FAIRCHILD SEMICONDUCTOR®

March 2013

FGP10N60UNDF

600 V, 10 A
Short Circuit Rated IGBT

Features

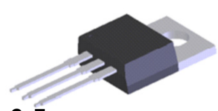
- Short Circuit Rated 10us
- High Current Capability
- High Input Impedance
- Fast Switching
- RoHS Compliant

General Description

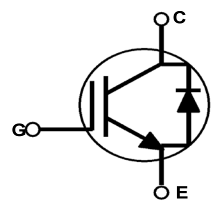
Using advanced NPT IGBT technology, Fairchild®'s the NPT IGBTs offer the optimum performance for low-power inverter-driven applications where low-losses and short-circuit ruggedness features are essential, such as sewing machine, CNC, motor control and home appliances.

Applications

- Sewing Machine, CNC, Home Appliances, Motor Control



TO-220



Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CES}	Collector to Emitter Voltage		600	V
V_{GES}	Gate to Emitter Voltage		$\pm$ 20	V
I_C	Collector Current	@ T_C = 25°C	20	A
	Collector Current	@ T_C = 100°C	10	A
$I_{CM\ (1)}$	Pulsed Collector Current	@ T_C = 25°C	30	A
I_F	Diode Forward Current	@ T_C = 25°C	10	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	139	W
	Maximum Power Dissipation	@ T_C = 100°C	56	W
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-55 to +150	°C

Notes:
1: Repetitive rating: Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case	-	0.9	°C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	-	3.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (PCB Mount)(2)	-	62.5	°C/W

Notes:
2: Mountde on 1" square PCB (FR4 or G-10 material)

Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGP10N60UNDF	FGP10N60UNDF	TO220	Tube	50ea	-

Electrical Characteristics of the IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0 V, I_C = 250 μA	600	-	-	V
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0 V	-	-	1	mA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0 V	-	-	±10	uA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 10 mA, V_{CE} = V_{GE}	5.5	6.8	8.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 10 A, V_{GE} = 15 V	-	2	2.45	V
		I_C = 10 A, V_{GE} = 15 V, T_C = 125°C	-	2.3	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	-	517		pF
C_{oes}	Output Capacitance		-	65		pF
C_{res}	Reverse Transfer Capacitance		-	20		pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400 V, I_C = 10 A, R_G = 10 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25°C	-	8.0		ns
t_r	Rise Time		-	6.3		ns
$t_{d(off)}$	Turn-Off Delay Time		-	52.2		ns
t_f	Fall Time		-	19.1	24.8	ns
E_{on}	Turn-On Switching Loss		-	0.15		uJ
E_{off}	Turn-Off Switching Loss		-	0.05		uJ
E_{ts}	Total Switching Loss		-	0.2		uJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400 V, I_C = 10 A, R_G = 10 Ω, V_{GE} = 15 V, Inductive Load, T_C = 125°C	-	8.1		ns
t_r	Rise Time		-	7.3		ns
$t_{d(off)}$	Turn-Off Delay Time		-	55.1		ns
t_f	Fall Time		-	34.2		ns
E_{on}	Turn-On Switching Loss		-	0.22		uJ
E_{off}	Turn-Off Switching Loss		-	0.08		uJ
E_{ts}	Total Switching Loss		-	0.3		uJ
T_{sc}	Short Circuit Withstand Time	V_{CC} = 350 V, R_G = 100 Ω, V_{GE} = 15V , T_C = 150°C	10	-	-	µs

Electrical Characteristics of the IGBT T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Unit
Q_g	Total Gate Charge	V_{CE} = 400 V, I_C = 10 A, V_{GE} = 1 V	-	37		nC
Q_{ge}	Gate to Emitter Charge		-	5		nC
Q_{gc}	Gate to Collector Charge		-	21		nC

Electrical Characteristics of the Diode T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max	Unit
V_{FM}	Diode Forward Voltage	I_F = 10 A	T_C = 25°C	-	1.8	2.2	V
			T_C = 125°C	-	1.7		
t_{rr}	Diode Reverse Recovery Time	I_F = 10 A, dI_F/dt = 200 A/μs	T_C = 25°C	-	37.7		ns
			T_C = 125°C	-	78.9		
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	-	75		nC
			T_C = 125°C	-	221		

TTypical Performance Characteristics

Figure 1. Typical Output Characteristics

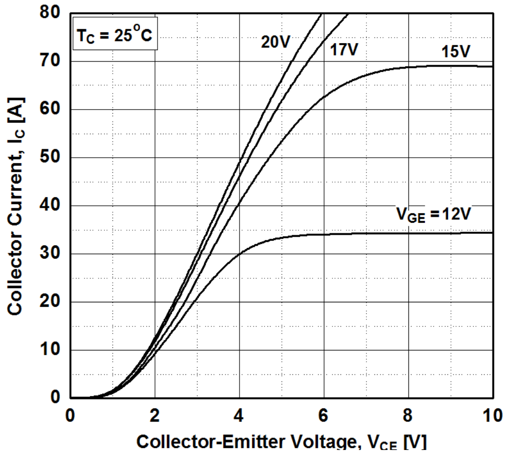


Figure 2. Typical Output Characteristics

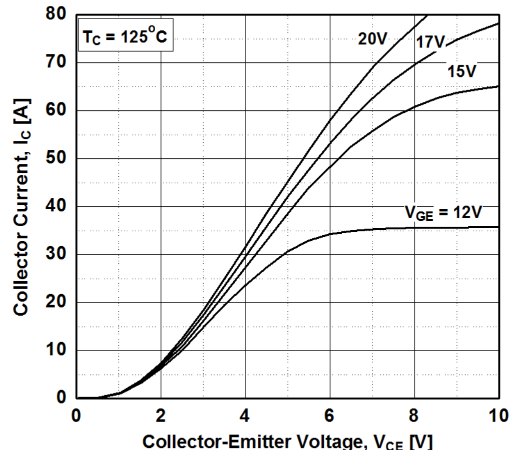


Figure 3. Typical Saturation Voltage Characteristics

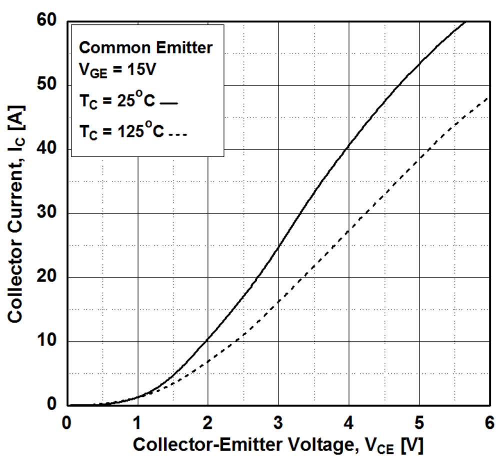


Figure 4. Transfer Characteristics

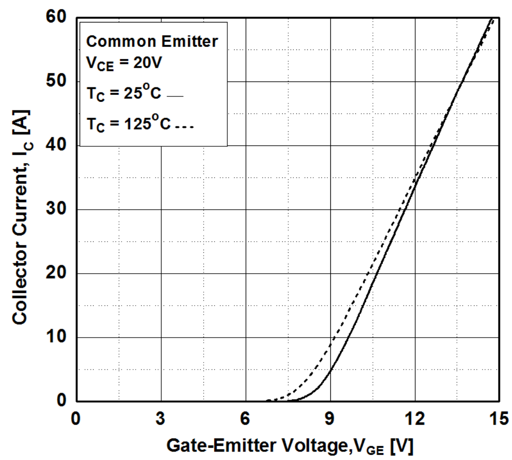


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

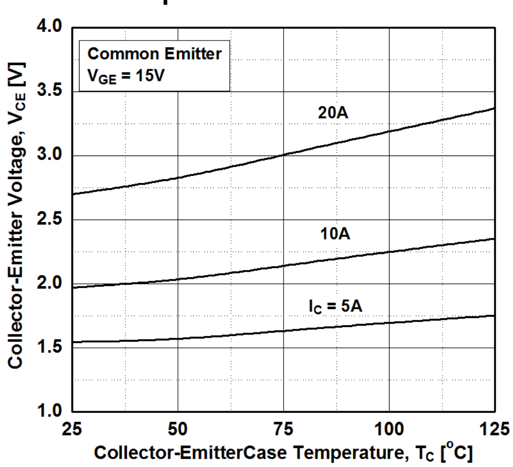
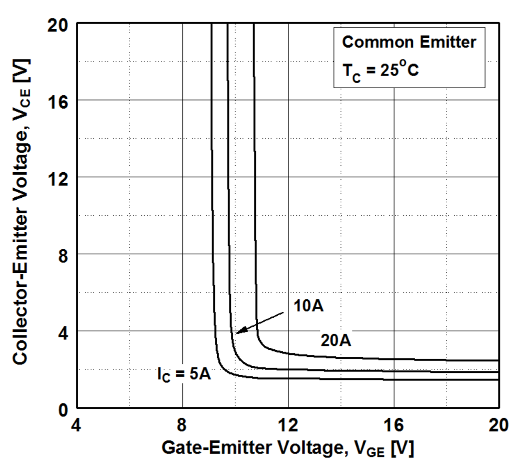


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

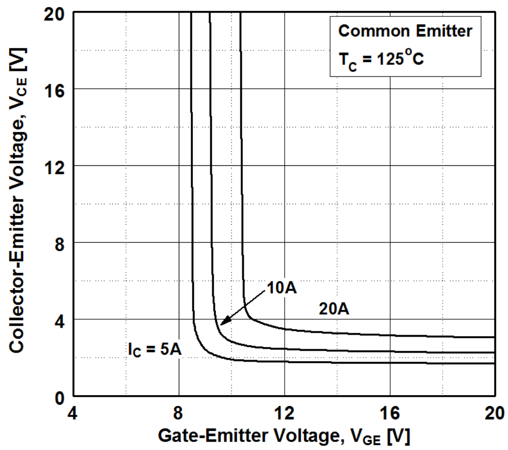


Figure 8. Capacitance Characteristics

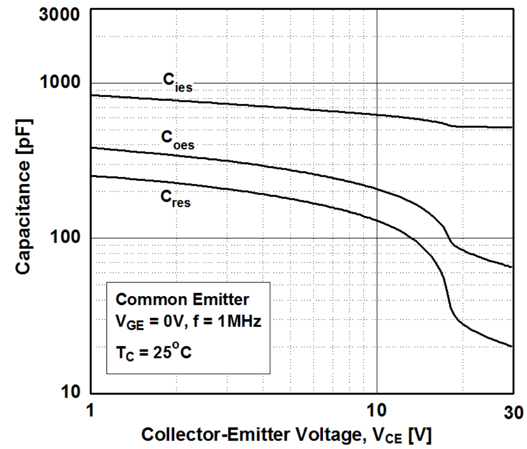


Figure 9. Gate charge Characteristics

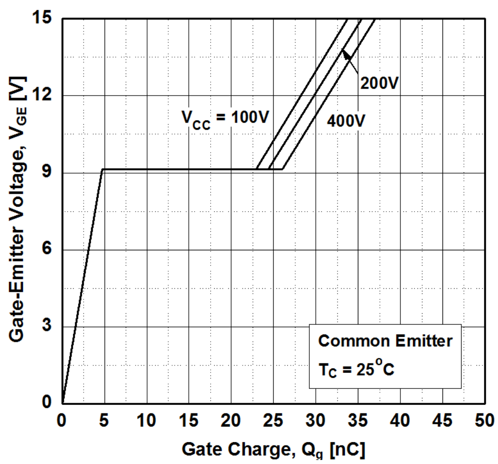


Figure 10. SOA Characteristics

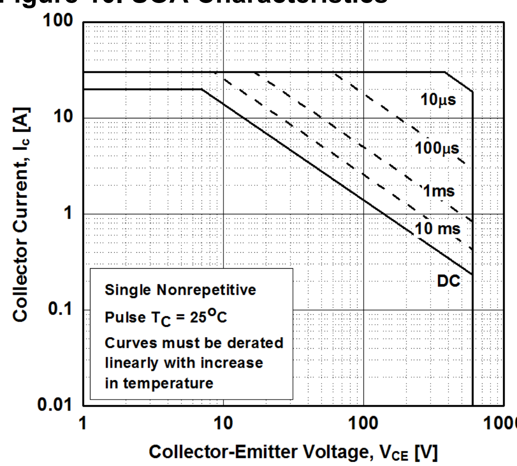


Figure 11. Turn-on Characteristics vs. Gate Resistance

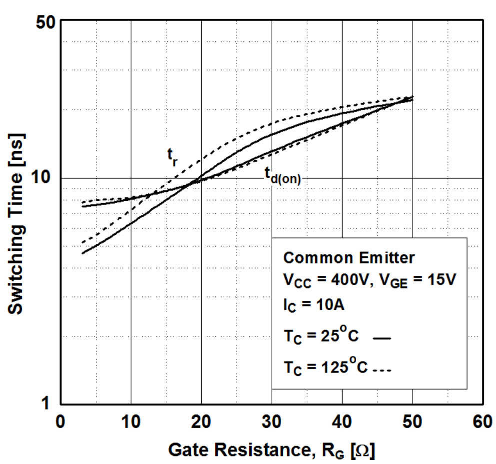
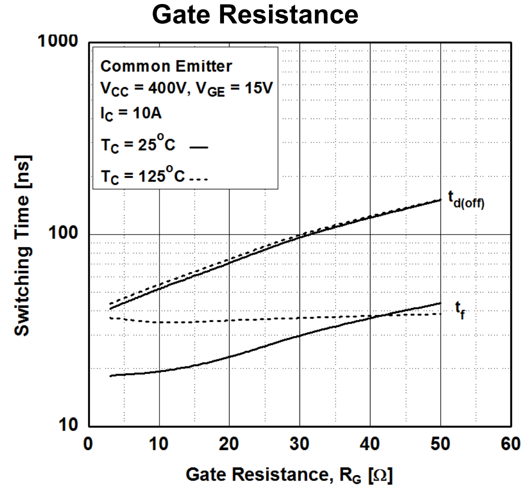


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

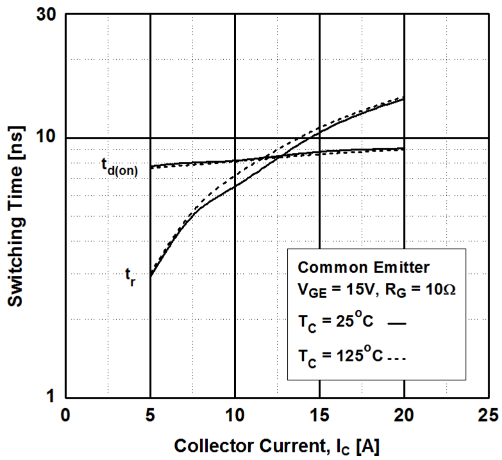


Figure 14. Turn-off Characteristics vs. Collector Current

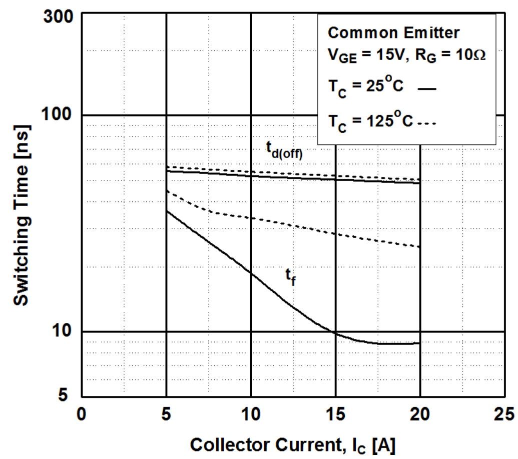


Figure 15. Switching Loss vs. Gate Resistance

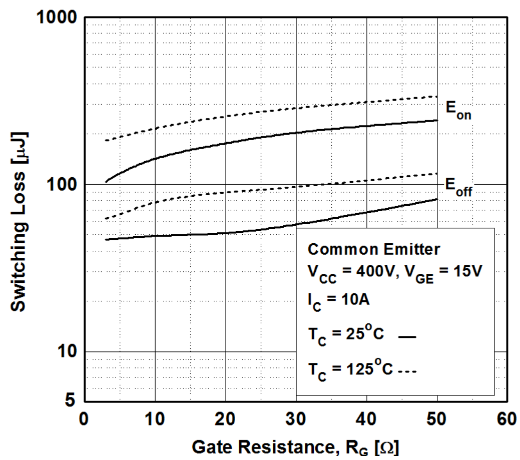


Figure 16. Switching Loss vs Collector Current

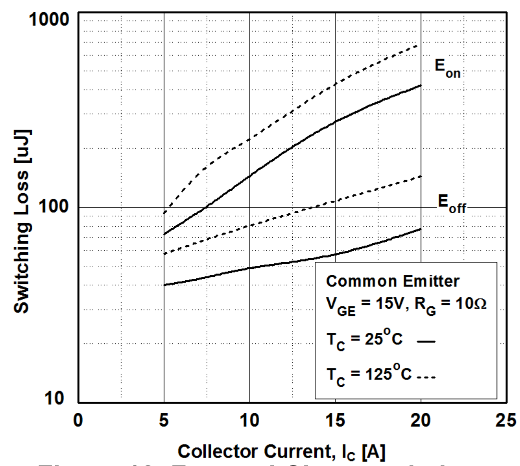


Figure 17. Turn off Switching SOA Characteristics

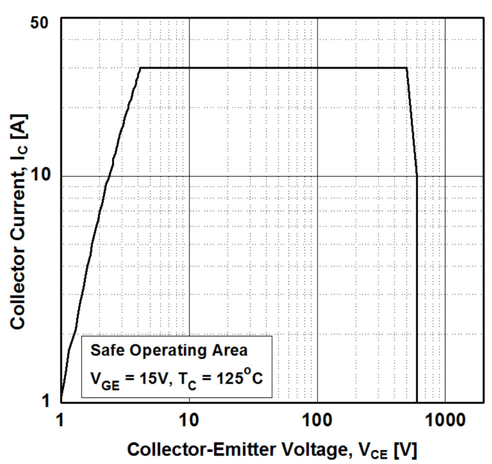
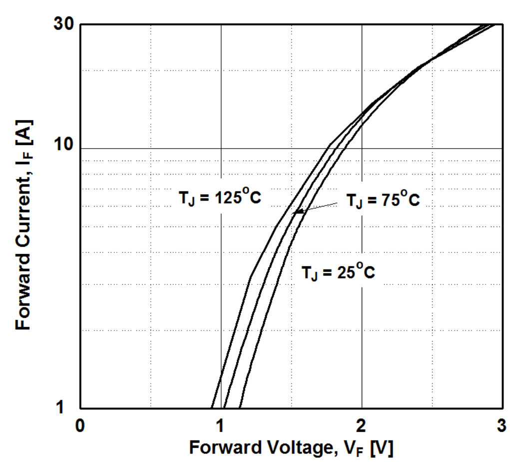


Figure 18. Forward Characteristics



Typical Performance Characteristics

Figure 19. Reverse Recovery Current

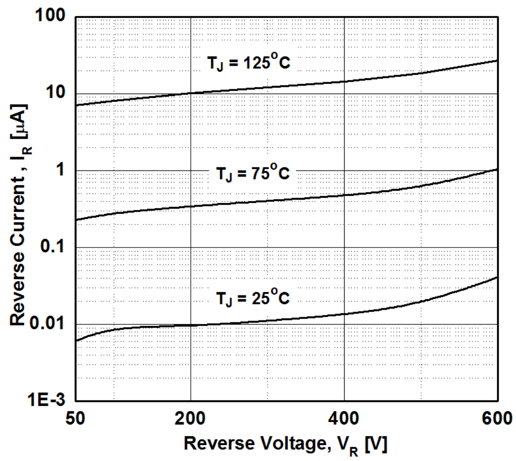


Figure 20. Stored Charge

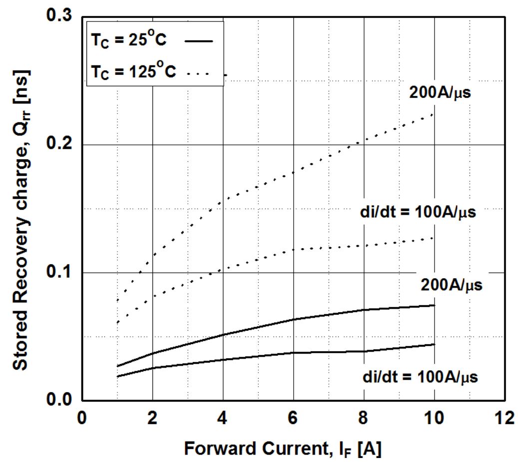


Figure 21. Reverse Recovery Time

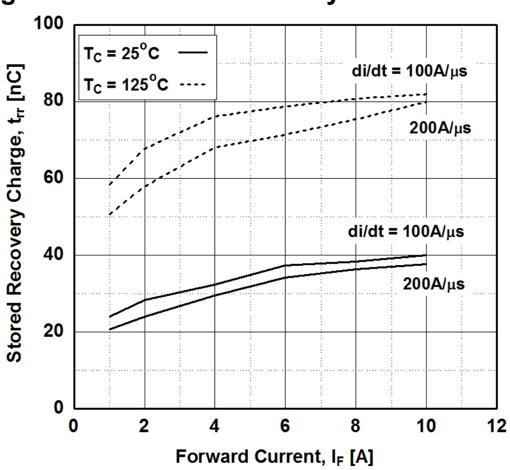
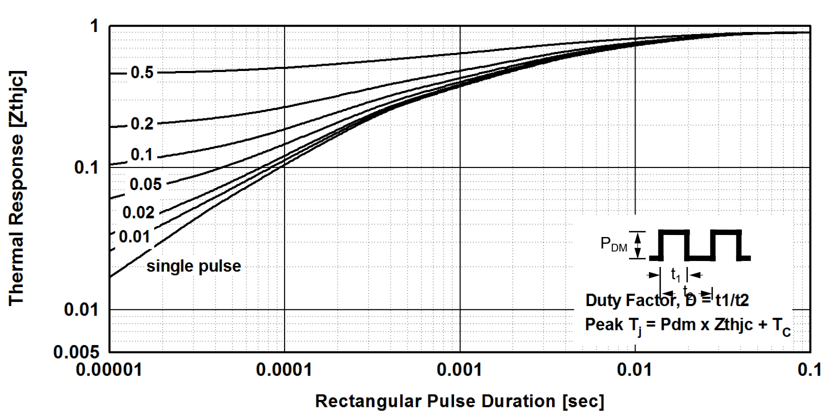
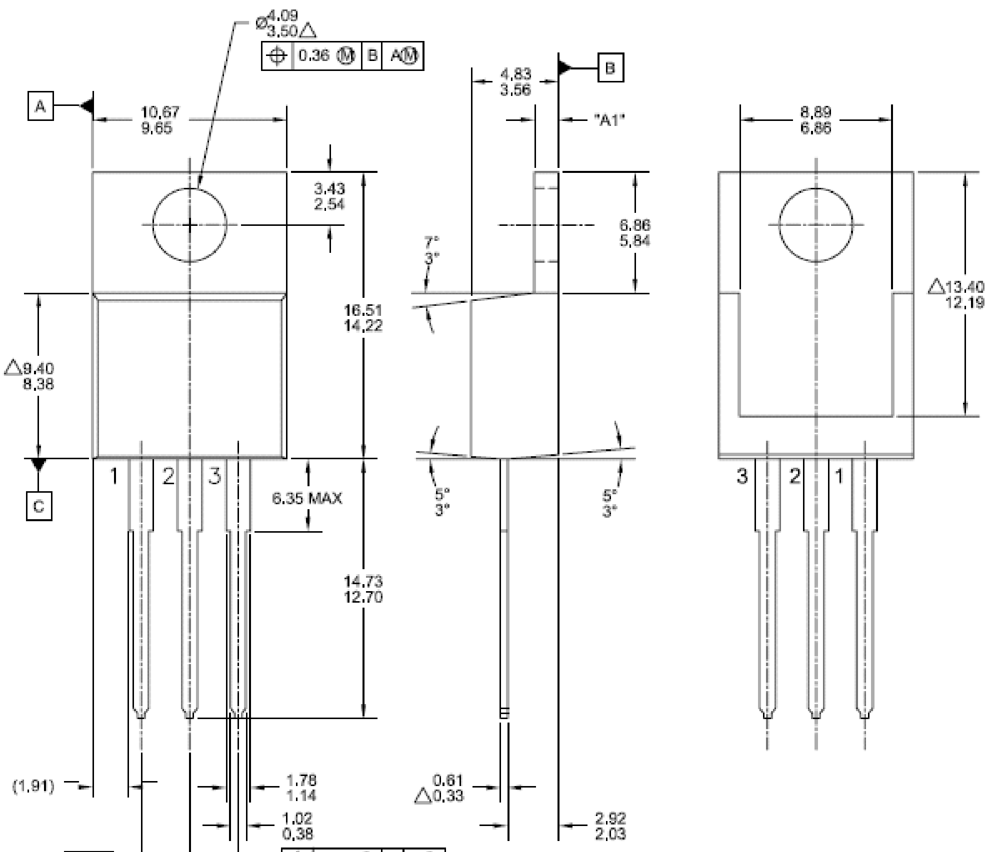


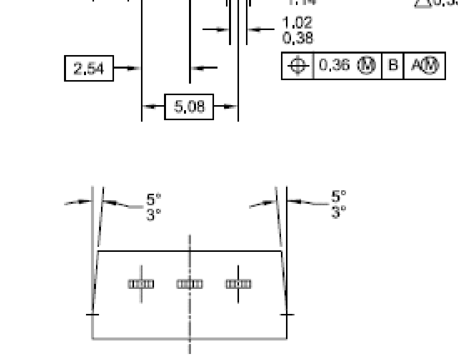
Figure 22.Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-220





NOTES: UNLESS OTHERWISE SPECIFIED
- A) REFERENCE JEDEC, TO-220, ISSUE K, VARIATION AB, DATED APRIL, 2002.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1973
- D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
- E) DOES NOT COMPLY JEDEC STANDARD VALUE.
- F) "A1" DIMENSIONS REPRESENT LIKE BELOW: SINGLE GAUGE = 0,51 - 0,61 DUAL GAUGE = 1.14 - 1.40
- G) DRAWING FILE NAME: TO220B03REV6

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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