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FAIRCHILD SEMICONDUCTOR®

November 2013

SGP10N60RUFD

600 V, 10 A Short Circuit Rated IGBT

General Description

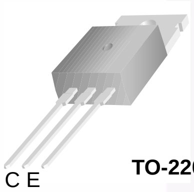
Fairchild's RUFD series of Insulated Gate Bipolar Transistors (IGBTs) provide low conduction and switching losses as well as short circuit ruggedness. The RUFD series is designed for applications such as motor control, Uninterrupted Power Supplies (UPS) and general inverters where short circuit ruggedness is a required feature.

Features

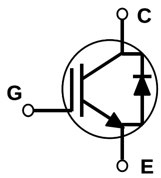
- 10 A, 600 V, T_C = 100°C
- Low Saturation Voltage: V_{CE}(sat) = 2.1 V @ I_C = 10 A
- Typical Fall Time. . . . . .242ns at T_J = 125°C
- High Speed Switching
- High Input Impedance
- Short Circuit Rating

Applications

Motor Control, UPS, General Inverter



TO-220



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Description		Ratings	Unit
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	16	A
	Collector Current	@ T_C = 100°C	10	A
$I_{CM\ (1)}$	Pulsed Collector Current		30	A
I_F	Diode Continuous Forward Current	@ T_C = 25°C	24	A
	Diode Continuous Forward Current	@ T_C = 100°C	12	A
I_{FM}	Diode Maximum Forward Current		92	A
T_{SC}	Short Circuit Withstand Time	@ T_C = 100°C	10	us
P_D	Maximum Power Dissipation	@ T_C = 25°C	75	W
	Maximum Power Dissipation	@ T_C = 100°C	30	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.	Unit
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction-to-Case	--	1.6	°C/W
$R_{\theta JC}$(DIODE)	Thermal Resistance, Junction-to-Case	--	2.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0 V, I_C = 250 uA	600	--	--	V
$\Delta B_{VCES} / \Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0 V, I_C = 1 mA	--	0.6	--	V/°C
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}$, V_{GE} = 0 V	--	--	250	uA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}$, V_{CE} = 0 V	--	--	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 10 mA, $V_{CE} = V_{GE}$	5.0	6.0	8.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 10 A, V_{GE} = 15 V	--	2.2	2.8	V
		I_C = 16 A, V_{GE} = 15 V	--	2.5	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	--	660	--	pF
C_{oes}	Output Capacitance		--	115	--	pF
C_{res}	Reverse Transfer Capacitance		--	25	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 10 A, R_G = 20 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25°C	--	15	--	ns
t_r	Rise Time		--	30	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	36	50	ns
t_f	Fall Time		--	158	200	ns
E_{on}	Turn-On Switching Loss		--	141	--	uJ
E_{off}	Turn-Off Switching Loss		--	215	--	uJ
E_{ts}	Total Switching Loss		--	356	500	uJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 10 A, R_G = 20 Ω, V_{GE} = 15 V, Inductive Load, T_C = 125°C	--	16	--	ns
t_r	Rise Time		--	33	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	42	60	ns
t_f	Fall Time		--	242	350	ns
E_{on}	Turn-On Switching Loss		--	161	--	uJ
E_{off}	Turn-Off Switching Loss		--	452	--	uJ
E_{ts}	Total Switching Loss		--	613	860	uJ
T_{sc}	Short Circuit Withstand Time	V_{CC} = 300 V, V_{GE} = 15 V @ T_C = 100°C	10	--	--	us
Q_g	Total Gate Charge	V_{CE} = 300 V, I_C = 10 A, V_{GE} = 15 V	--	30	45	nC
Q_{ge}	Gate-Emitter Charge		--	5	10	nC
Q_{gc}	Gate-Collector Charge		--	8	16	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.	Unit
V_{FM}	Diode Forward Voltage	I_F = 12 A	T_C = 25°C	--	1.4	1.7	V
			T_C = 100°C	--	1.3	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 12 A, di_F/dt = 200 A/µs	T_C = 25°C	--	42	60	ns
			T_C = 100°C	--	60	--	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	--	3.5	6.0	A
			T_C = 100°C	--	5.6	--	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	--	80	180	nC
			T_C = 100°C	--	220	--	

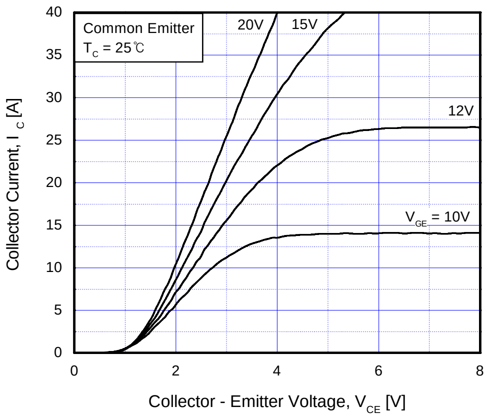


Fig 1. Typical Output Characteristics

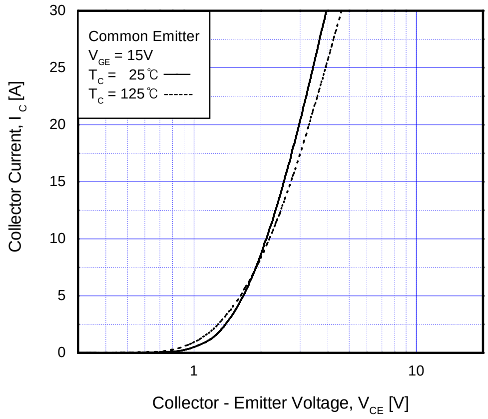


Fig 2. Typical Saturation Voltage Characteristics

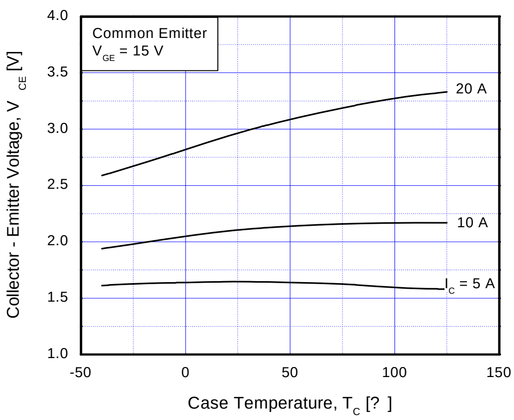


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

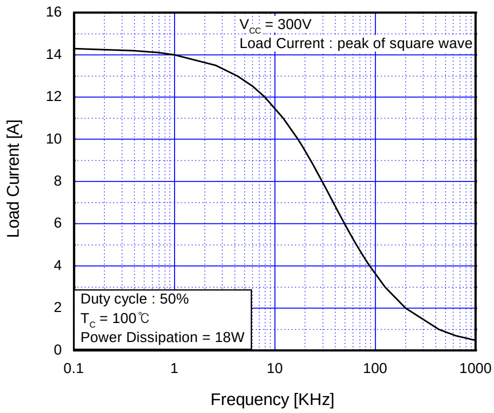


Fig 4. Load Current vs. Frequency

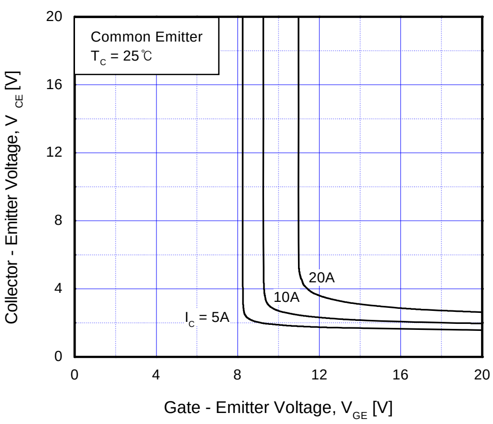


Fig 5. Saturation Voltage vs. V_{GE}

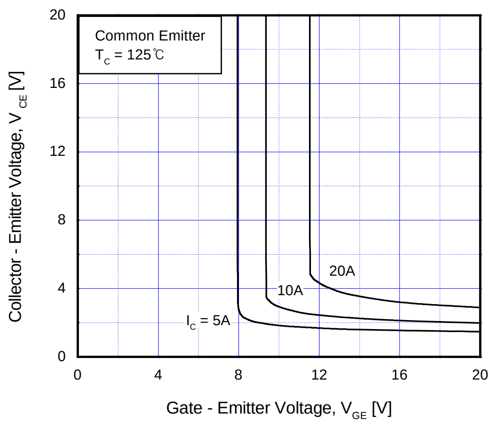


Fig 6. Saturation Voltage vs. V_{GE}

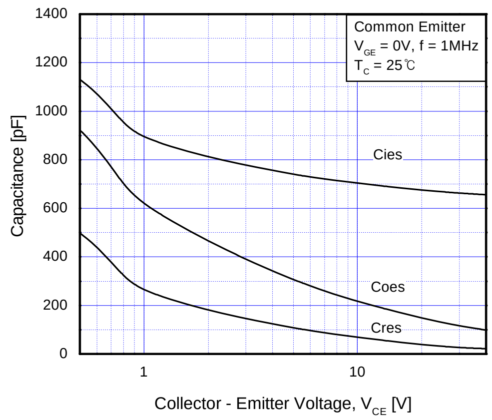


Fig 7. Capacitance Characteristics

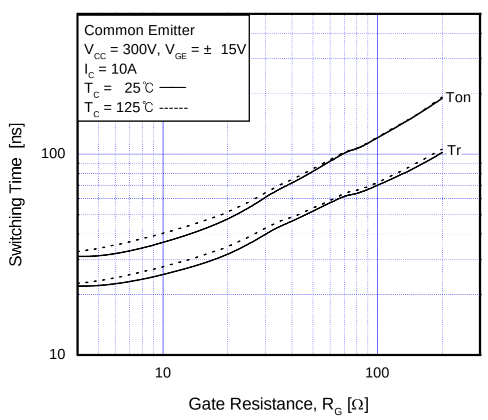


Fig 8. Turn-On Characteristics vs. Gate Resistance

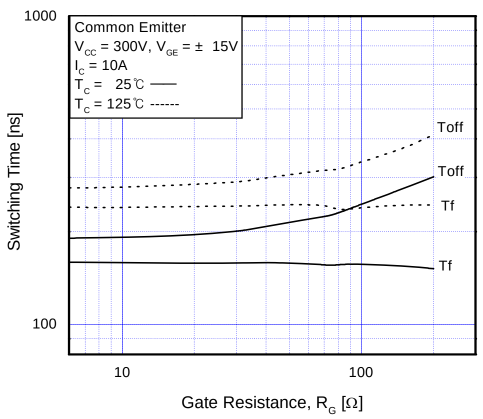


Fig 9. Turn-Off Characteristics vs. Gate Resistance

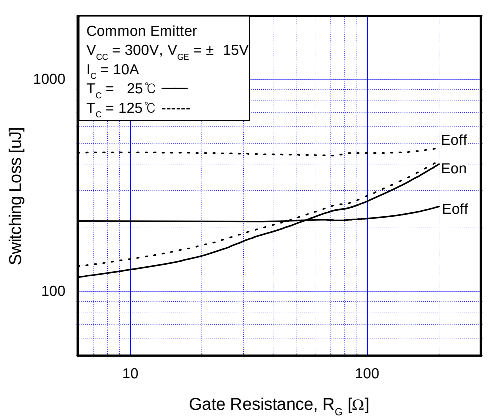


Fig 10. Switching Loss vs. Gate Resistance

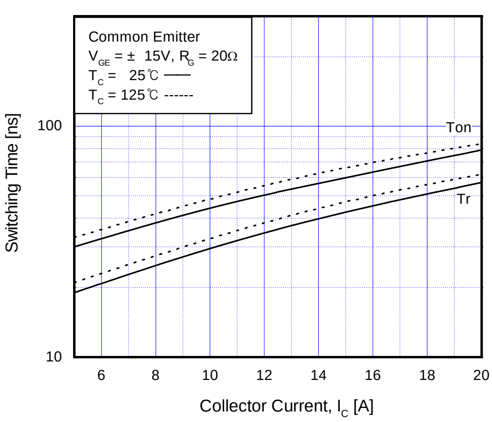


Fig 11. Turn-On Characteristics vs. Collector Current

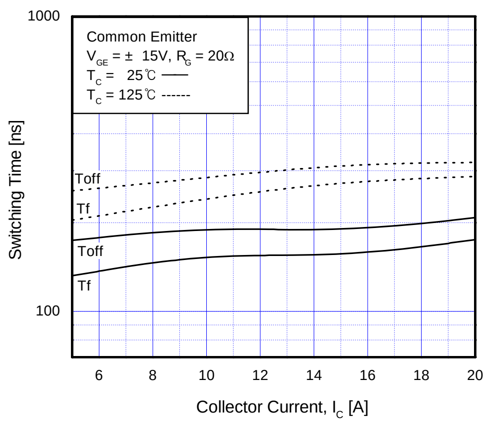


Fig 12. Turn-Off Characteristics vs. Collector Current

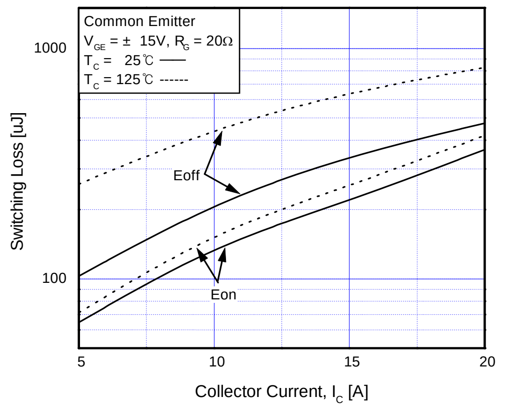


Fig 13. Switching Loss vs. Collector Current

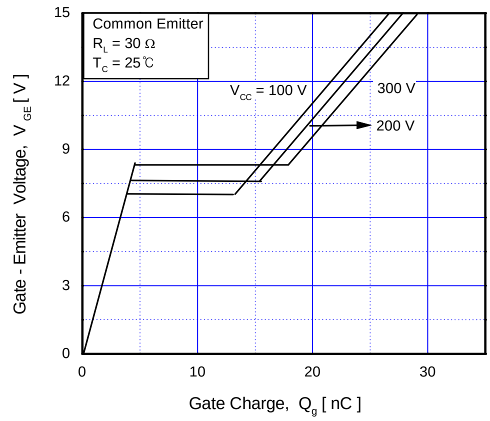


Fig 14. Gate Charge Characteristics

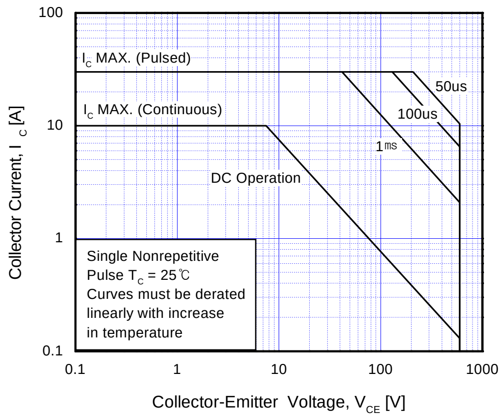


Fig 15. SOA Characteristics

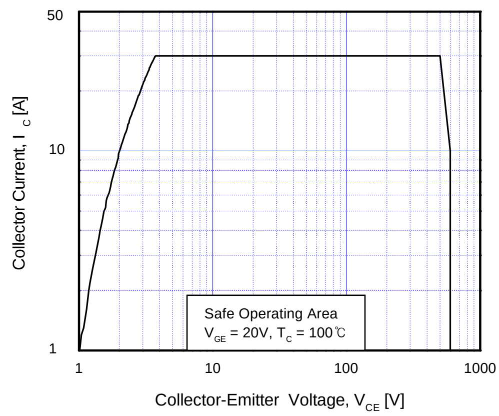


Fig 16. Turn-Off SOA Characteristics

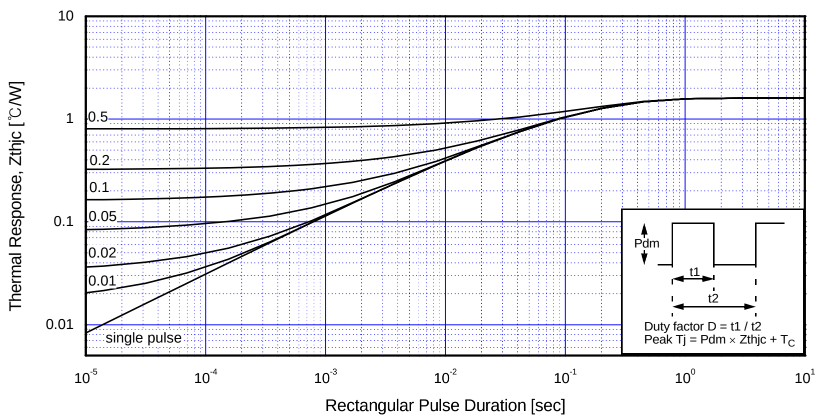


Fig 17. Transient Thermal Impedance of IGBT

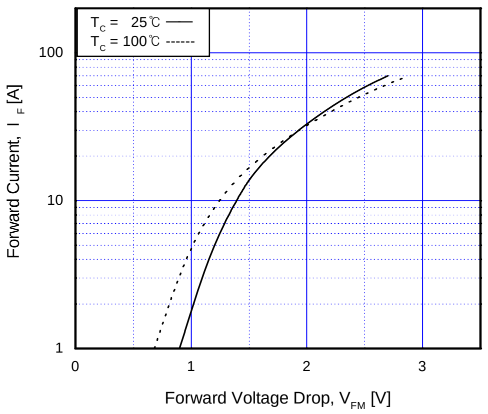


Fig 18. Forward Characteristics

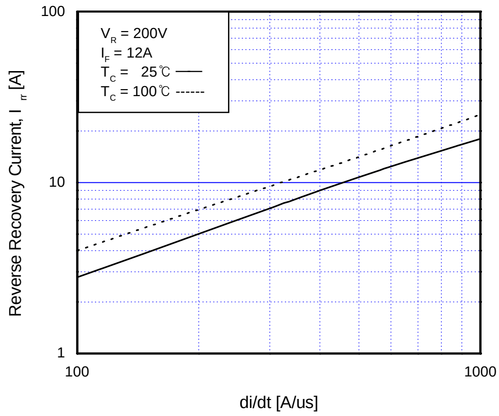


Fig 19. Reverse Recovery Current

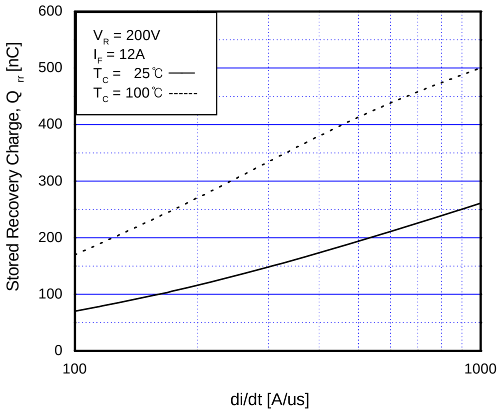


Fig 20. Stored Charge

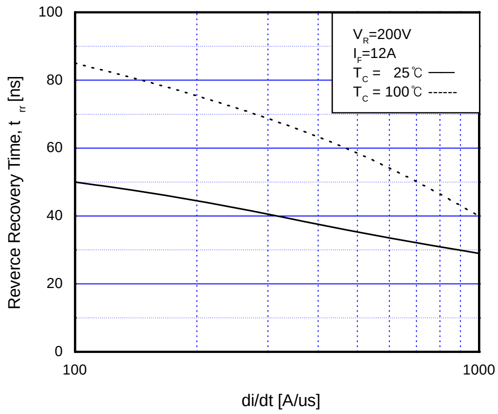
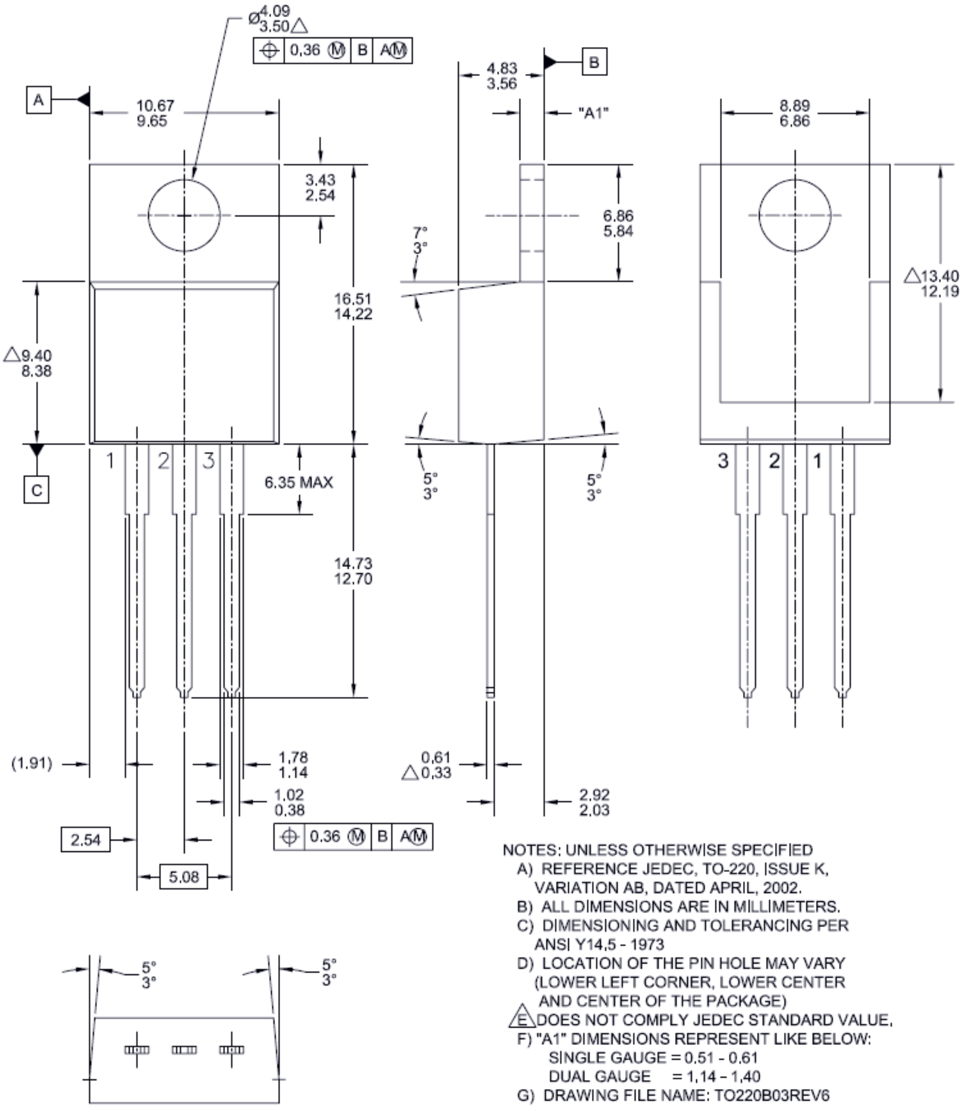


Fig 21. Reverse Recovery Time

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED
- A) REFERENCE JEDEC, TO-220, ISSUE K, VARIATION AB, DATED APRIL, 2002.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1973
- D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
- E) DOES NOT COMPLY JEDEC STANDARD VALUE.
- F) "A1" DIMENSIONS REPRESENT LIKE BELOW:
  SINGLE GAUGE = 0.51 - 0.61
  DUAL GAUGE = 1.14 - 1.40
- G) DRAWING FILE NAME: TO220B03REV6

Figure 22. TO-220 3L - TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB

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2. A critical component in 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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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.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I66