



August 2005

FGA25N120ANTD

1200V NPT Trench IGBT

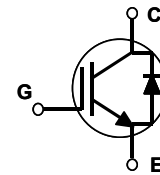
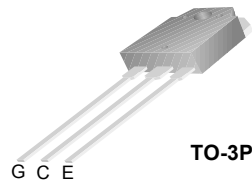
Features

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



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	@ $T_C = 25^\circ C$	50
	Collector Current	@ $T_C = 100^\circ C$	25
I_{CM}	Pulsed Collector Current (Note 1)	75	A
I_F	Diode Continuous Forward Current	@ $T_C = 100^\circ C$	25
I_{FM}	Diode Maximum Forward Current	150	A
P_D	Maximum Power Dissipation	@ $T_C = 25^\circ C$	312
	Maximum Power Dissipation	@ $T_C = 100^\circ C$	125
T_J	Operating Junction Temperature	-55 to +150	$^\circ C$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ C$
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ C$

Thermal Characteristics

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

FGA25N120ANTD 1200V NPT Trench IGBT

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 $T_C = 25^\circ\text{C}$ unless otherwise noted

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

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

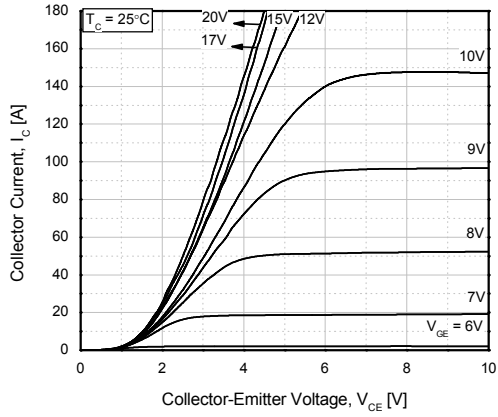


Figure 2. Typical Saturation Voltage Characteristics

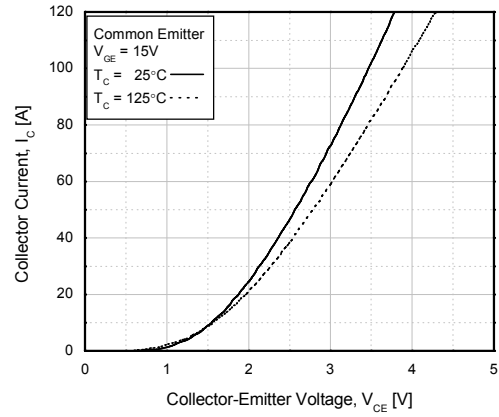


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

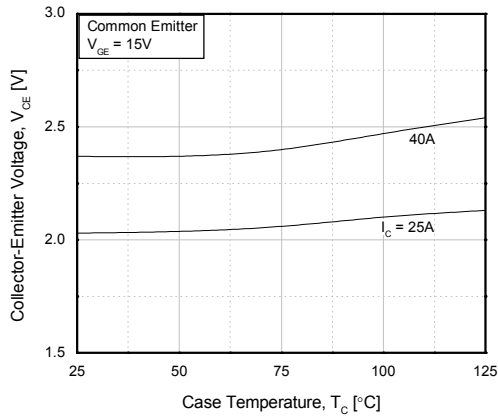


Figure 4. Saturation Voltage vs. V_GE

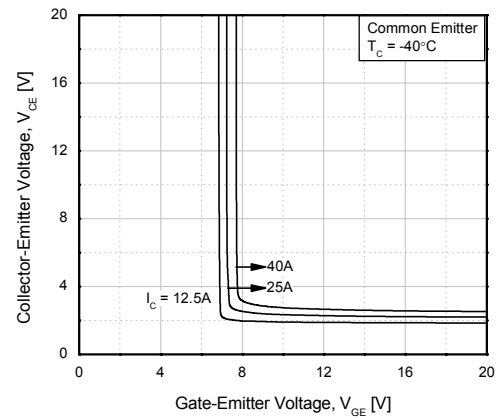


Figure 5. Saturation Voltage vs. V_GE

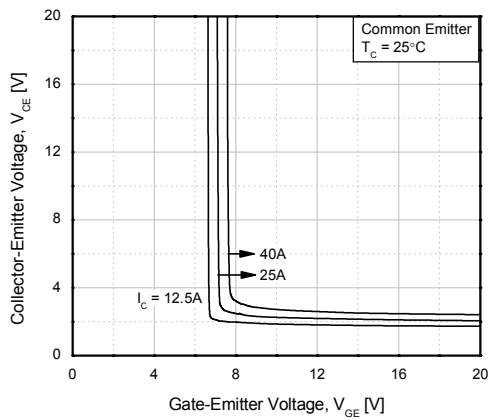
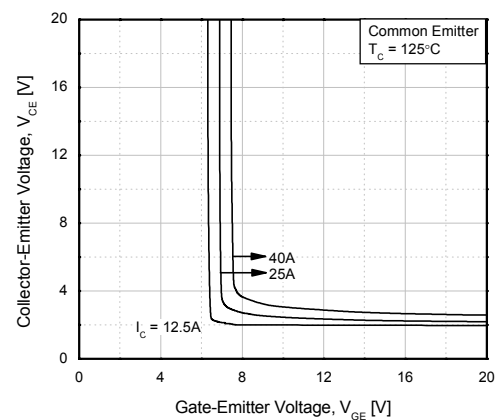


Figure 6. Saturation Voltage vs. V_GE



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

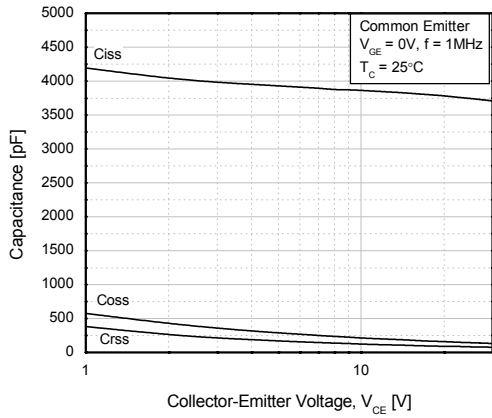


Figure 8. Turn-On Characteristics vs. Gate Resistance

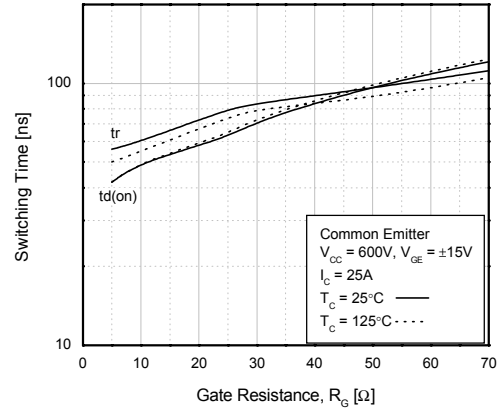


Figure 9. Turn-Off Characteristics vs. Gate Resistance

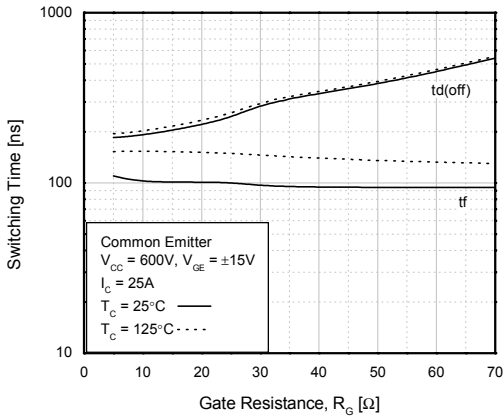


Figure 10. Switching Loss vs. Gate Resistance

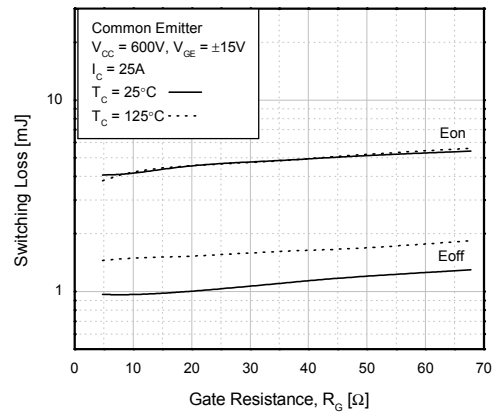


Figure 11. Turn-On Characteristics vs. Collector Current

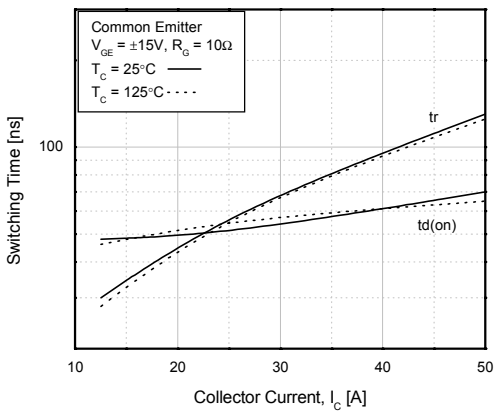
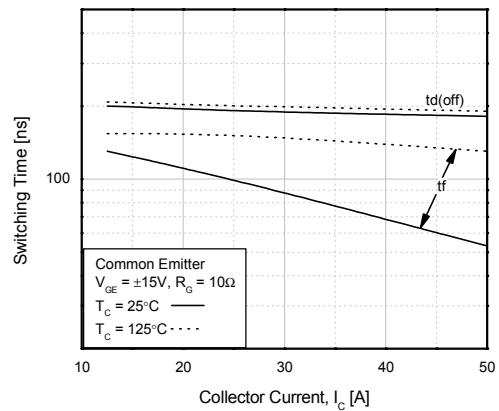


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

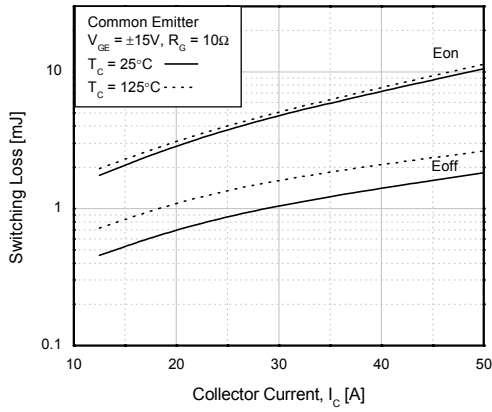


Figure 14. Gate Charge Characteristics

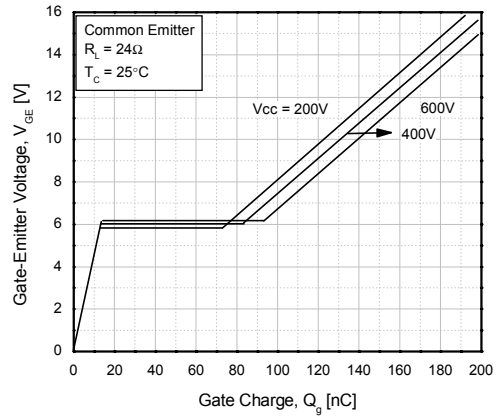


Figure 15. SOA Characteristics

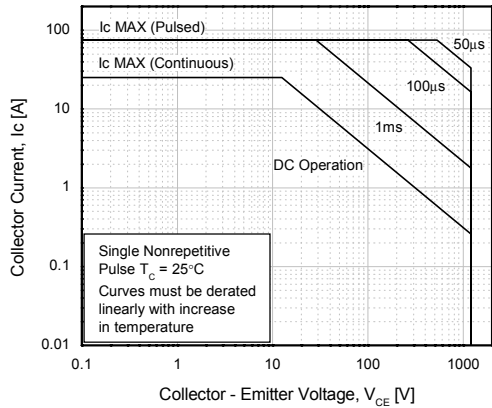


Figure 16. Turn-Off SOA

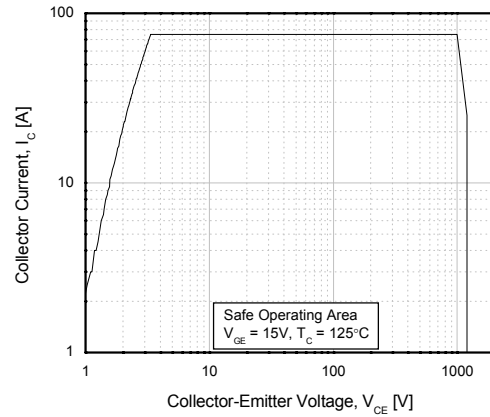
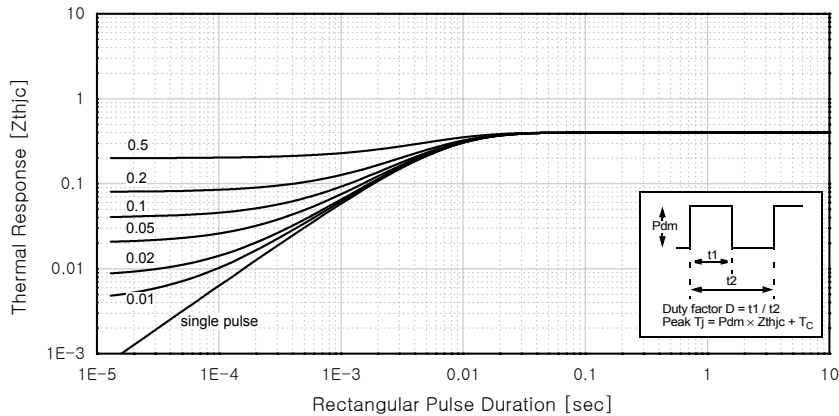


Figure 17. Transient Thermal Impedance of IGBT



Typical Performance Characteristics (Continued)

Figure 18. Forward Characteristics

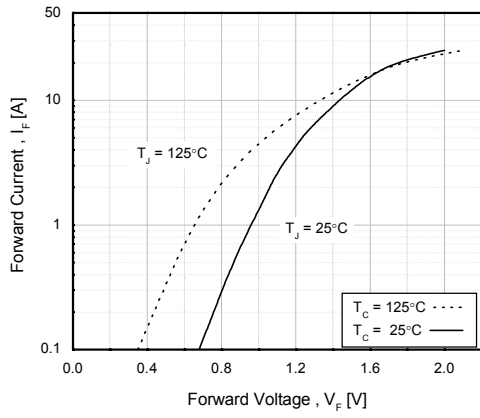


Figure 19. Reverse Recovery Current

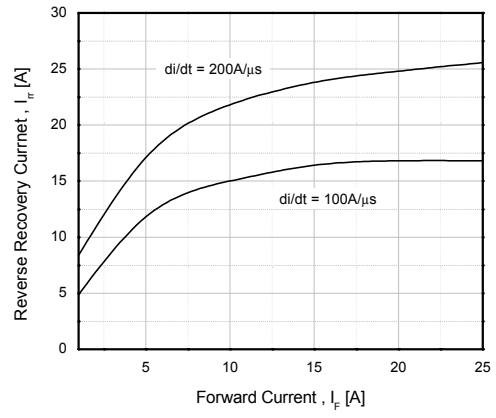


Figure 20. Stored Charge

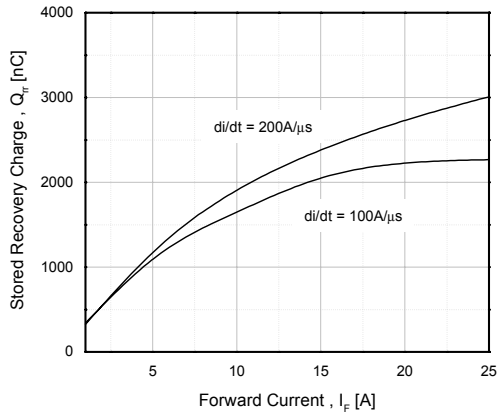
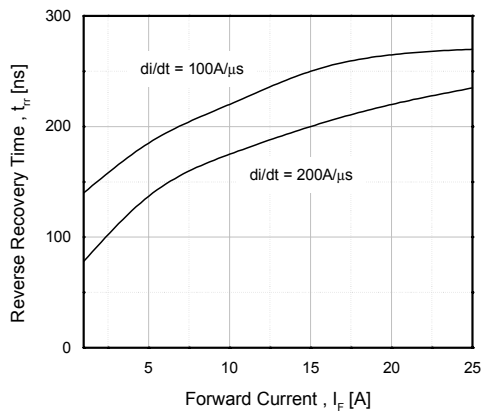
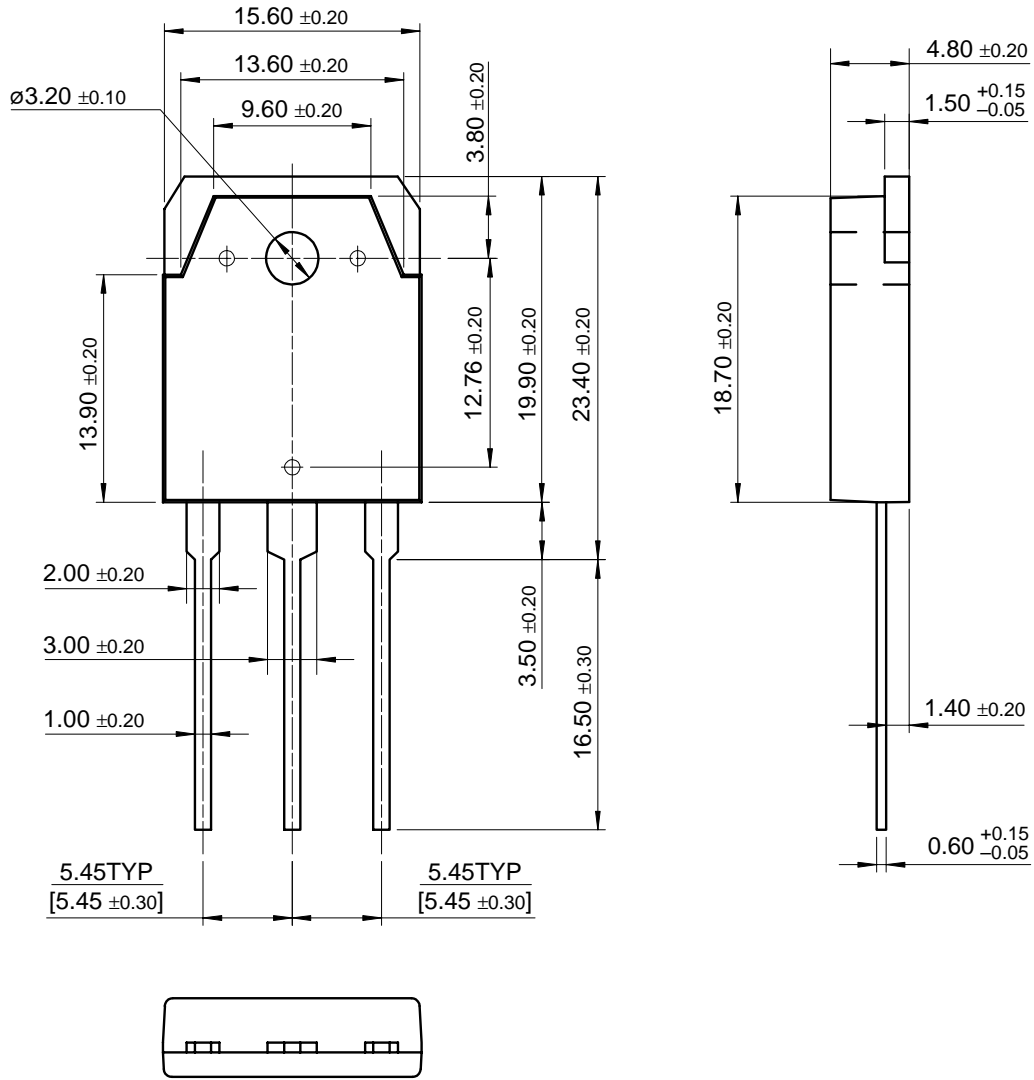


Figure 21. Reverse Recovery Time



Mechanical Dimensions

TO-3P



Dimensions in Millimeters

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E ² C MOS™	i-Lo™	OCX™	μSerDes™	VCX™
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