FAIRCHILD SEMICONDUCTOR®

May 2006

FGPF7N60RUFD
600V, 7A RUF IGBT CO-PAK

Features

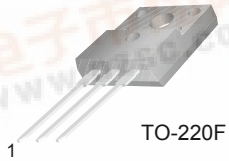
- High speed switching
- Low saturation voltage : $V_{CE(sat)}$ = 1.95 V @ I_C = 7A
- High input impedance
- CO-PAK, IGBT with FRD : t_{rr} = 50 ns (typ.)
- Short Circuit rated

Applications

Motor controls and general purpose inverters.

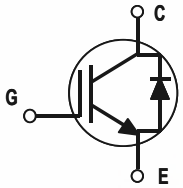
Description

Fairchild's Insulated Gate Bipolar Transistors (IGBTs) provides low conduction and switching losses.The device is designed for Motor applications where ruggedness is a required feature.



TO-220F

1.Gate 2.Collector 3.Emitter



Absolute Maximum Ratings

Symbol	Description		FGP7N60RUFD	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	14	A
	Collector Current	@ T_C = 100°C	7	A
$I_{CM\ (1)}$	Pulsed Collector Current		21	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	12	A
I_{FM}	Diode Maximum Forward Current		60	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	41	W
	Maximum Power Dissipation	@ T_C = 100°C	16	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

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	--	3.0	°C/W
$R_{\theta JC}$(DIODE)	Thermal Resistance, Junction-to-Case	--	4.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGPF7N60RUFD	FGPF7N60RUFDTU	TO-220F	Rail / Tube	50ea	-

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 250uA	600	--	--	V
$\Delta B_{VCES}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0V, I_C = 3mA	--	0.6	--	V/°C
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0V	--	--	250	uA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0V	--	--	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 7mA, V_{CE} = V_{GE}	5.0	6.5	8.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 7A, V_{GE} = 15V	--	1.95	2.8	V
		I_C = 7A, V_{GE} = 15V, T_C = 125°C	--	2.1	--	V
		I_C = 14 A, V_{GE} = 15V	--	2.65	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	--	510	--	pF
C_{oes}	Output Capacitance		--	55	--	pF
C_{res}	Reverse Transfer Capacitance		--	15	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 7A, R_G = 30Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	--	60	--	ns
t_r	Rise Time		--	60	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	80	ns
t_f	Fall Time		--	170	280	ns
E_{on}	Turn-On Switching Loss		--	0.23	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.10	--	mJ
E_{ts}	Total Switching Loss		--	0.33	0.5	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 7 A, R_G =30Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	--	65	--	ns
t_r	Rise Time		--	70	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	55	--	ns
t_f	Fall Time		--	350	--	ns
E_{on}	Turn-On Switching Loss		--	0.25	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.27	--	mJ
E_{ts}	Total Switching Loss		--	0.52	--	mJ
Q_g	Total Gate Charge	V_{CE} = 300 V, I_C = 7A, V_{GE} = 15V	--	24	36	nC
Q_{ge}	Gate-Emitter Charge		--	4	6	nC
Q_{gc}	Gate-Collector Charge		--	10	15	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	7.5	--	nH

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 = 7A	T_C = 25°C	--	1.65	2.1	V
			T_C = 100°C	--	1.58	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 7A dI/dt = 200 A/μs	T_C = 25°C	--	50	65	ns
			T_C = 100°C	--	58	--	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	--	2.5	3.75	A
			T_C = 100°C	--	3.3	--	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	--	62.5	122	nC
			T_C = 100°C	--	95.7	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

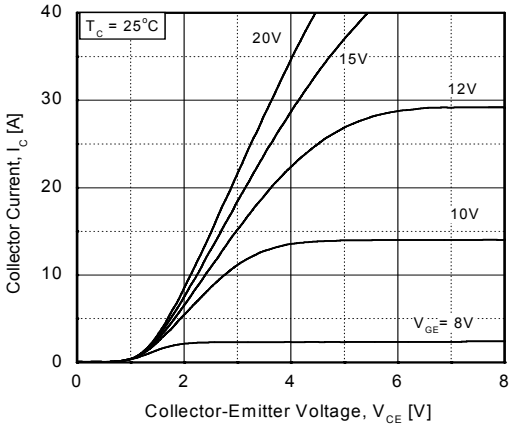


Figure 2. Typical Saturation Voltage Characteristics

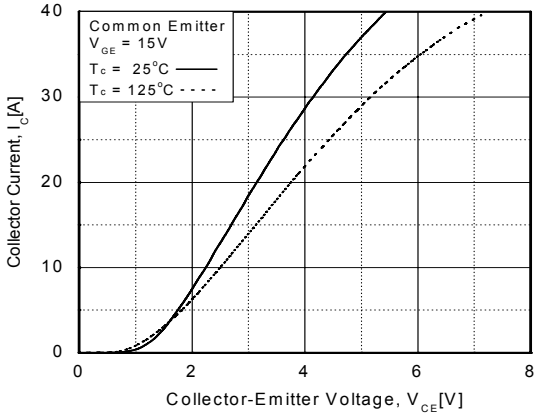


Figure 3. Saturation Voltage vs Case Temperature at Variant Current Level

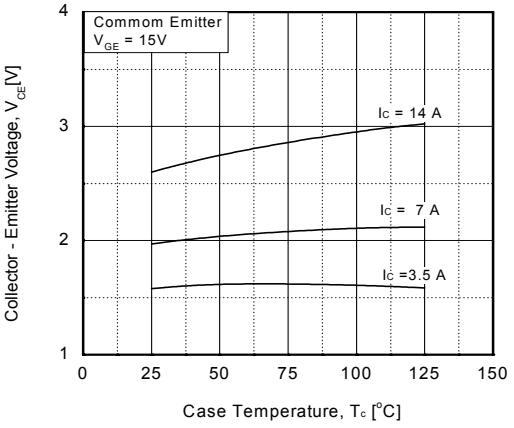


Figure 4. Load Current vs Frequency

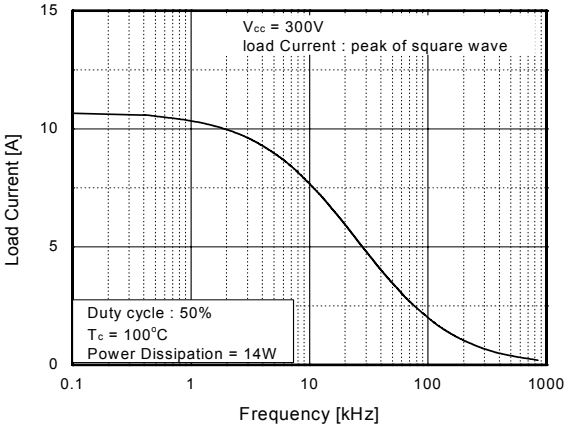


Figure 5. Saturation Voltage vs. Vge

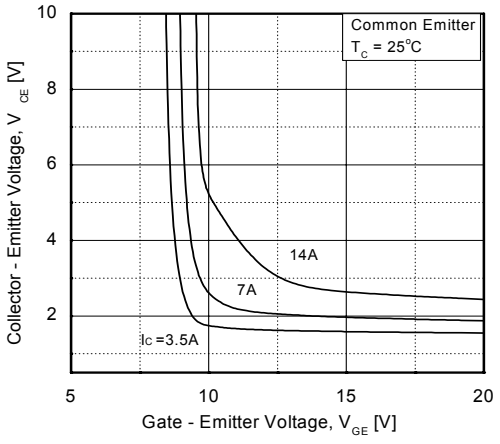
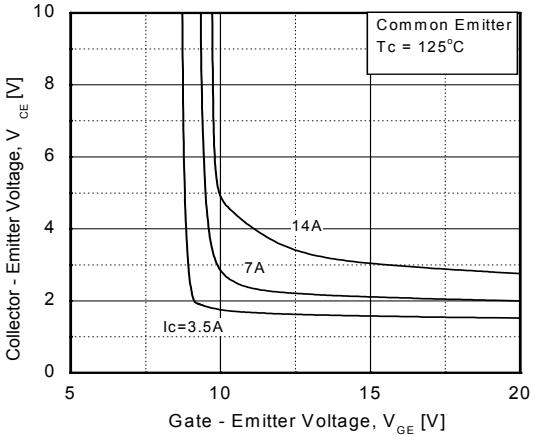


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics Temperature at Variant Current Level

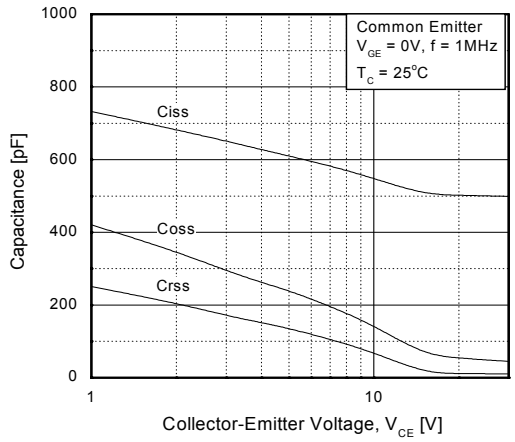


Figure 8. Turn-On Characteristics vs. Gate Resistance

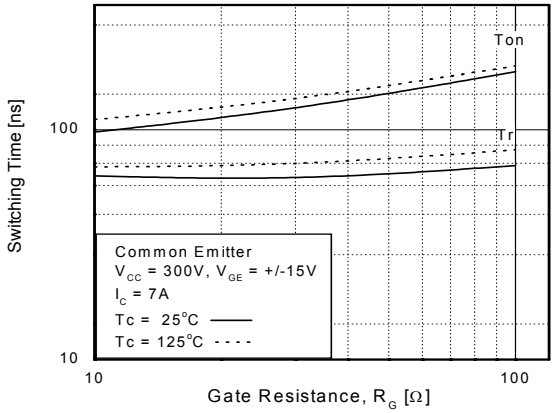


Figure 9. Turn-Off Characteristics vs. Gate Resistance

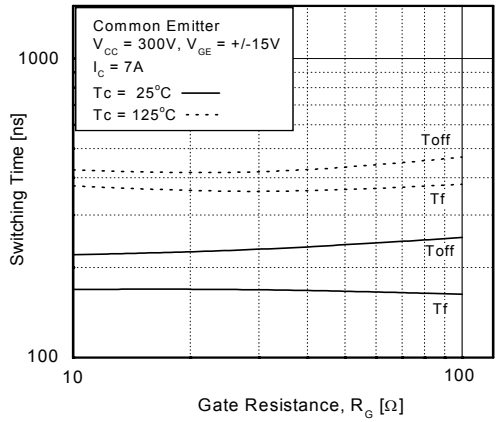


Figure 10. Switching Loss vs. Gate Resistance

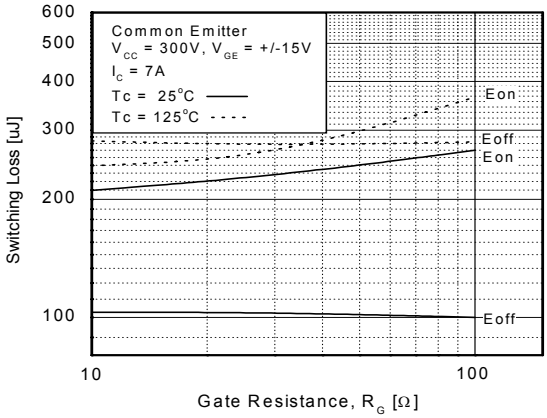


Figure 11. Turn-On Characteristics vs. Collector Current

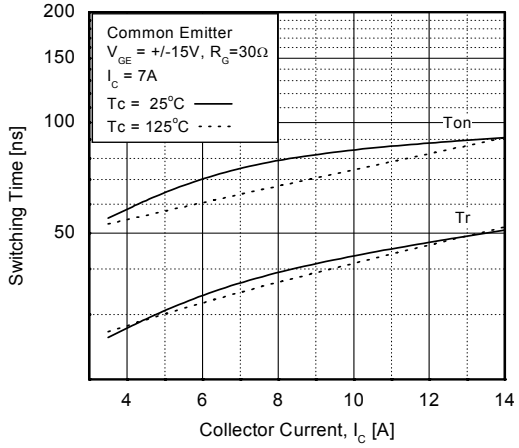
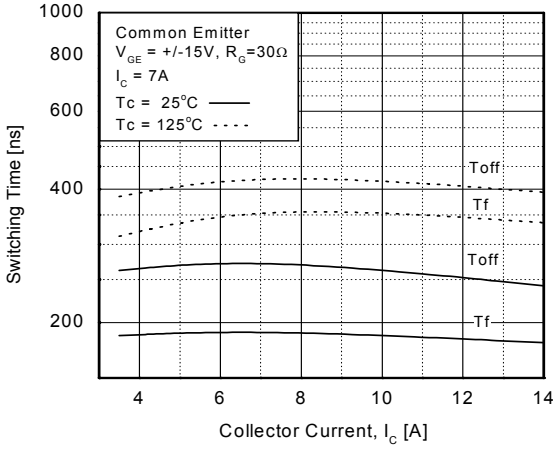


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

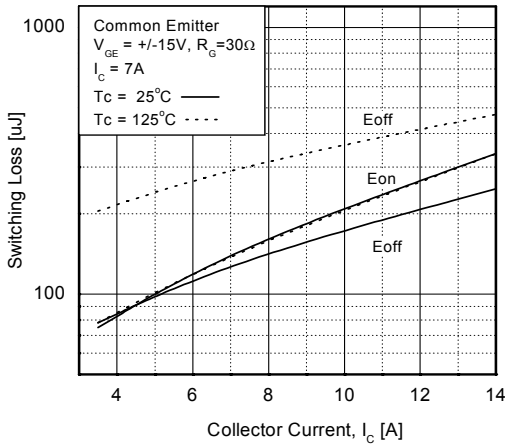


Figure 14. Gate Charge Characteristics

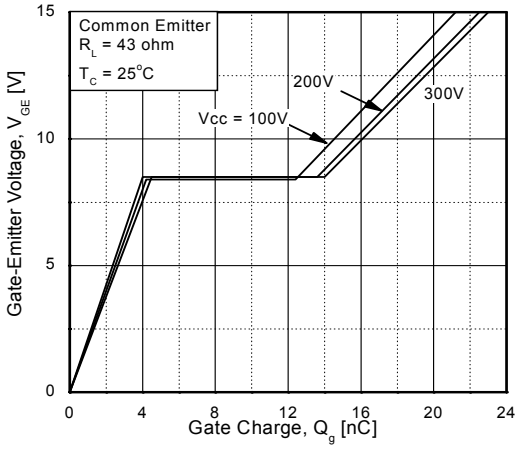


Figure 15. SOA Characteristics

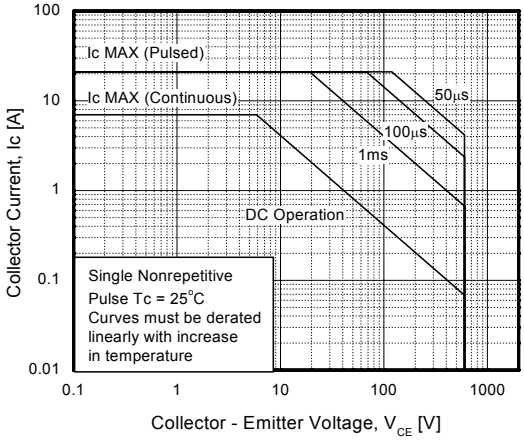
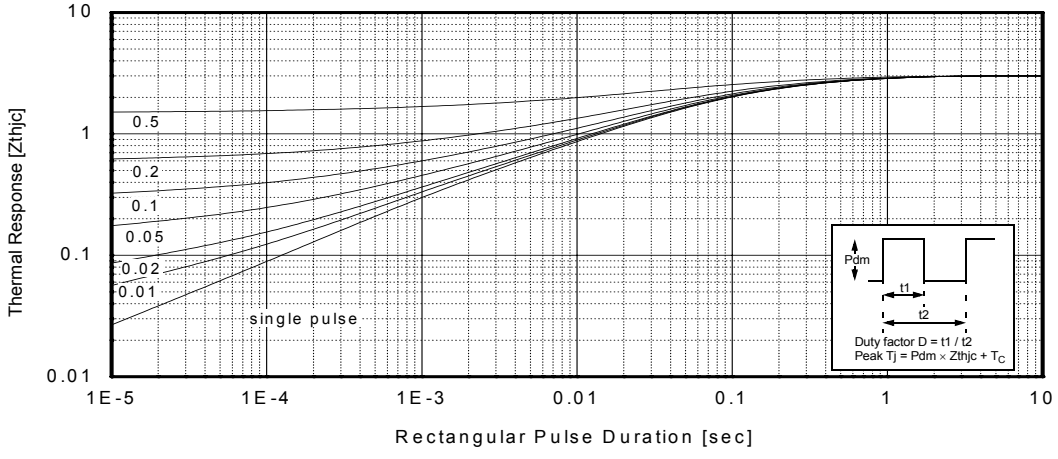


Figure 16. Transient Thermal Impedance of IGBT



Typical Performance Characteristics (Continued)

Figure 17. Forward Voltage Characteristics

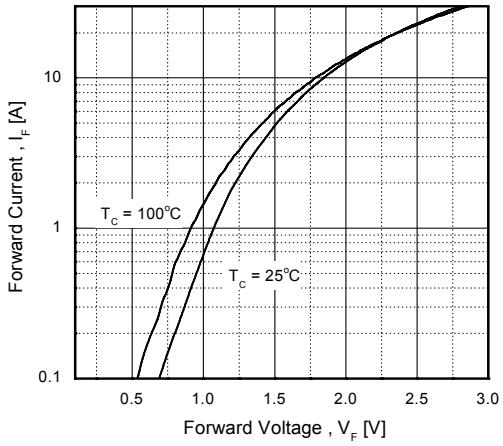


Figure 18. Reverse Recovery Current

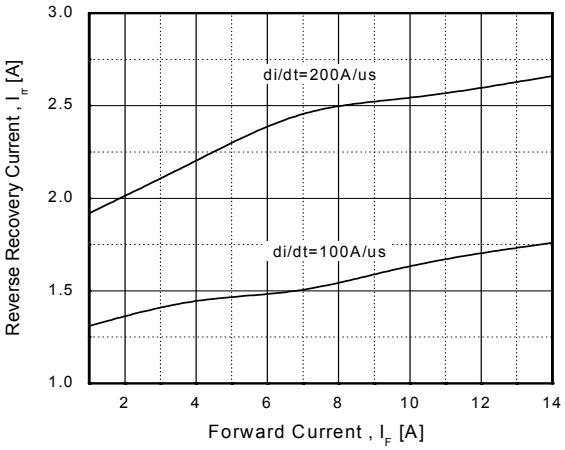


Figure 19. Stored Charge

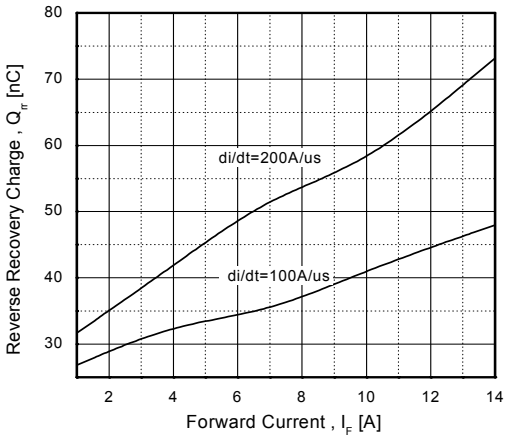
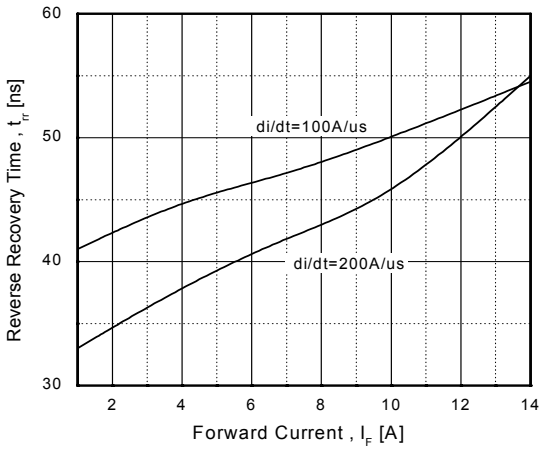


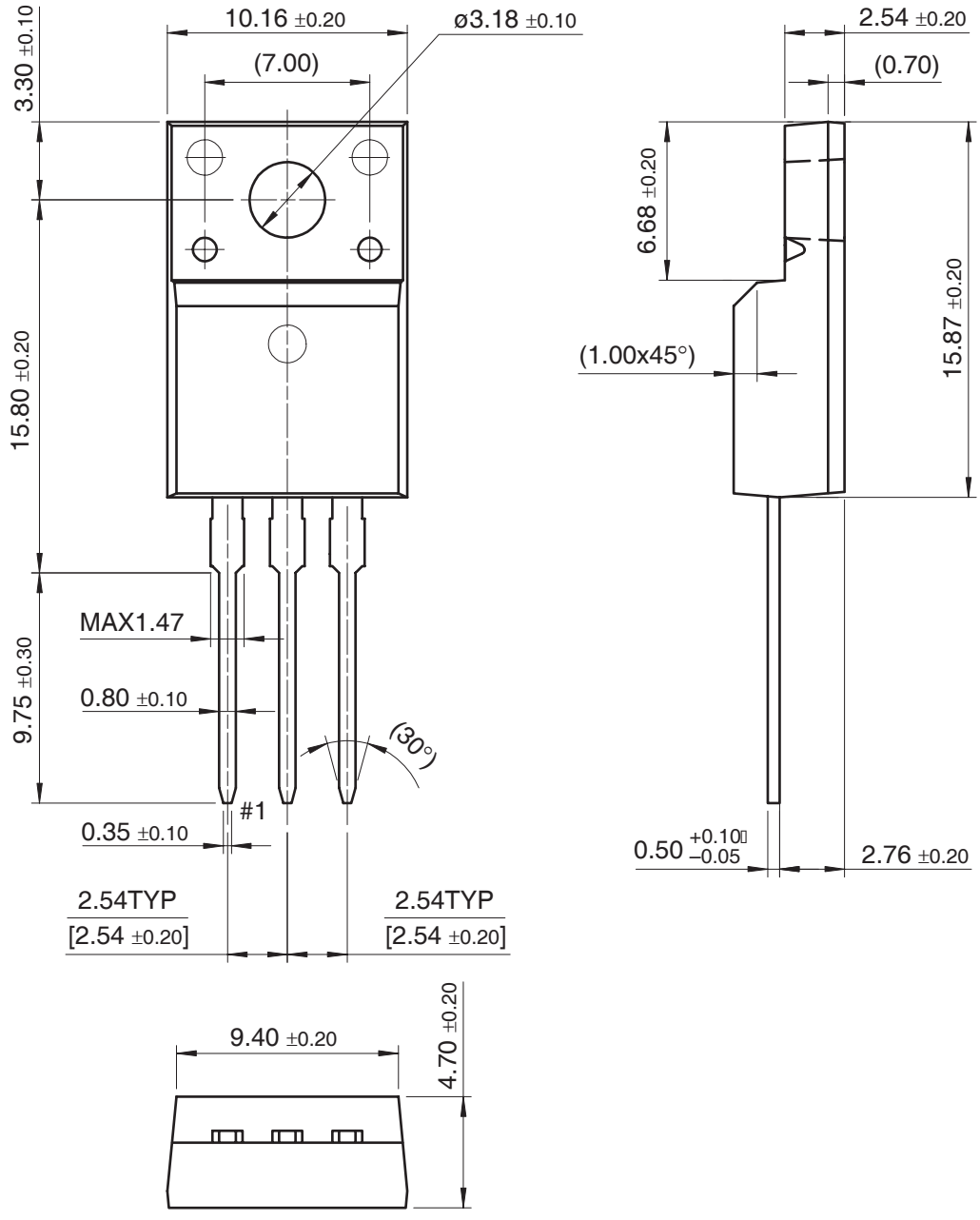
Figure 20. Reverse Recovery Time



Dimensions in Millimeters

Mechanical Dimensions

TO-220F



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