

FGB5N60UNDF

600V, 5A

Short Circuit Rated IGBT

Features

- Short circuit rated 10us
- High current capability
- High input impedance
- Fast switching
- RoHS compliant

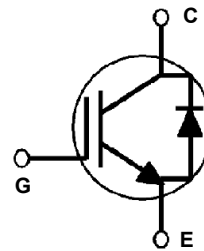
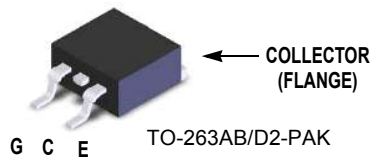


Applications

- Home appliance inverter-driven application
 - Fan Motor Driver, Circulation Pump, Refrigerator, Dish Washer

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 feature are essential.



Absolute Maximum Ratings

Symbol	Description	Ratings	Units
V_{CES}	Collector to Emitter Voltage	600	V
V_{GES}	Gate to Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	10	A
	Collector Current @ $T_C = 100^\circ\text{C}$	5	A
$I_{CM(1)}$	Pulsed Collector Current @ $T_C = 25^\circ\text{C}$	15	A
I_F	Diode Forward Current @ $T_C = 25^\circ\text{C}$	5	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	73.5	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	29.4	W
T_J	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Notes:

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

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance, Junction to Case		1.7	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$ (Diode)	Thermal Resistance, Junction to Case		4.5	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (PCB Mount)(2)		40	$^{\circ}\text{C}/\text{W}$

Notes:

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

Package Marking and Ordering Information

Device Marking	Device	Package	Rel Size	Tape Width	Quantity
FGB5N60UNDF	FGB5N60UNDF	TO-263AB/D2-PAK		-	50

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector to Emitter Breakdown Voltage	$V_{GE} = 0\text{V}, I_C = 250\mu\text{A}$	600	-	-	V
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{V}$	-	-	1	mA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{V}$	-	-	± 10	μA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 5\text{mA}, V_{CE} = V_{GE}$	5.5	6.8	8.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 5\text{A}, V_{GE} = 15\text{V}$	-	1.9	2.4	V
		$I_C = 5\text{A}, V_{GE} = 15\text{V}, T_C = 125^{\circ}\text{C}$	-	2.3	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$	-	181		pF
C_{oes}	Output Capacitance		-	28		pF
C_{res}	Reverse Transfer Capacitance		-	7		pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400\text{V}, I_C = 5\text{A}, R_G = 10\Omega, V_{GE} = 15\text{V},$ Inductive Load, $T_C = 25^{\circ}\text{C}$	-	5.4		ns
t_r	Rise Time		-	1.9		ns
$t_{d(off)}$	Turn-Off Delay Time		-	25.4		ns
t_f	Fall Time		-	101	202	ns
E_{on}	Turn-On Switching Loss		-	0.08		mJ
E_{off}	Turn-Off Switching Loss		-	0.07		mJ
E_{ts}	Total Switching Loss		-	0.15		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400\text{V}, I_C = 5\text{A}, R_G = 10\Omega, V_{GE} = 15\text{V},$ Inductive Load, $T_C = 125^{\circ}\text{C}$	-	5.2		ns
t_r	Rise Time		-	2.3		ns
$t_{d(off)}$	Turn-Off Delay Time		-	26.6		ns
t_f	Fall Time		-	125		ns
E_{on}	Turn-On Switching Loss		-	0.15		mJ
E_{off}	Turn-Off Switching Loss		-	0.09		mJ
E_{ts}	Total Switching Loss		-	0.24		mJ
T_{sc}	Short Circuit Withstand Time	$V_{CC} = 350\text{V}, R_G = 100\Omega, V_{GE} = 15\text{V}, T_C = 150^{\circ}\text{C}$	10	-	-	μs

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

Q_g	Total Gate Charge	$V_{CE} = 400\text{V}, I_C = 5\text{A},$ $V_{GE} = 15\text{V}$	-	12.1		nC
Q_{ge}	Gate to Emitter Charge		-	1.7		nC
Q_{gc}	Gate to Collector Charge		-	7.2		nC

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Units	
V_{FM}	Diode Forward Voltage	$I_F = 5\text{A}$	$T_C = 25^\circ\text{C}$	-	1.7	2.2	V
			$T_C = 125^\circ\text{C}$	-	1.6	-	
t_{rr}	Diode Reverse Recovery Time	$I_F = 5\text{A}, di_F/dt = 200\text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	35		ns
			$T_C = 125^\circ\text{C}$	-	87		
Q_{rr}	Diode Reverse Recovery Charge		$T_C = 25^\circ\text{C}$	-	71		nC
			$T_C = 125^\circ\text{C}$	-	240	-	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

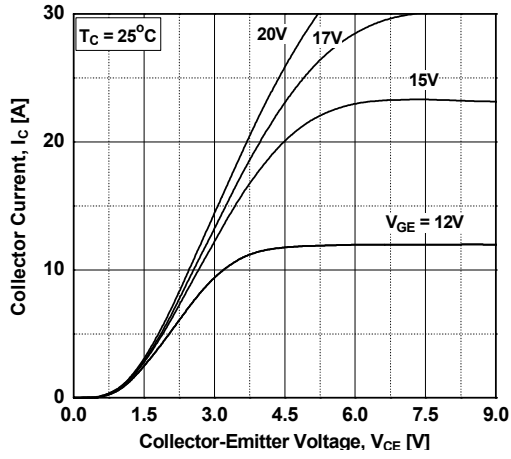


Figure 2. Typical Output Characteristics

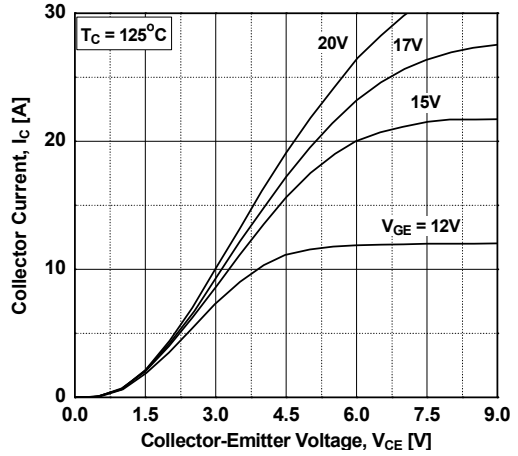


Figure 3. Typical Saturation Voltage Characteristics

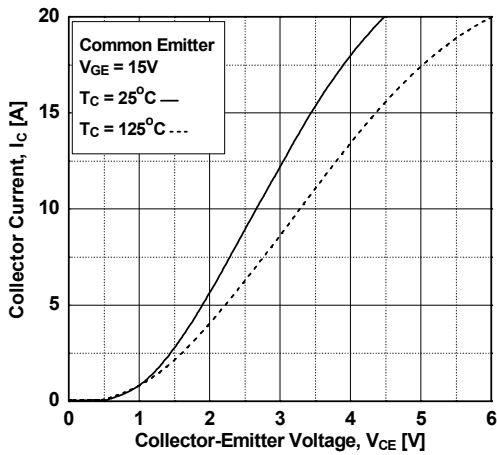


Figure 4. Transfer Characteristics

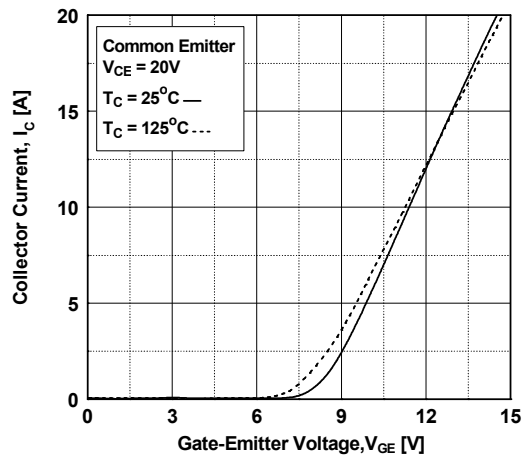


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

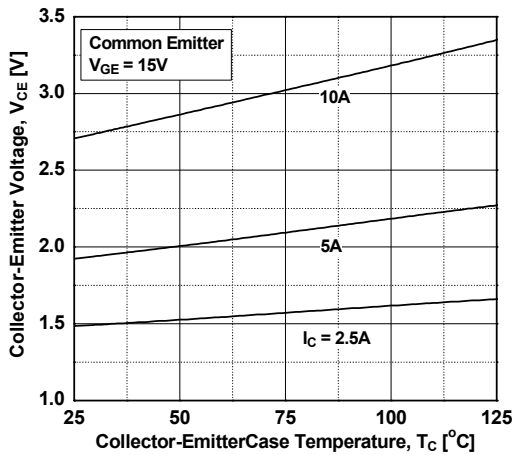
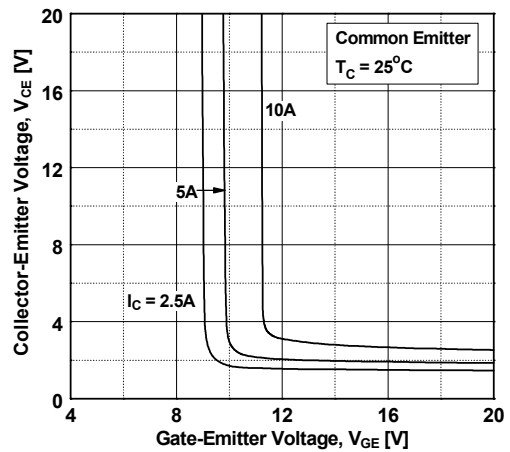


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

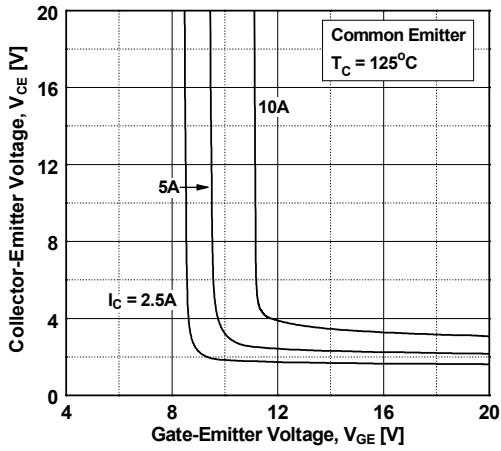


Figure 8. Capacitance Characteristics

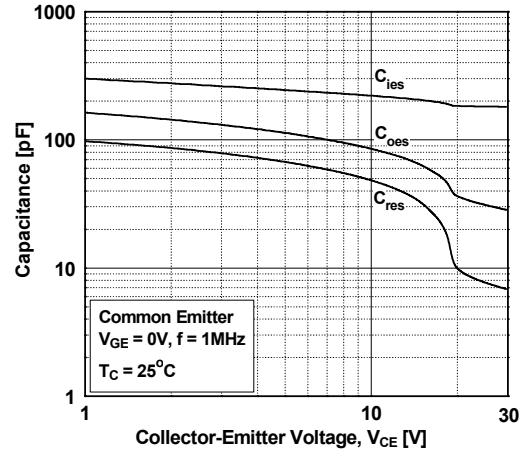


Figure 9. Gate charge Characteristics

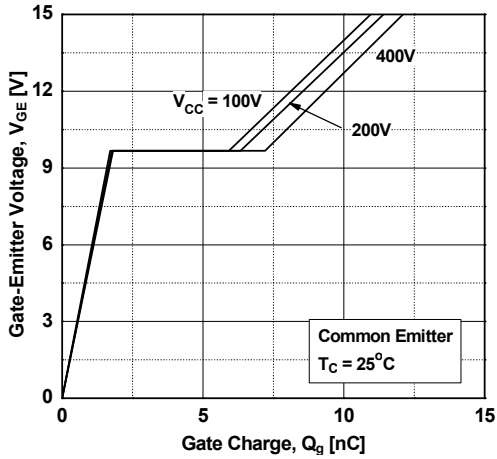


Figure 10. SOA Characteristics

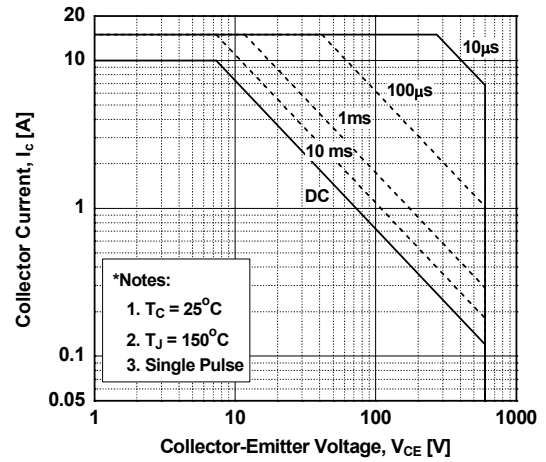


Figure 11. Turn-on Characteristics vs. Gate Resistance

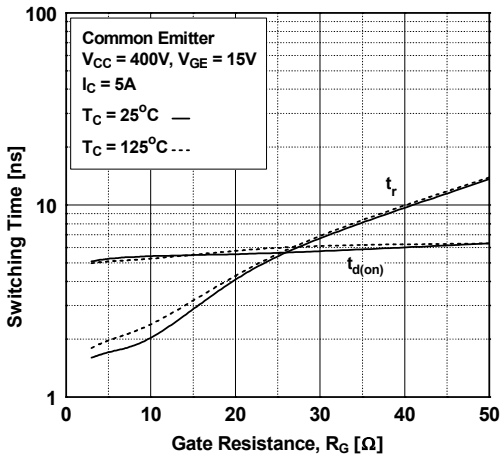
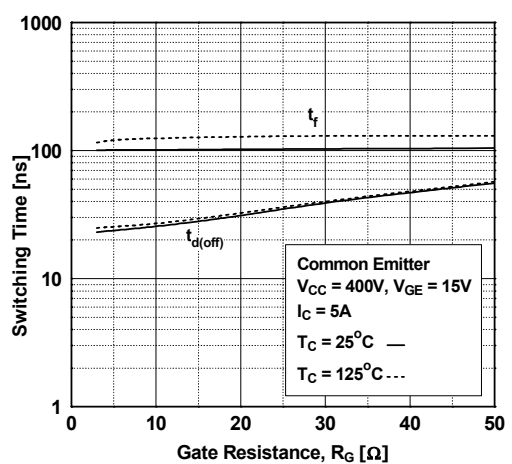


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

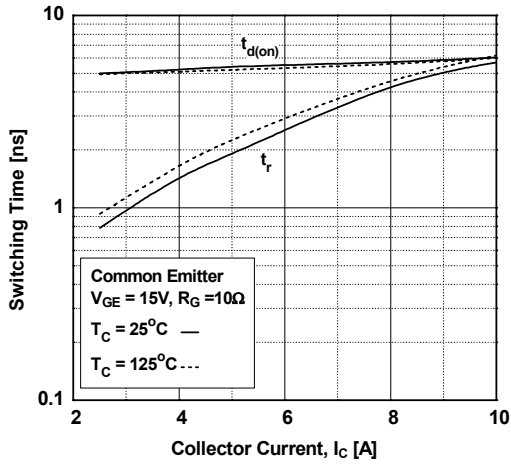


Figure 14. Turn-off Characteristics vs. Collector Current

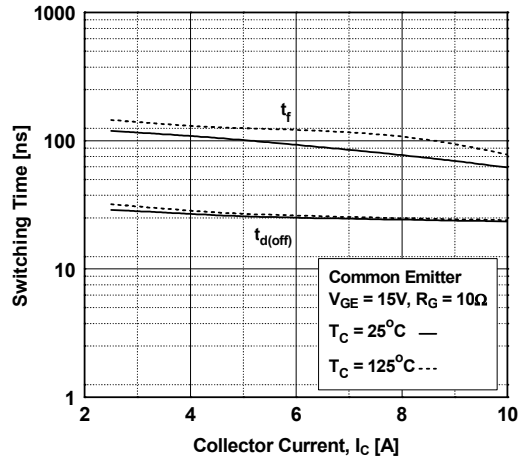


Figure 15. Switching Loss vs. Gate Resistance

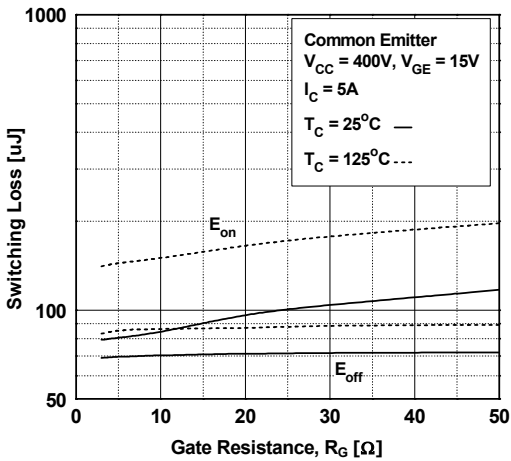


Figure 16. Switching Loss vs. Collector Current

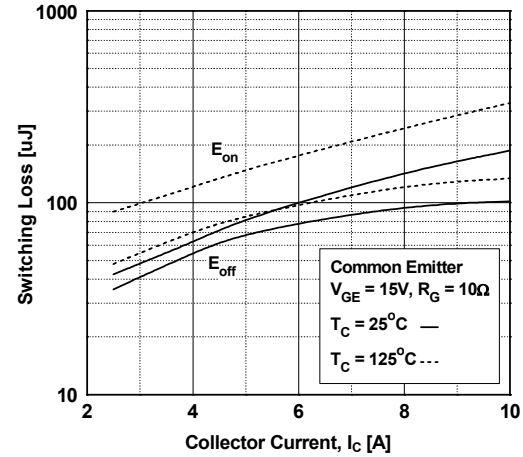


Figure 17. Turn off Switching SOA Characteristics

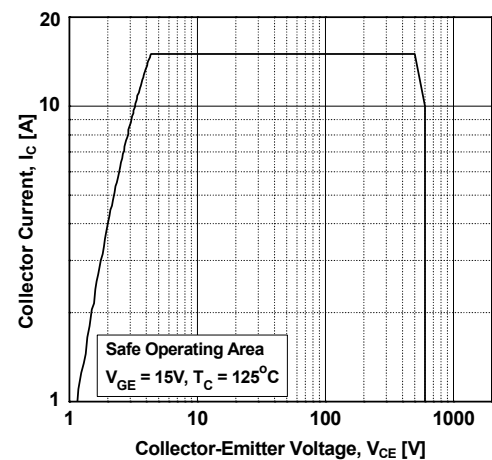
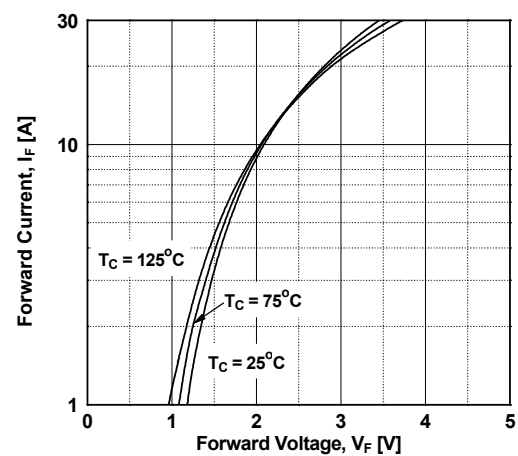


Figure 18. Forward Characteristics



Typical Performance Characteristics

Figure 19. Reverse Recovery Current

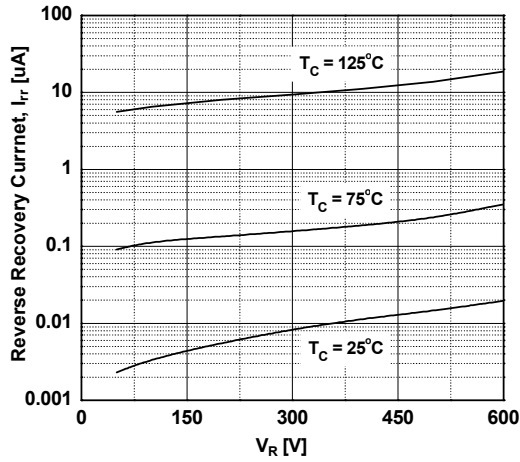


Figure 20. Stored Charge

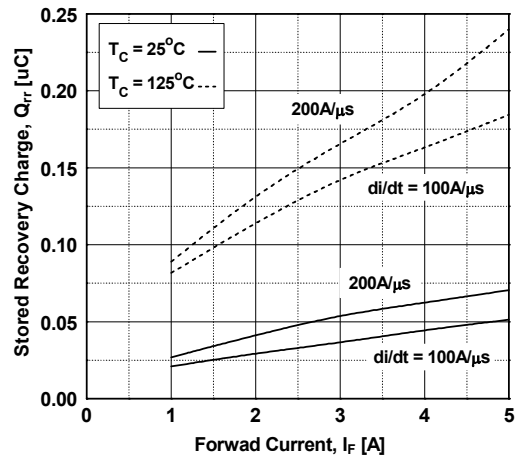


Figure 21. Reverse Recovery Time

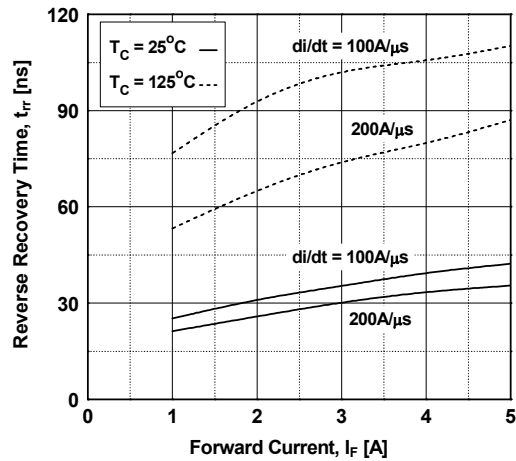
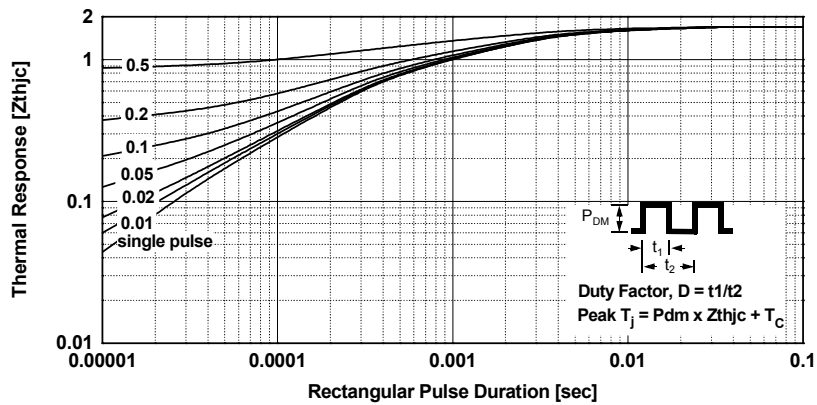
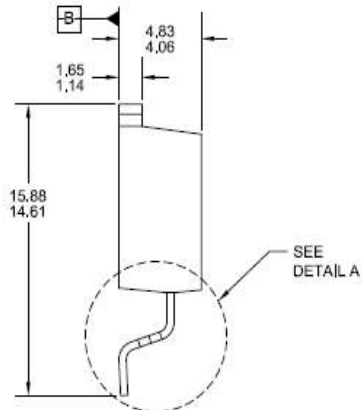
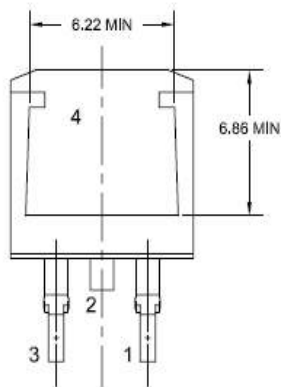
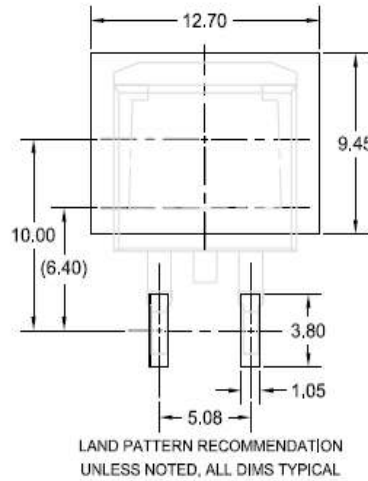
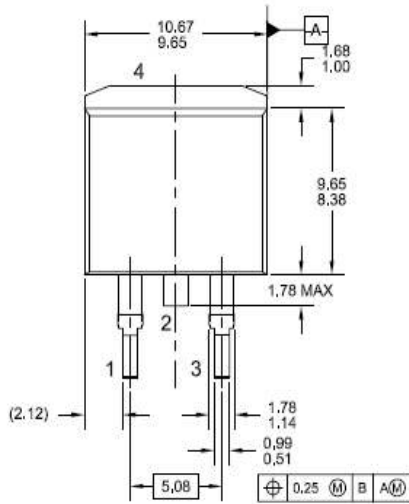


Figure 23. Transient Thermal Impedance of IGBT

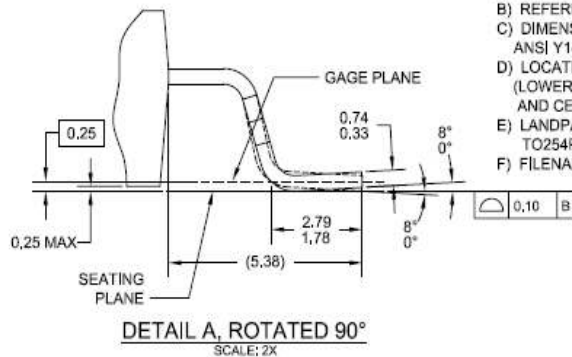


Mechanical Dimensions

TO-263AB/D²-PAK







- NOTES: UNLESS OTHERWISE SPECIFIED
 A) ALL DIMENSIONS ARE IN MILLIMETERS.
 B) REFERENCE JEDEC, TO-263, VARIATION AB.
 C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5M - 1994.
 D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE).
 E) LANDPATTERN RECOMMENDATION PER IPC TO254P1524X482-3N
 F) FILENAME: TO263A02REV6





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| BitSiC® | Green FPS™ | Programmable Active Droop™ | TinyBuck™ |
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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.
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