FAIRCHILD SEMICONDUCTOR®

May 2006

FGA15N120ANTD / FGA15N120ANTD_F109
1200V NPT Trench IGBT

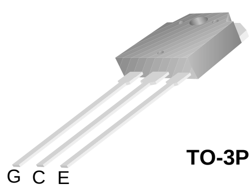
Features

- NPT Trench Technology, Positive temperature coefficient
- Low saturation voltage: $V_{CE(sat), typ}$ = 1.9V @ I_C = 15A and T_C = 25°C
- Low switching loss: $E_{off, typ}$ = 0.6mJ @ I_C = 15A and T_C = 25°C
- Extremely enhanced avalanche capability

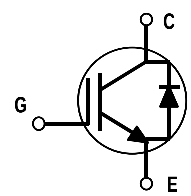
Description

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



Absolute Maximum Ratings

Symbol	Description		FGA15N120ANTD	Units
V_{CES}	Collector-Emitter Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	30	A
	Collector Current	@ T_C = 100°C	15	A
I_{CM}	Pulsed Collector Current (Note 1)		45	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	15	A
I_{FM}	Diode Maximum Forward Current		45	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	186	W
	Maximum Power Dissipation	@ T_C = 100°C	74	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	--	0.67	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case for Diode	--	2.88	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	°C/W

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

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGA15N120ANTD	FGA15N120ANTD	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 = 15mA, $V_{CE} = V_{GE}$	4.5	6.5	8.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 15A, V_{GE} = 15V	--	1.9	2.4	V
		I_C = 15A, V_{GE} = 15V, T_C = 125°C	--	2.2	--	V
		I_C = 30A, V_{GE} = 15V	--	2.3	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	--	2650	--	pF
C_{oes}	Output Capacitance		--	143	--	pF
C_{res}	Reverse Transfer Capacitance		--	96	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 15A, R_G = 10Ω, V_{GE} = 15V, Inductive Load, T_C = 25°C	--	15	--	ns
t_r	Rise Time		--	20	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	160	--	ns
t_f	Fall Time		--	100	180	ns
E_{on}	Turn-On Switching Loss		--	3	4.5	mJ
E_{off}	Turn-Off Switching Loss		--	0.6	0.9	mJ
E_{ts}	Total Switching Loss		--	3.6	5.4	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600 V, I_C = 15A, R_G = 10Ω, V_{GE} = 15V, Inductive Load, T_C = 125°C	--	15	--	ns
t_r	Rise Time		--	20	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	170	--	ns
t_f	Fall Time		--	150	--	ns
E_{on}	Turn-On Switching Loss		--	3.2	4.8	mJ
E_{off}	Turn-Off Switching Loss		--	0.8	1.2	mJ
E_{ts}	Total Switching Loss		--	4.0	6.0	mJ
Q_g	Total Gate Charge	V_{CE} = 600 V, I_C = 15A, V_{GE} = 15V	--	120	180	nC
Q_{ge}	Gate-Emitter Charge		--	16	22	nC
Q_{gc}	Gate-Collector Charge		--	50	65	nC

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 = 15A	T_C = 25°C	--	1.7	2.7	V
			T_C = 125°C	--	1.8	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 15A dI/dt = 200 A/µs	T_C = 25°C	--	210	330	ns
			T_C = 125°C	--	280	--	
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	--	2835	6600	nC
			T_C = 125°C	--	4340	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

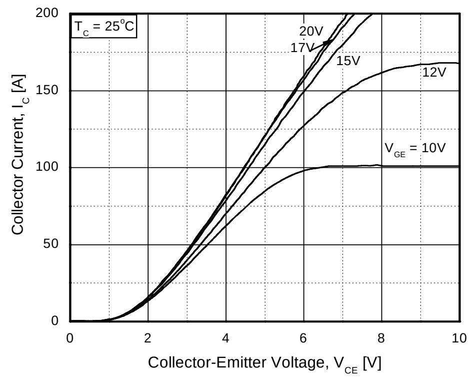


Figure 2. Typical Saturation Voltage Characteristics

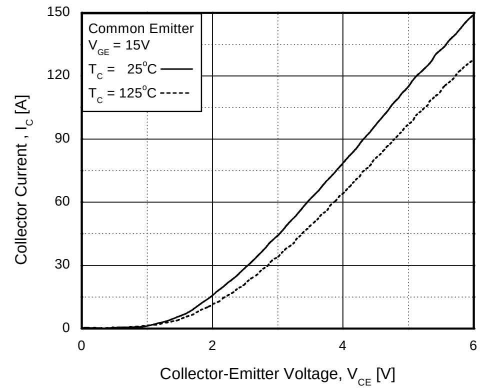


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

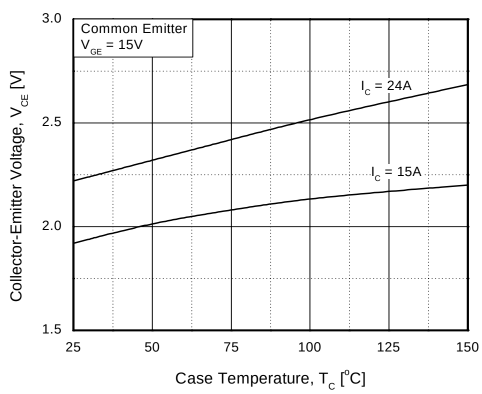


Figure 4. Saturation Voltage vs. V_{GE}

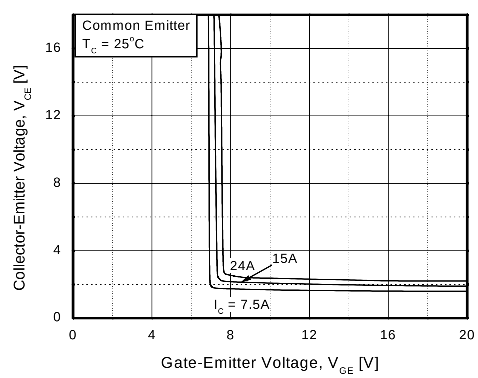


Figure 5. Saturation Voltage vs. V_{GE}

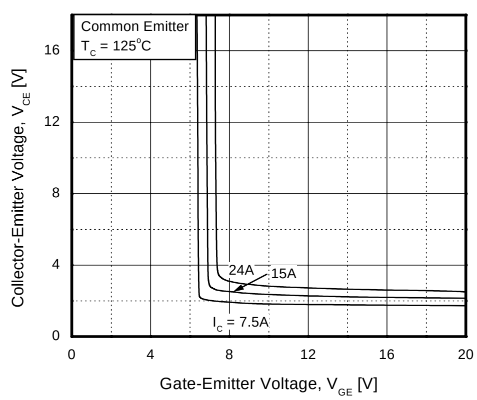
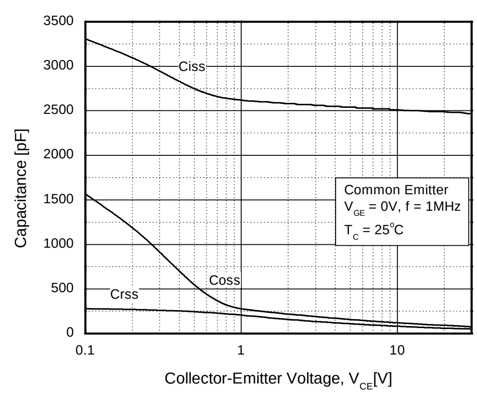


Figure 6. Capacitance Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Turn-On Characteristics vs. Gate Resistance

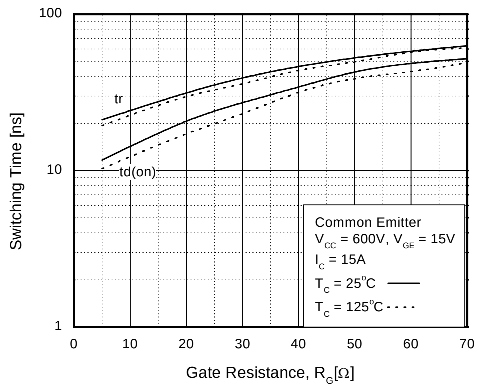


Figure 8. Turn-Off Characteristics vs. Gate Resistance

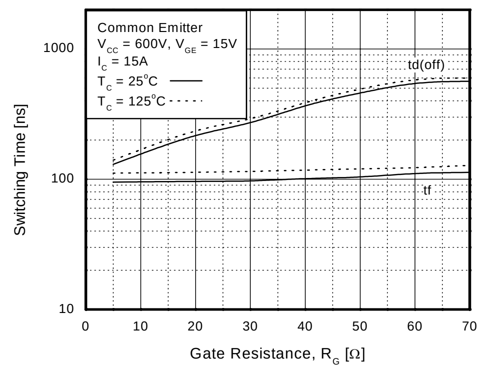


Figure 9. Switching Loss vs. Gate Resistance

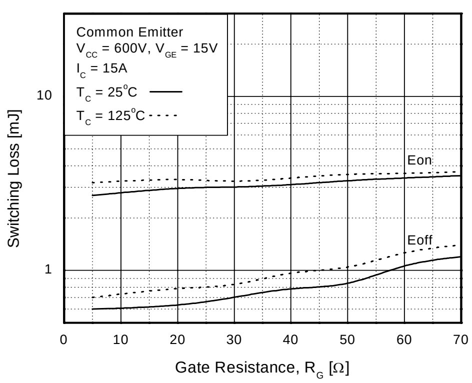


Figure 10. Turn-On Characteristics vs. Collector Current

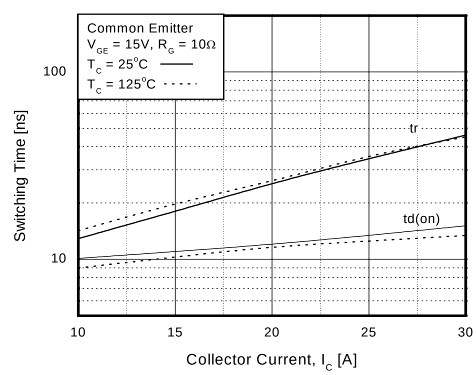


Figure 11. Turn-Off Characteristics vs. Collector Current

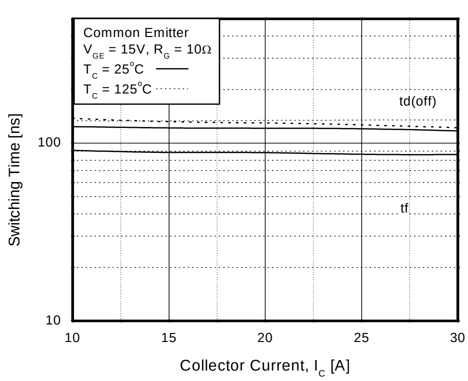
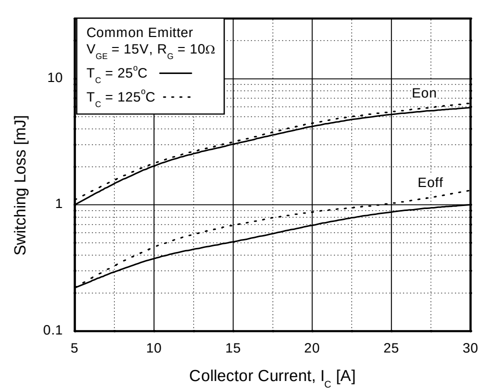


Figure 12. Switching Loss vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Gate Charge Characteristics

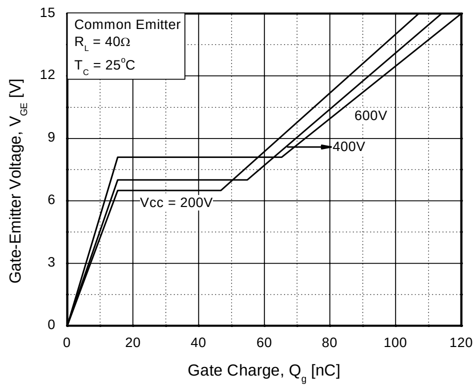


Figure 14. SOA Characteristics

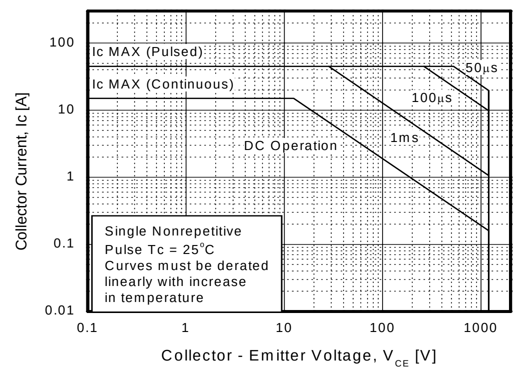


Figure 15. Turn-Off SOA

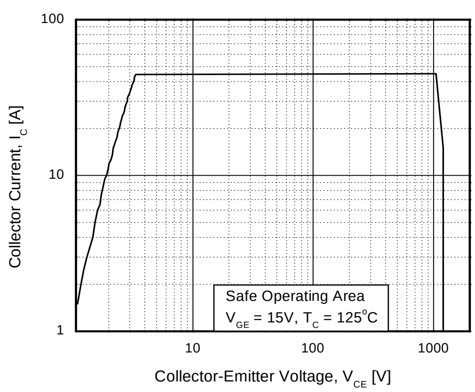
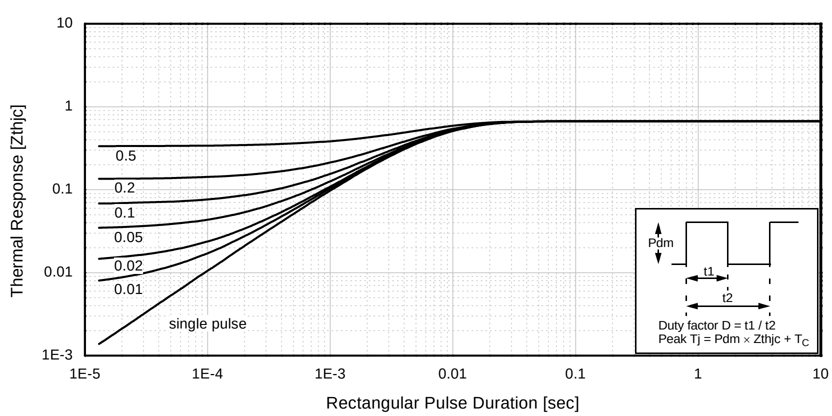


Figure 16. Transient Thermal Impedance of IGBT



Typical Performance Characteristics (Continued)

Figure 17. Forward Characteristics

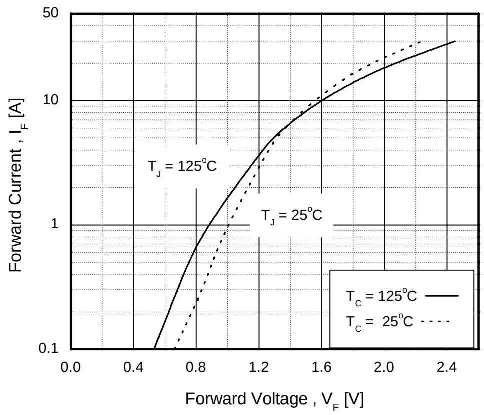


Figure 18. Reverse Recovery Current

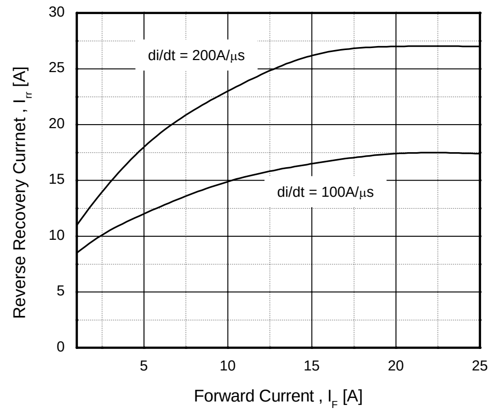


Figure 19. Stored Charge

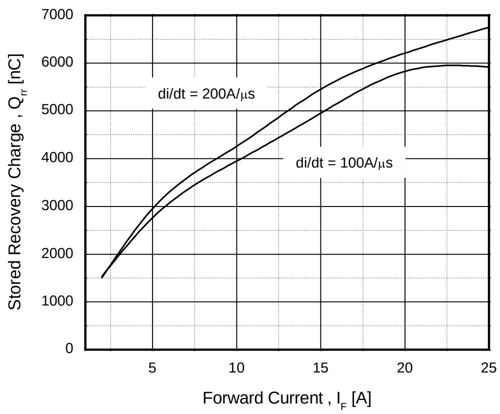
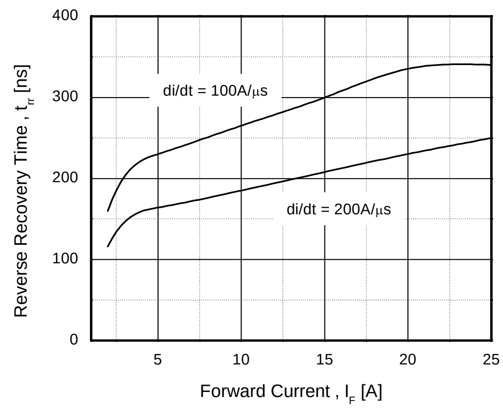
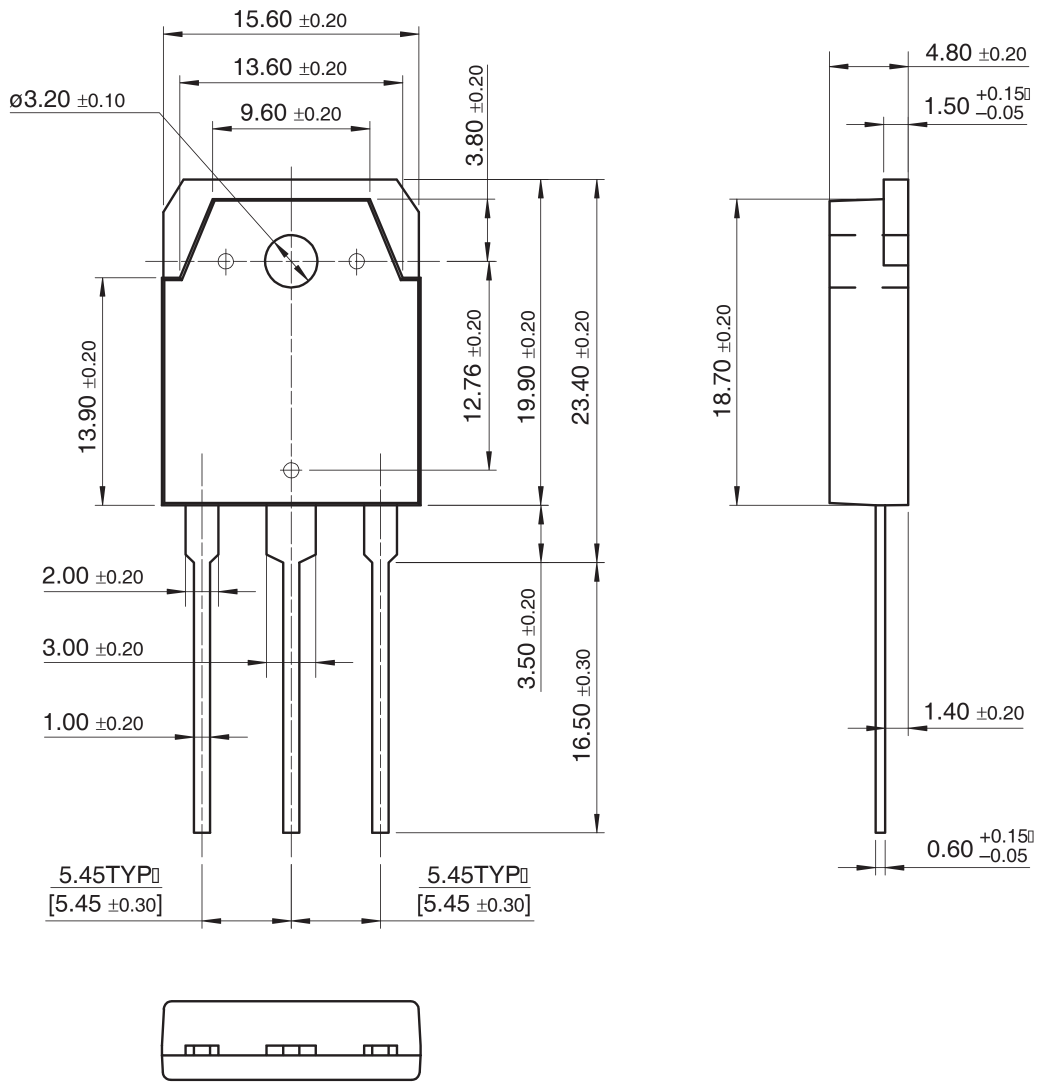


Figure 20. Reverse Recovery Time



Mechanical Dimensions

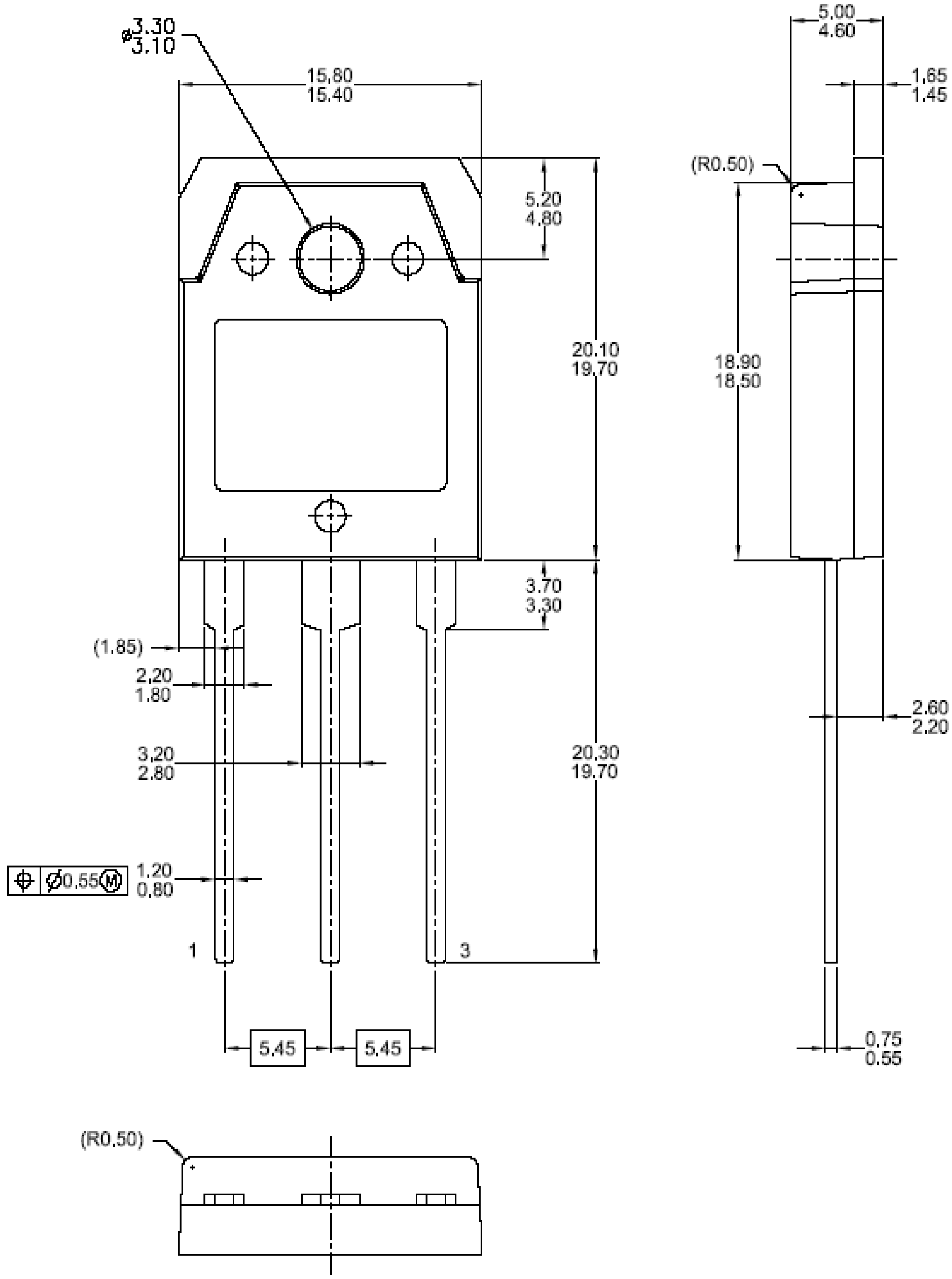
TO-3P



Dimensions in Millimeters

Mechanical Dimensions (continued)

TO-3PN



Dimensions in Millimeters

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