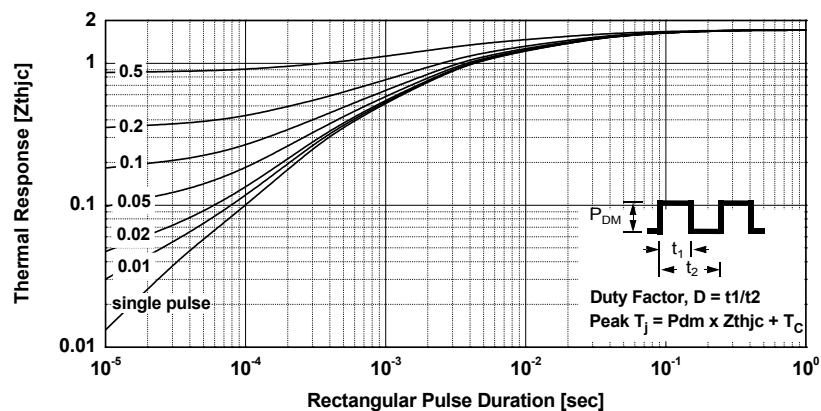


Figure 22. Transient Thermal Impedance of Diode





## Mechanical Dimensions

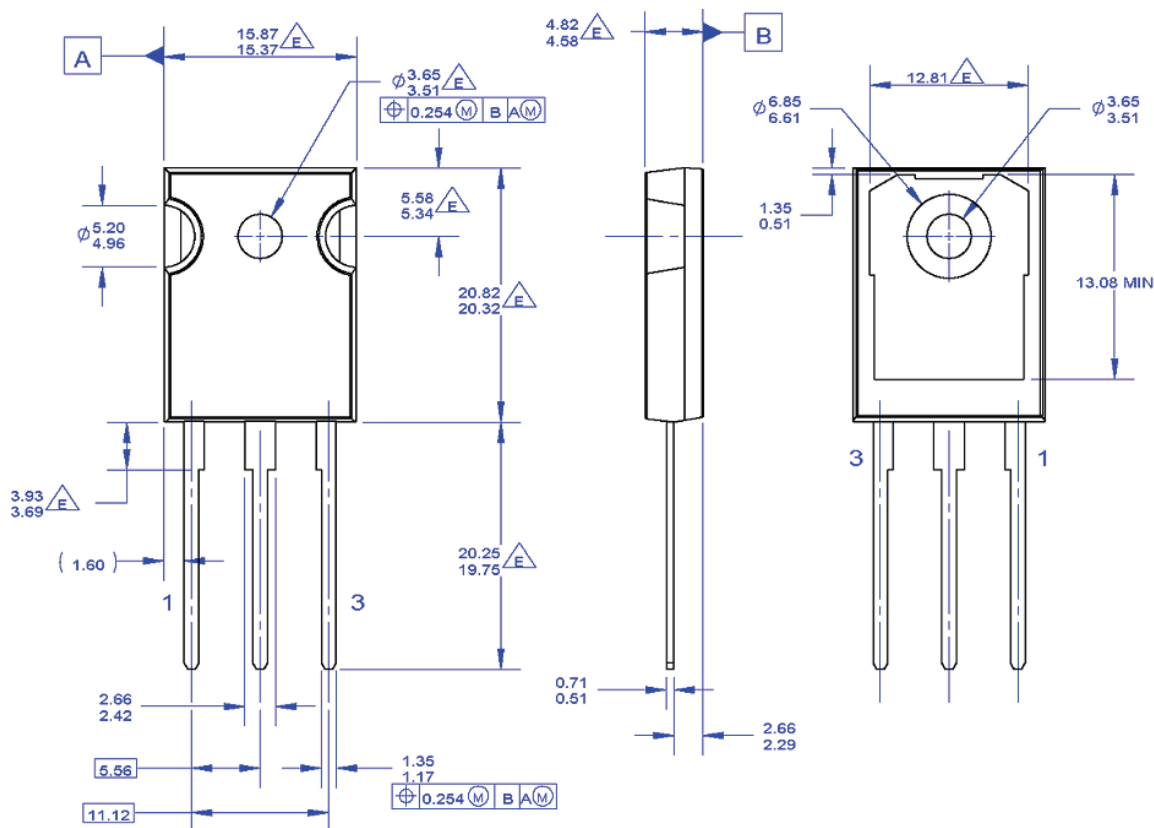


Figure 23. TO-247 3L - TO-247, MOLDED, 3 LEADS, JEDEC AB LONG LEADS





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Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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