FAIRCHILD
SEMICONDUCTOR®

August 2005

FGA25N120ANTD
1200V NPT Trench IGBT

Features

- NPT Trench Technology, Positive temperature coefficient
- Low saturation voltage: $V_{CE(sat), typ}$ = 2.0V @ I_C = 25A and T_C = 25°C
- Low switching loss: $E_{off, typ}$ = 0.96mJ @ I_C = 25A and T_C = 25°C
- Extremely enhanced avalanche capability

Description

Using Fairchild's proprietary trench design and advanced NPT technology, the 1200V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation.

This device is well suited for the resonant or soft switching application such as induction heating, microwave oven, etc.

TO-3P

G C E
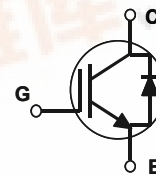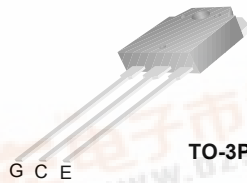
Absolute Maximum Ratings

Symbol	Description		FGA25N120ANTD	Units
V_{CES}	Collector-Emitter Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	50	A
	Collector Current	@ T_C = 100°C	25	A
I_{CM}	Pulsed Collector Current (Note 1)		75	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	25	A
I_{FM}	Diode Maximum Forward Current		150	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	312	W
	Maximum Power Dissipation	@ T_C = 100°C	125	W
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case for IGBT	--	0.4	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case for Diode	--	2.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGA25N120ANTD	FGA25N120ANTD	TO-3P	--	--	30

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}$, $V_{GE} = 0V$	--	--	3	mA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}$, $V_{CE} = 0V$	--	--	± 250	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 25mA$, $V_{CE} = V_{GE}$	3.5	5.5	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 25A$, $V_{GE} = 15V$	--	2.0	2.5	V
		$I_C = 25A$, $V_{GE} = 15V$, $T_C = 125°C$	--	2.15	--	V
		$I_C = 50A$, $V_{GE} = 15V$	--	2.65	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30V$, $V_{GE} = 0V$, f = 1MHz	--	3700	--	pF
C_{oes}	Output Capacitance		--	130	--	pF
C_{res}	Reverse Transfer Capacitance		--	80	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600 V$, $I_C = 25A$, $R_G = 10Ω$, $V_{GE} = 15V$, Inductive Load, $T_C = 25°C$	--	50	--	ns
t_r	Rise Time		--	60	90	ns
$t_{d(off)}$	Turn-Off Delay Time		--	190	--	ns
t_f	Fall Time		--	100	180	ns
E_{on}	Turn-On Switching Loss		--	4.1	6.2	mJ
E_{off}	Turn-Off Switching Loss		--	0.96	1.5	mJ
E_{ts}	Total Switching Loss		--	5.06	7.7	mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600 V$, $I_C = 25A$, $R_G = 10Ω$, $V_{GE} = 15V$, Inductive Load, $T_C = 125°C$	--	50	--	ns
t_r	Rise Time		--	60	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	200	--	ns
t_f	Fall Time		--	154	--	ns
E_{on}	Turn-On Switching Loss		--	4.3	6.9	mJ
E_{off}	Turn-Off Switching Loss		--	1.5	2.4	mJ
E_{ts}	Total Switching Loss		--	5.8	9.3	mJ
Q_g	Total Gate Charge	$V_{CE} = 600 V$, $I_C = 25A$, $V_{GE} = 15V$	--	200	300	nC
Q_{ge}	Gate-Emitter Charge		--	15	23	nC
Q_{gc}	Gate-Collector Charge		--	100	150	nC

Notes:

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

Electrical Characteristics of DIODE T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	I_F = 25A	T_C = 25°C	--	2.0	3.0	V
			T_C = 125°C	--	2.1	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 25A dI/dt = 200 A/μs	T_C = 25°C	--	235	350	ns
			T_C = 125°C	--	300	--	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	--	27	40	A
			T_C = 125°C	--	31	--	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	--	3130	4700	nC
			T_C = 125°C	--	4650	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics
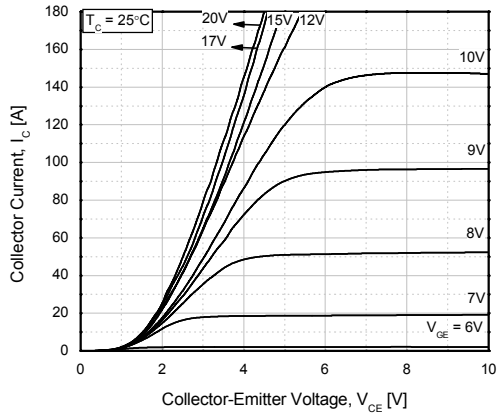
Figure 2. Typical Saturation Voltage Characteristics
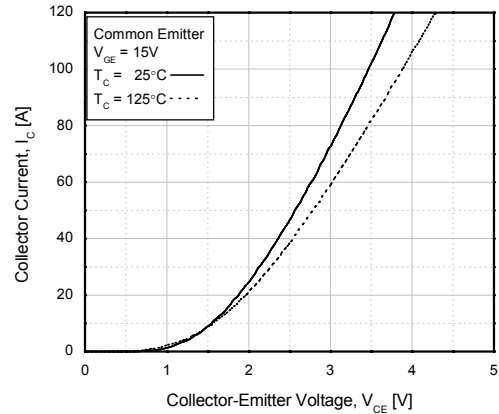
Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level
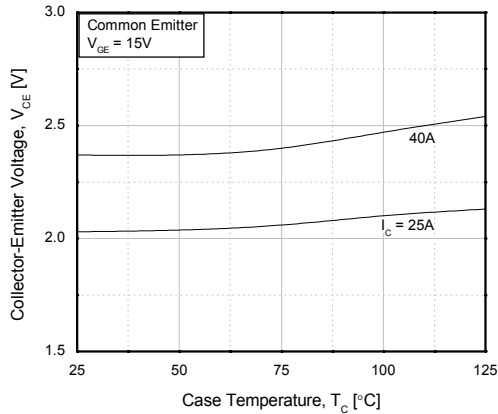
Figure 4. Saturation Voltage vs. V_{GE}
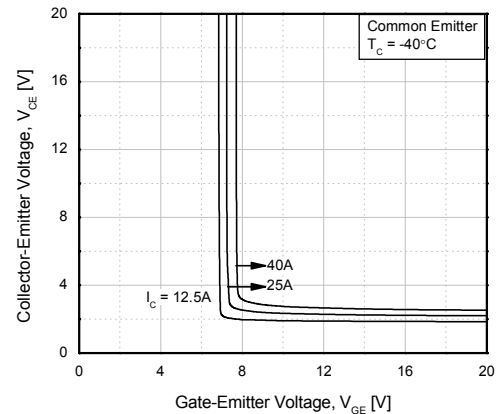
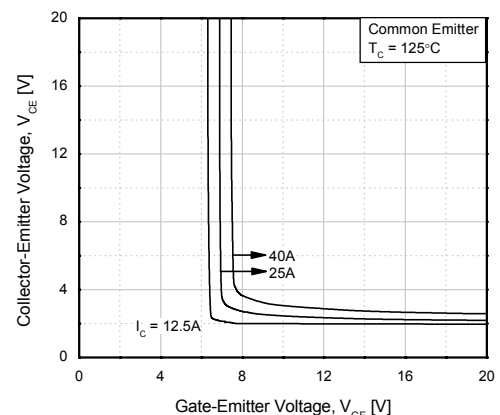## Figure 5. Saturation Voltage vs. V_{GE}
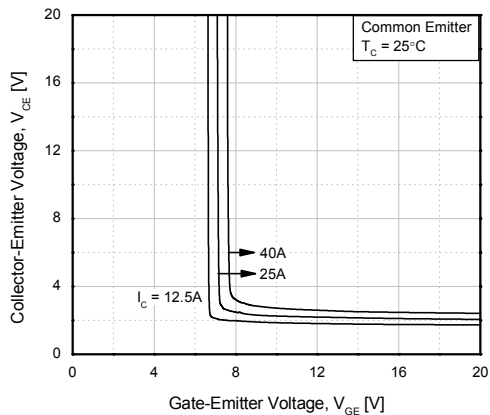
Figure 6. Saturation Voltage vs. V_{GE}

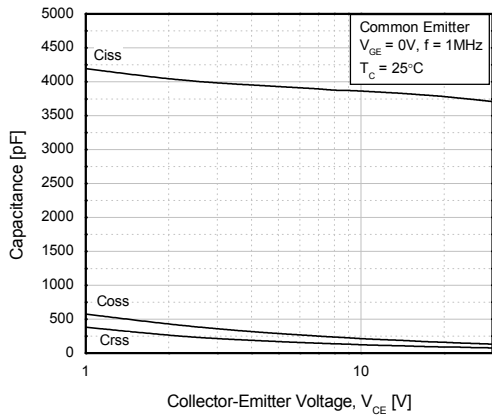## Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

Figure 8. Turn-On Characteristics vs. Gate Resistance
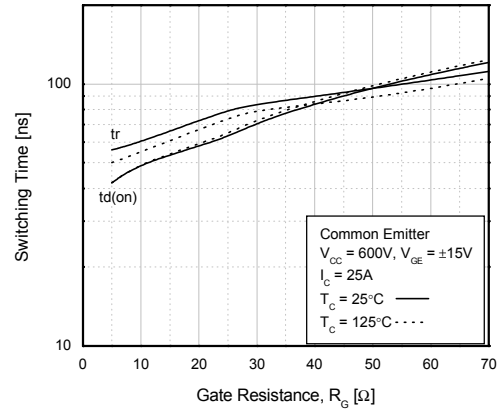
Figure 9. Turn-Off Characteristics vs. Gate Resistance
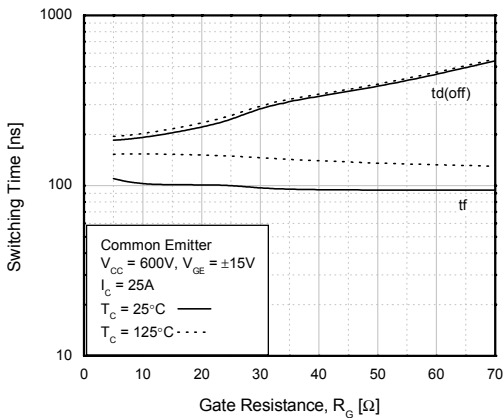

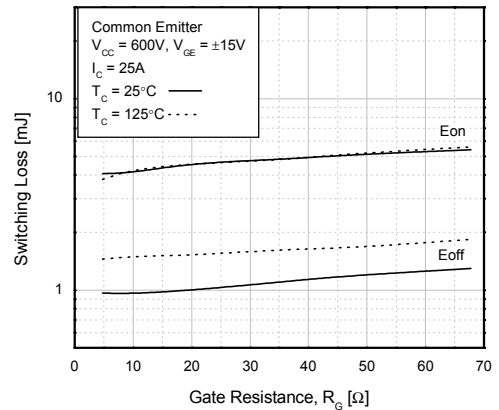### Figure 10. Switching Loss vs. Gate Resistance

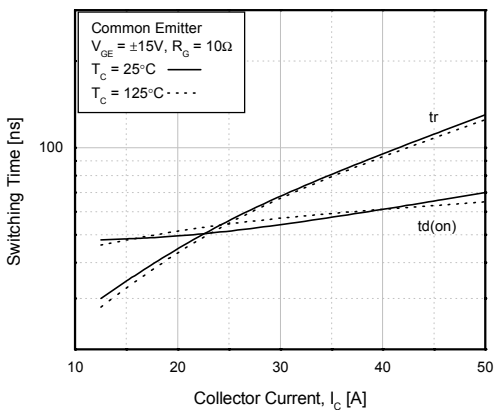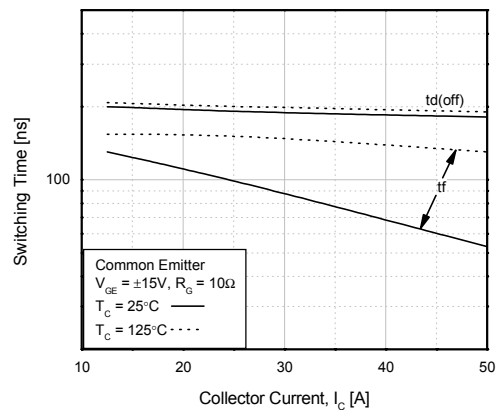### Figure 11. Turn-On Characteristics vs. Collector Current

Figure 12. Turn-Off Characteristics vs. Collector Current

Typical Performance Characteristics (Continued)
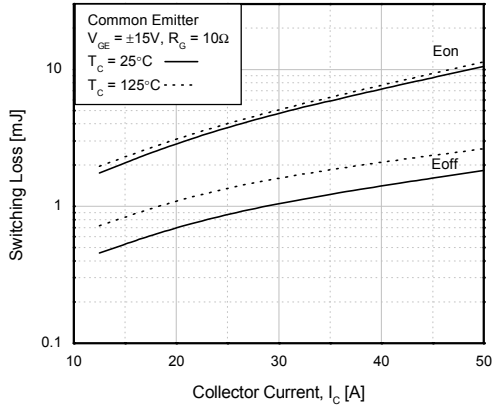
Figure 13. Switching Loss vs. Collector Current
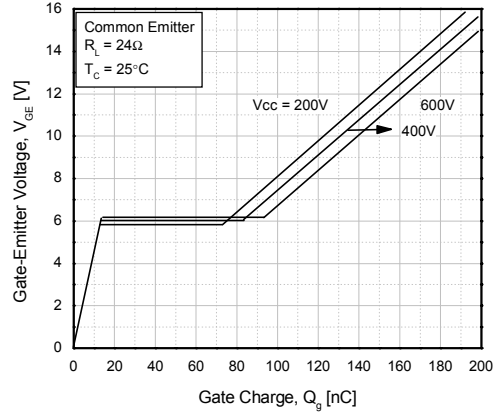

Figure 14. Gate Charge Characteristics
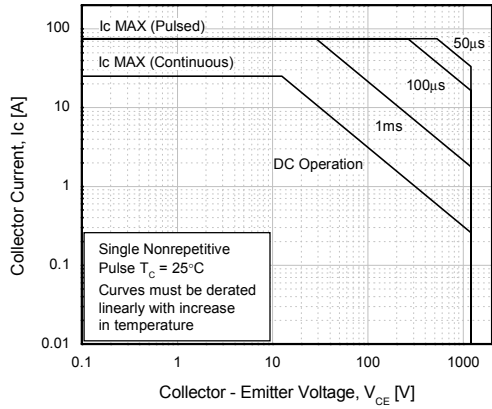

Figure 15. SOA Characteristics
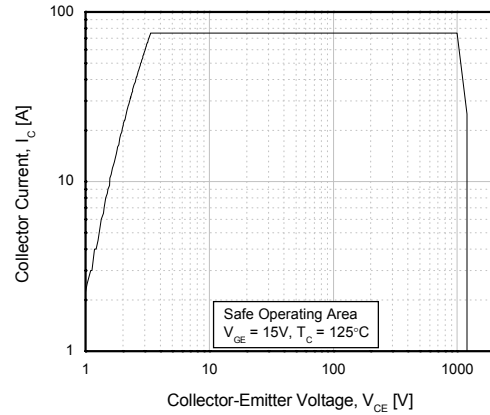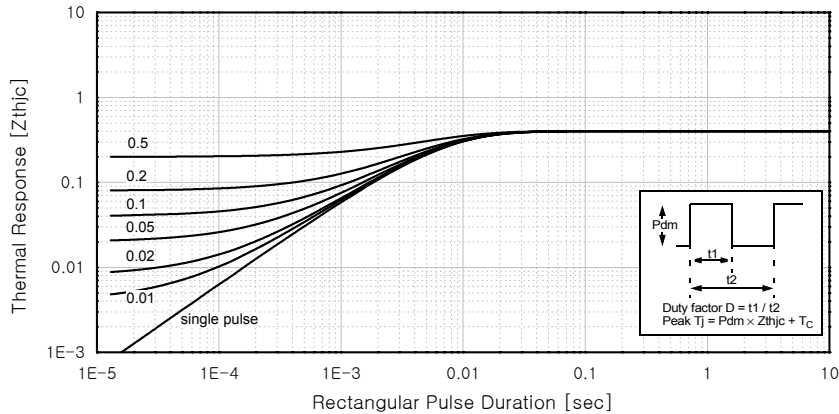

Figure 16. Turn-Off SOA

Figure 17. Transient Thermal Impedance of IGBT

Typical Performance Characteristics (Continued)

Figure 18. Forward Characteristics
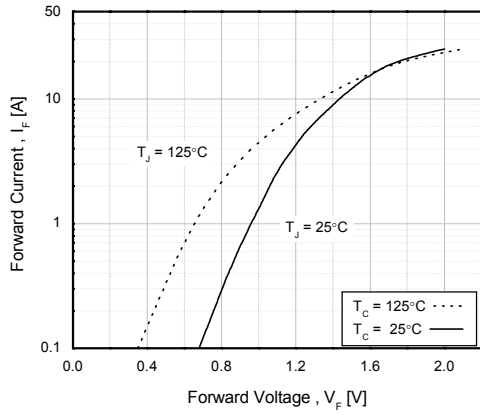
Figure 19. Reverse Recovery Current
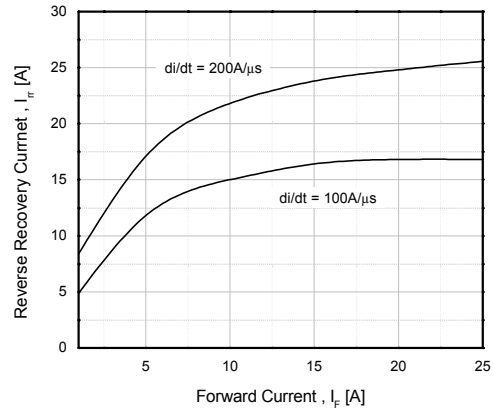
Figure 20. Stored Charge
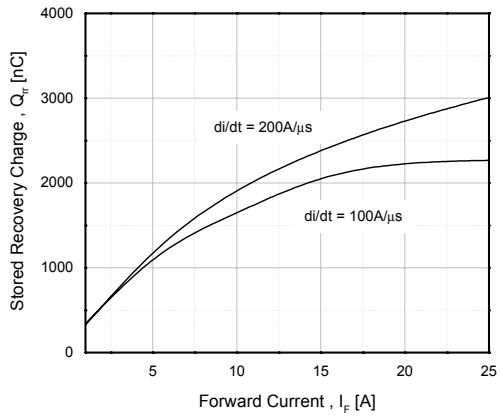
Figure 21. Reverse Recovery Time
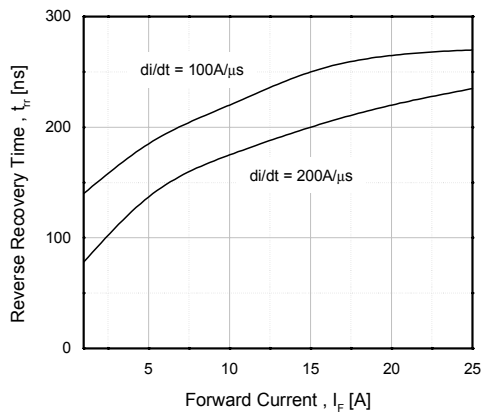
Mechanical Dimensions

TO-3P

15.60 ±0.20

13.60 ±0.20

9.60 ±0.20

ø3.20 ±0.10

3.80 ±0.20

13.90 ±0.20

12.76 ±0.20

19.90 ±0.20

23.40 ±0.20

2.00 ±0.20

3.00 ±0.20

1.00 ±0.20

3.50 ±0.20

16.50 ±0.30

5.45TYP
[5.45 ±0.30]

5.45TYP
[5.45 ±0.30]

4.80 ±0.20

1.50 $^{+0.15}_{-0.05}$

18.70 ±0.20

1.40 ±0.20

0.60 $^{+0.15}_{-0.05}$
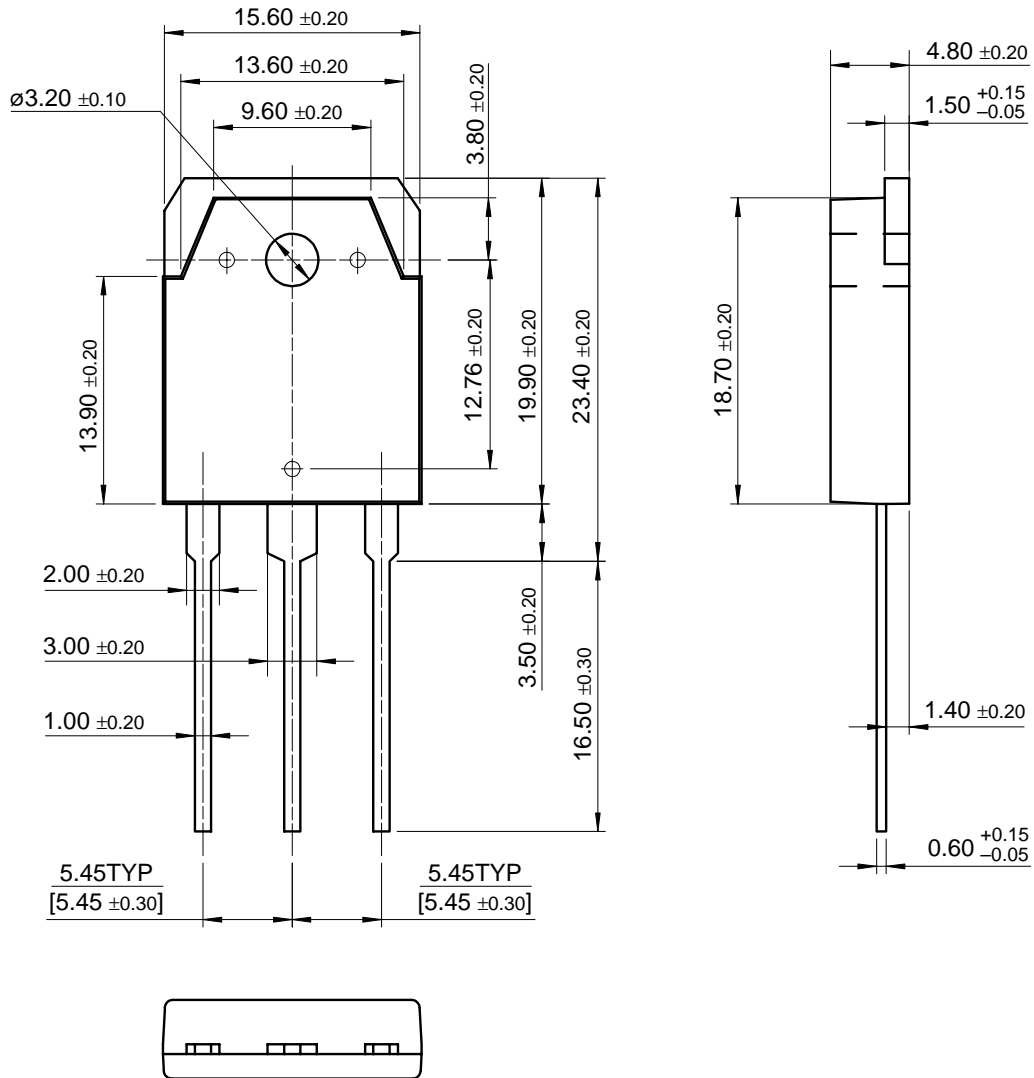
Dimensions in Millimeters

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EnSigna™	ImpliedDisconnect™	OCXPro™	SILENT SWITCHER®	Wire™
FACT™	IntelliMAX™	OPTOLOGIC®	SMART START™	
FACT Quiet Series™		OPTOPLANAR™	SPM™	
		PACMAN™	Stealth™	
Across the board. Around the world.™		POP™	SuperFET™	
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Programmable Active Droop™		PowerEdge™	SuperSOT™-6	

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2. A critical component is 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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No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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