

**FAIRCHILD**  
SEMICONDUCTOR®

June 2006



# FGA120N30D

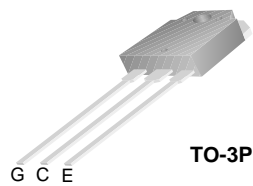
## 300V PDP IGBT

### Features

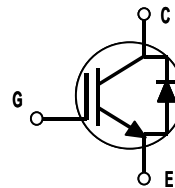
- High Current Capability
- Low saturation voltage:  $V_{CE(sat)}$ , Typ = 1.1V @  $I_C = 25A$
- High Input Impedance

### Description

Employing Unified IGBT Technology, FGA120N30D provides low conduction and switching loss. FGA120N30D offers the optimum solution for PDP applications where low conduction loss is essential.



TO-3P



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

Symbol	Description	FGA120N30D	Units
$V_{CES}$	Collector-Emitter Voltage	300	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 30$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	120	A
$I_{CM}$	Pulsed Collector Current (Note 1) @ $T_C = 25^\circ\text{C}$	300	A
$I_F$	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	10	A
$I_{FM}$	Diode Maximum Forward Current	40	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	290	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	116	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 test , pulse width = 100usec , Duty = 0.5

\*  $I_{c\_pulse}$  limited by max  $T_J$

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction-to-Case for IGBT	--	0.43	$^\circ\text{C}/\text{W}$
$R_{\theta JC}(DIODE)$	Thermal Resistance, Junction-to-Case for Diode	--	1.56	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	$^\circ\text{C}/\text{W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGA120N30D	FGA120N30D	TO-3P	--	--	30

## Electrical Characteristics of the IGBT T<sub>C</sub> = 25°C unless otherwise noted

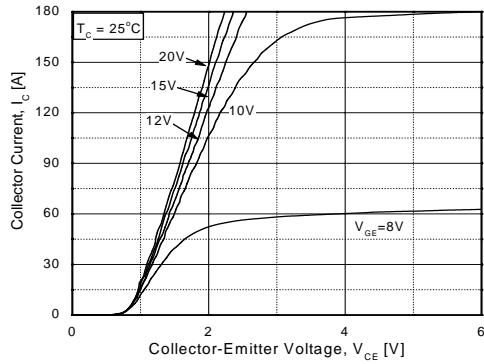
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	300	--	--	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	--	0.6	--	V/°C
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0V$	--	--	100	$\mu A$
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	--	--	$\pm 250$	nA
<b>On Characteristics</b>						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 250\mu A, V_{CE} = V_{GE}$	2.5	4.0	5.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 25A, V_{GE} = 15V$	--	1.1	1.4	V
		$I_C = 120A, V_{GE} = 15V$	--	1.9	--	V
		$I_C = 120A, V_{GE} = 15V, T_C = 125^\circ C$	--	2.0	--	V
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE} = 30V, V_{GE} = 0V, f = 1MHz$	--	2310	-	pF
$C_{oes}$	Output Capacitance		--	360	-	pF
$C_{res}$	Reverse Transfer Capacitance		--	100	-	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 200V, I_C = 25A, R_G = 8.7\Omega, V_{GE} = 15V, \text{Resistive Load}, T_C = 25^\circ C$	--	30	--	ns
$t_r$	Rise Time		--	270	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	--	ns
$t_f$	Fall Time		--	130	300	ns
$E_{on}$	Turn-On Switching Loss		--	0.17	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	0.56	--	mJ
$E_{ts}$	Total Switching Loss		--	0.73	--	mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 200V, I_C = 25A, R_G = 8.7\Omega, V_{GE} = 15V, \text{Resistive Load}, T_C = 125^\circ C$	--	30	--	ns
$t_r$	Rise Time		--	280	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	105	--	ns
$t_f$	Fall Time		--	180	--	ns
$E_{on}$	Turn-On Switching Loss		--	0.18	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	0.9	--	mJ
$E_{ts}$	Total Switching Loss		--	1.08	--	mJ
$Q_g$	Total Gate Charge	$V_{CE} = 200V, I_C = 25A, V_{GE} = 15V$	--	120	180	nC
$Q_{ge}$	Gate-Emitter Charge		--	15	22	nC
$Q_{gc}$	Gate-Collector Charge		--	60	90	nC

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

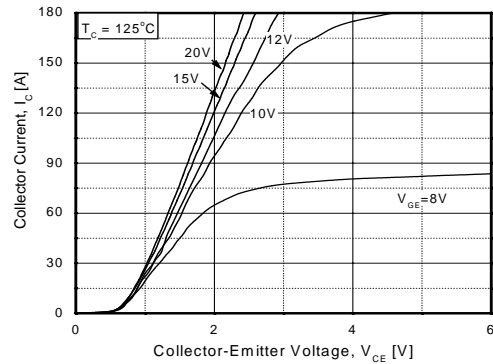
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units	
$V_{FM}$	Diode Forward Voltage	$I_F = 10\text{A}$	$T_C = 25^\circ\text{C}$	--	1.1	1.4	V
			$T_C = 125^\circ\text{C}$	--	0.9	--	
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 10\text{A}$ $di/dt = 200\text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	--	21	--	ns
			$T_C = 125^\circ\text{C}$	--	35	--	
$I_{rr}$	Diode Peak Reverse Recovery Current		$T_C = 25^\circ\text{C}$	--	2.8	--	A
			$T_C = 125^\circ\text{C}$	--	5.6	--	
$Q_{rr}$	Diode Reverse Recovery Charge		$T_C = 25^\circ\text{C}$	--	29.4	--	nC
			$T_C = 125^\circ\text{C}$	--	98	--	

## Typical Performance Characteristics

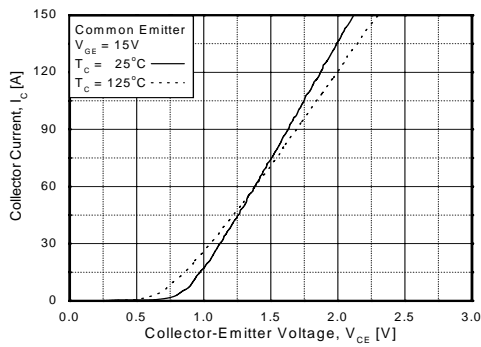
**Figure 1. Typical Output Characteristics**



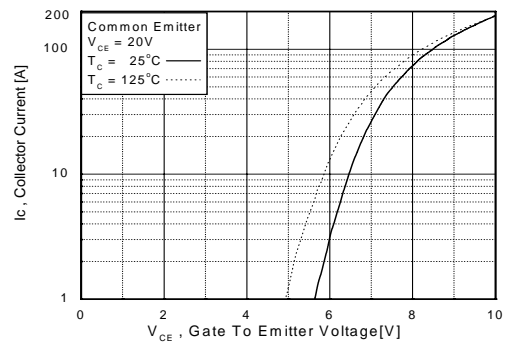
**Figure 2. Typical Output Characteristics**



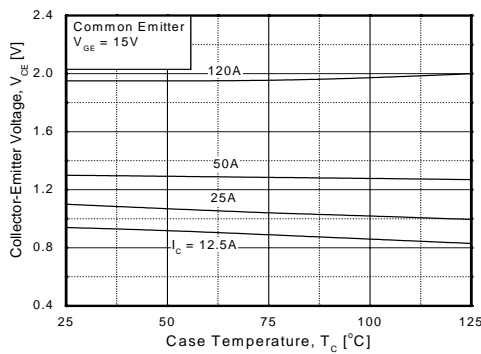
**Figure 3. Typical Saturation Voltage Characteristics**



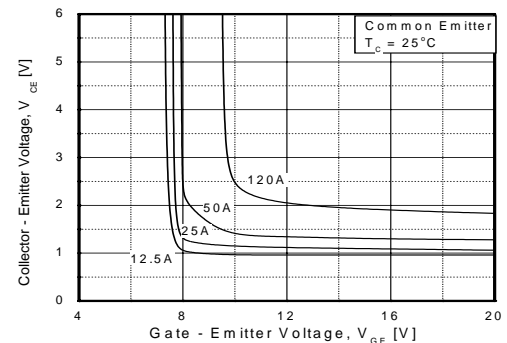
**Figure 4. Transfer characteristics**



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

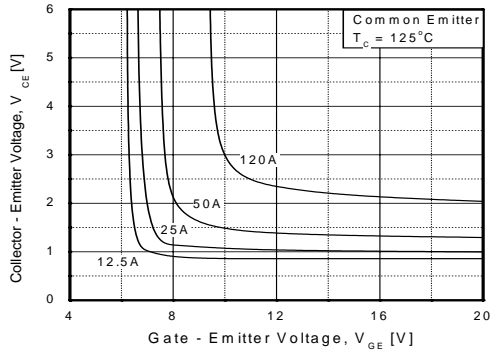


**Figure 6. Saturation Voltage vs. Vge**

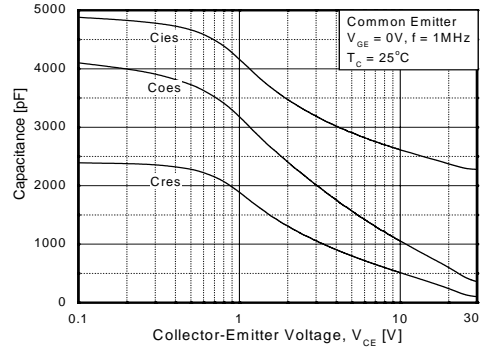


## Typical Performance Characteristics (Continued)

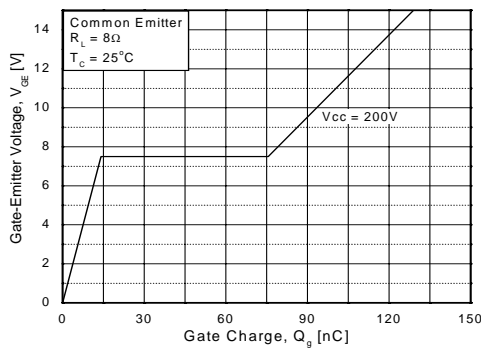
**Figure 7. Saturation Voltage vs.  $V_{GE}$**



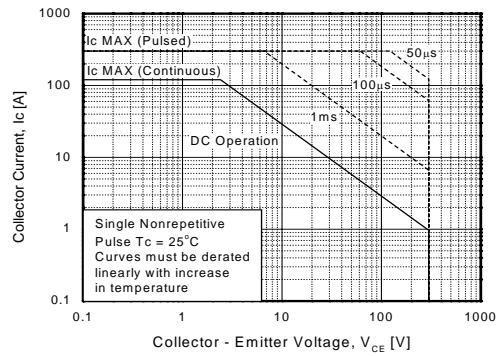
**Figure 8. Capacitance Characteristics**



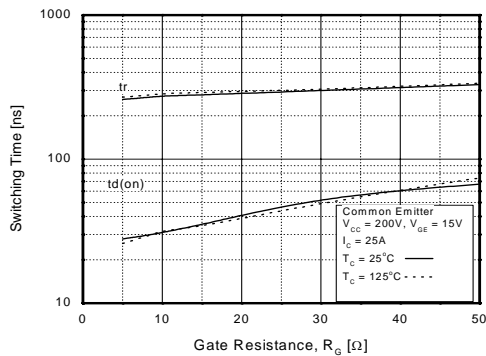
**Figure 9. Gate Charge Characteristics**



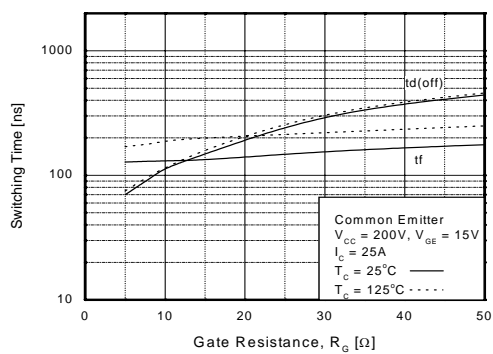
**Figure 10. SOA Characteristics**



**Figure 11. Turn-On Characteristics vs. Gate Resistance**

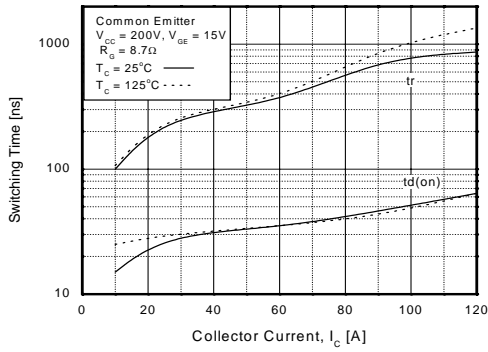


**Figure 12. Turn-Off Characteristics vs. Gate Resistance**

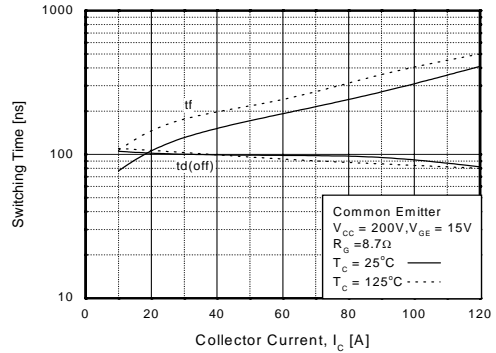


**Typical Performance Characteristics (Continued)**

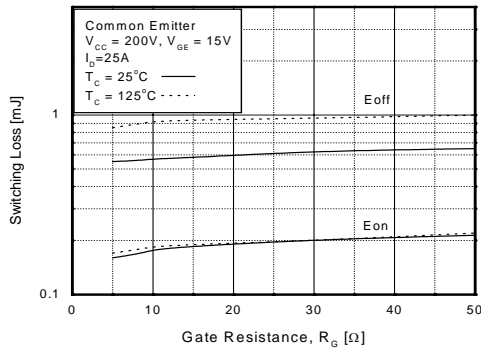
**Figure 13. Turn-On Characteristics vs. Collector Current**



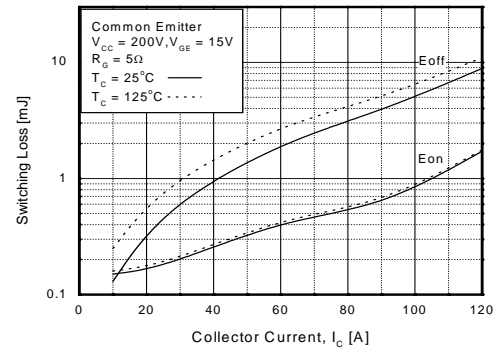
**Figure 14. Turn-Off Characteristics vs. Collector Current**



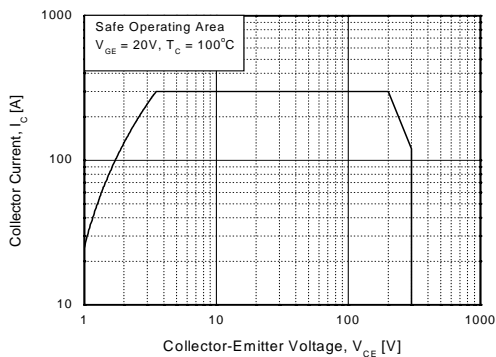
**Figure 15. Switching Loss vs. Gate Resistance**



**Figure 16. Switching Loss vs. Collector Current**

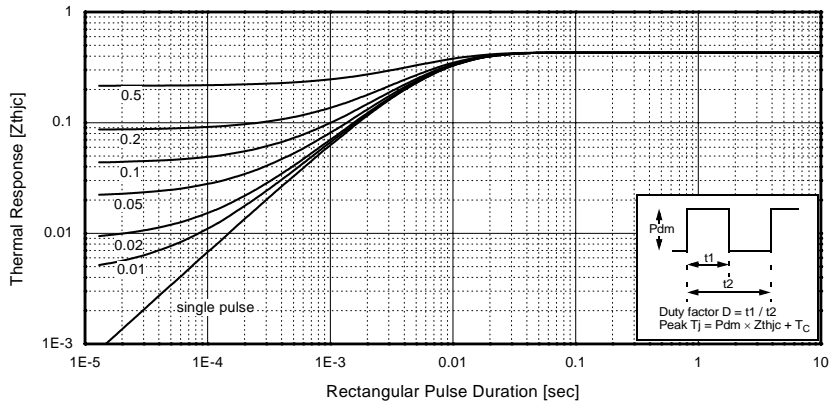


**Figure 17. Turn-Off SOA Figure**

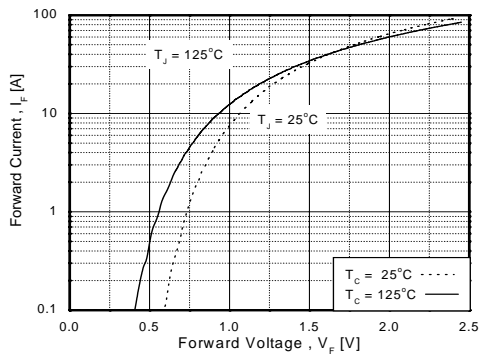


**Typical Performance Characteristics (Continued)**

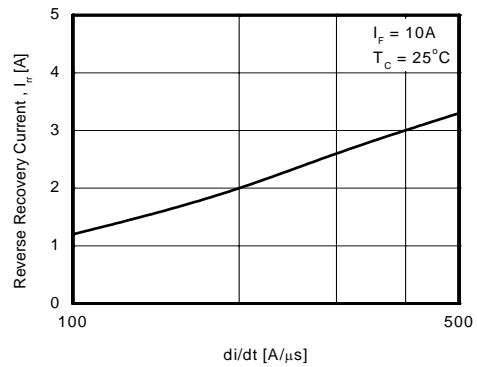
**Figure 18. Transient Thermal Impedance of IGBT**



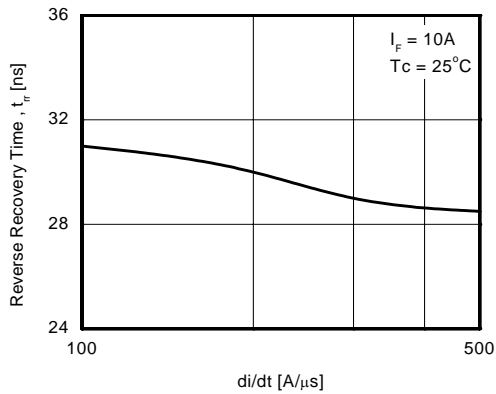
**Figure 19. Forward Characteristics**



**Figure 20. Typical Reverse Recovery Current**

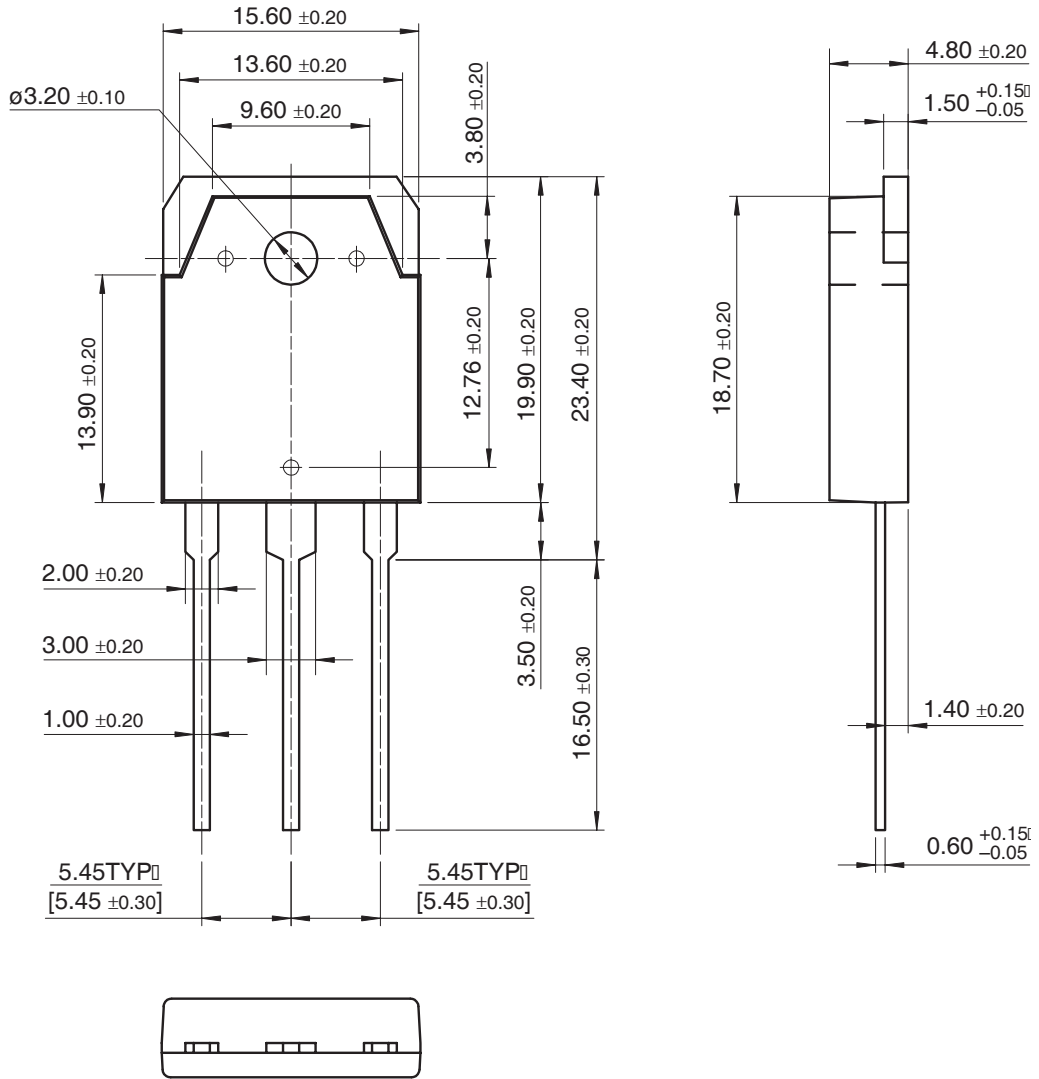


**Figure 21. Typical Reverse Recovery Time**



Mechanical Dimensions

TO-3P





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E <sup>2</sup> CMOS <sup>TM</sup>	i-Lo <sup>TM</sup>	OCX <sup>TM</sup>	RapidConnect <sup>TM</sup>	TruTranslation <sup>TM</sup>
EnSigna <sup>TM</sup>	ImpliedDisconnect <sup>TM</sup>	OCXPro <sup>TM</sup>	mSerDes <sup>TM</sup>	UHC <sup>TM</sup>
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The Power Franchise <sup>®</sup>		POPT <sup>TM</sup>	SPM <sup>TM</sup>	Wire <sup>TM</sup>
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