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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR®

September 2013

FGA20S140P
1400 V, 20 A Shorted-anode IGBT

Features

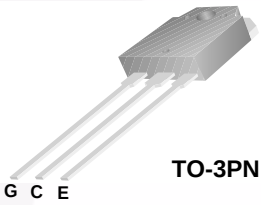
- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)}$ =1.9 V @ I_C = 20 A
- High Input Impedance
- RoHS Compliant

Applications

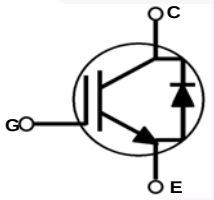
- Induction Heating, Microwave Oven

General Description

Using advanced field stop trench and shorted-anode technology, Fairchild's shorted-anode trench IGBTs offer superior conduction and switching performances for soft switching applications. The device can operate in parallel configuration with exceptional avalanche capability. This device is designed for induction heating and microwave oven.



TO-3PN



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description		Ratings	Unit
V_{CES}	Collector to Emitter Voltage		1400	V
V_{GES}	Gate to Emitter Voltage		±25	V
I_C	Collector Current	@ T_C = 25°C	40	A
	Collector Current	@ T_C = 100°C	20	A
$I_{CM\ (1)}$	Pulsed Collector Current		60	A
I_F	Diode Continuous Forward Current	@ T_C = 25°C	40	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	20	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	272	W
	Maximum Power Dissipation	@ T_C = 100°C	136	W
T_J	Operating Junction Temperature		-55 to +175	°C
T_{stg}	Storage Temperature Range		-55 to +175	°C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case	--	0.55	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	40	°C/W

Notes:
1: Limited by Tjmax

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGA20S140P	FGA20S140P	TO-3PN	-	-	30

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
I_{CES}	Collector Cut-Off Current	V_{CE} = 1400, V_{GE} = 0V	-	-	1	mA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0V	-	-	±500	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 20mA, V_{CE} = V_{GE}	4.5	6.0	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 20A, V_{GE} = 15V T_C = 25°C	-	1.9	2.4	V
		I_C = 20A, V_{GE} = 15V, T_C = 125°C	-	2.1	-	V
		I_C = 20A, V_{GE} = 15V, T_C = 175°C	-	2.2	-	V
V_{FM}	Diode Forward Voltage	I_F = 20A, T_C = 25°C	-	1.7	2.4	V
		I_F = 20A, T_C = 175°C	-	2.1	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	-	1686	-	pF
C_{oes}	Output Capacitance		-	45	-	pF
C_{res}	Reverse Transfer Capacitance		-	32	-	pF
Switching Characcteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600V, I_C = 20A, R_G = 10Ω, V_{GE} = 15V, Resistive Load, T_C = 25°C	-	20		ns
t_r	Rise Time		-	245	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	400	-	ns
t_f	Fall Time		-	130	-	ns
E_{on}	Turn-On Switching Loss		-	0.76	-	mJ
E_{off}	Turn-Off Switching Loss		-	0.56	-	mJ
E_{ts}	Total Switching Loss		-	1.32	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600V, I_C = 20A, R_G = 10Ω, V_{GE} = 15V, Resistive Load, T_C = 175°C	-	21	-	ns
t_r	Rise Time		-	301	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	420	-	ns
t_f	Fall Time		-	356	-	ns
E_{on}	Turn-On Switching Loss		-	0.95	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.39	-	mJ
E_{ts}	Total Switching Loss		-	2.34	-	mJ
Q_g	Total Gate Charge	V_{CE} = 600V, I_C = 20A, V_{GE} = 15V	-	203.5	-	nC
Q_{ge}	Gate to Emitter Charge		-	10.8	-	nC
Q_{gc}	Gate to Collector Charge		-	84.6	-	nC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

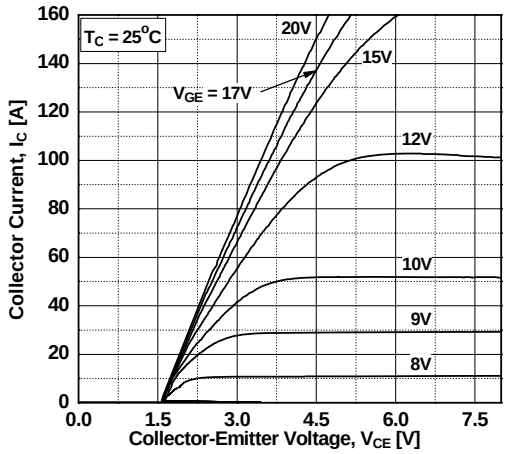


Figure 2. Typical Saturation Voltage Characteristics

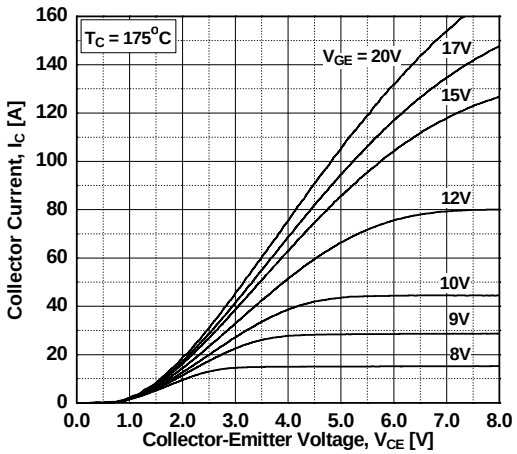


Figure 3. Typical Saturation Voltage Characteritics

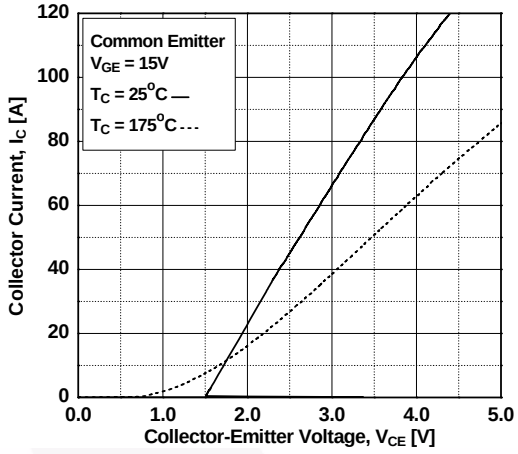


Figure 4. Transfer Characteristics

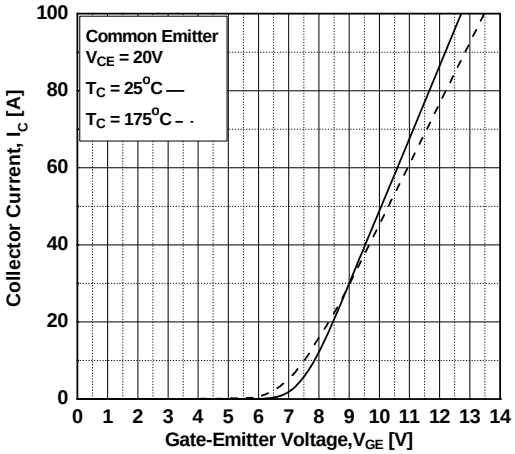


Figure 5. Saturation Voltage vs. Case

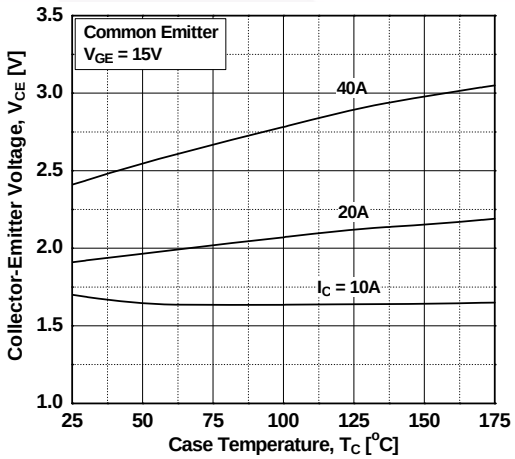
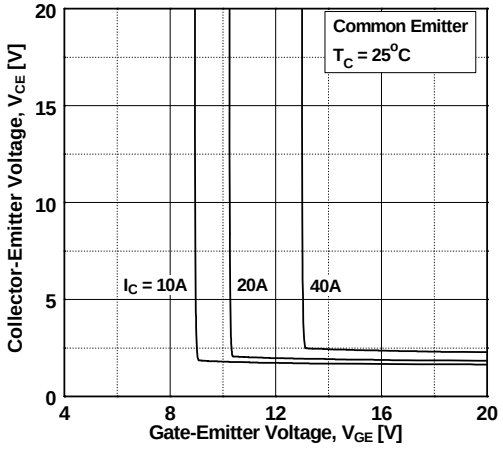


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. Vge

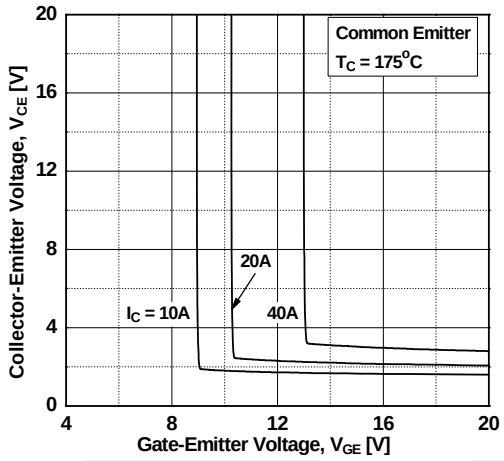


Figure 8. Capacitance Characteristics

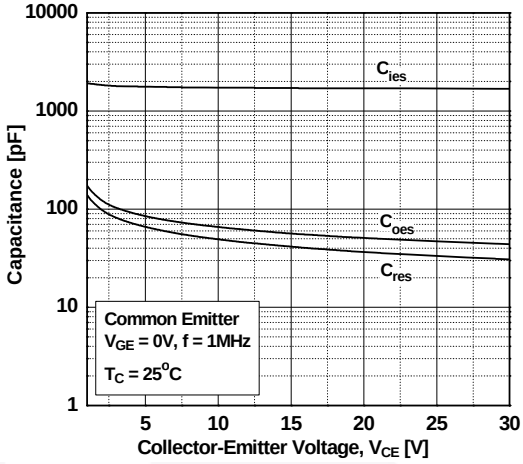


Figure 9. Gate Charge Characteristics

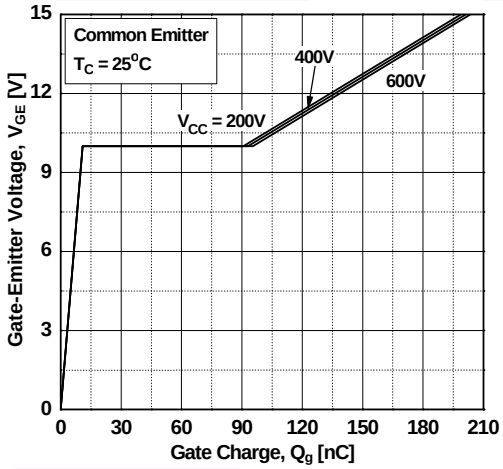


Figure 10. SOA Characteristics

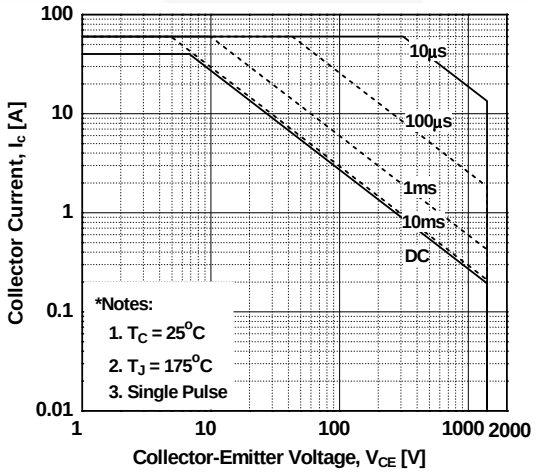


Figure 11. Turn-On Characteristics vs Gate Resistance

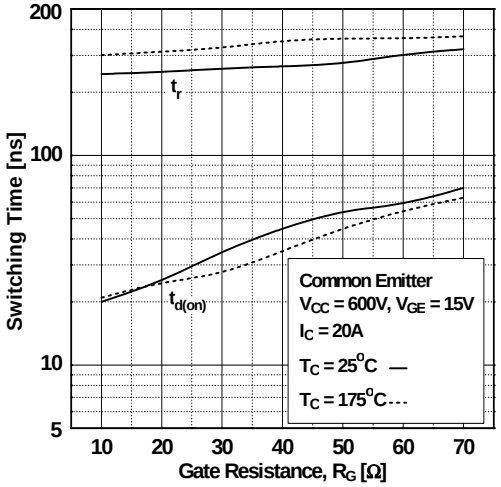
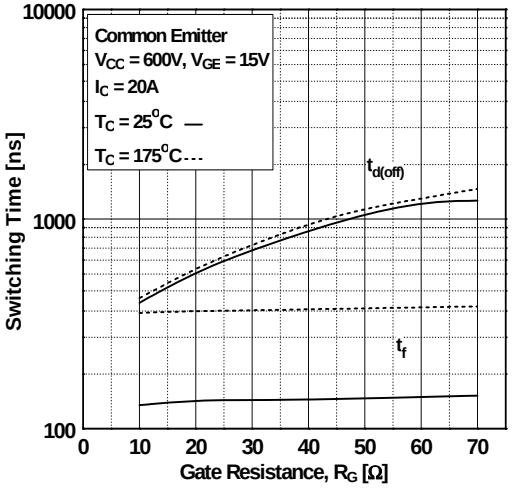


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics VS. Collector Current

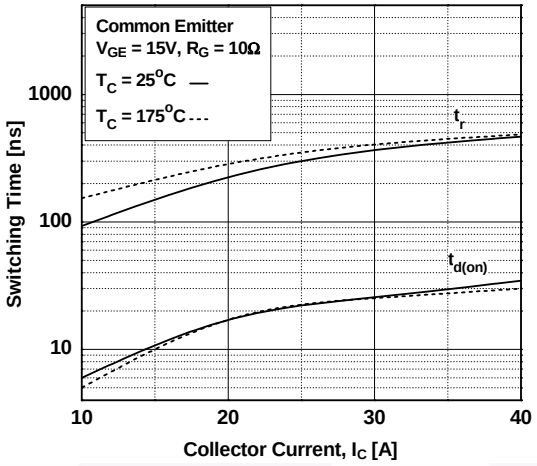


Figure 14.Turn-off Characteristics VS. Collector Current

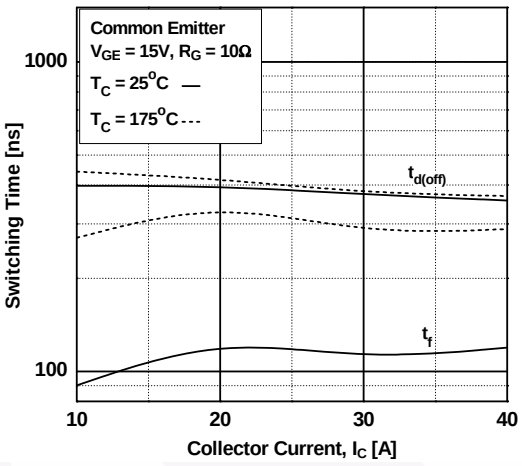


Figure 15. Switching Loss VS. Gate Resistance

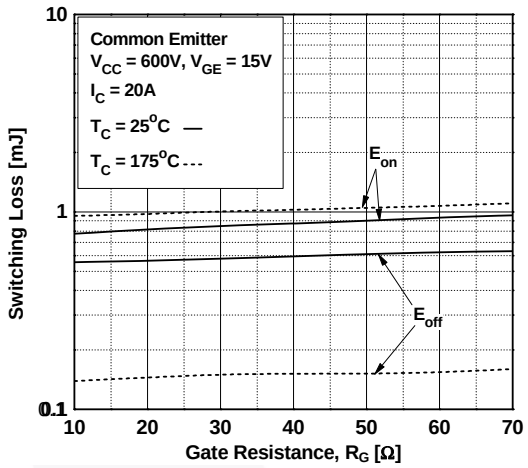


Figure 16. Switching Loss VS. Gate Resistance

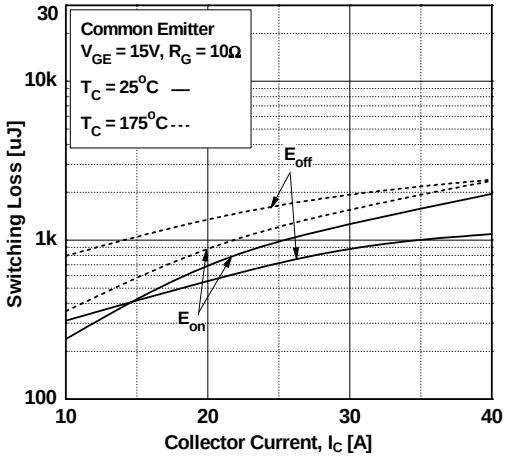


Figure 17. Turn off Switching SOA Characteristics

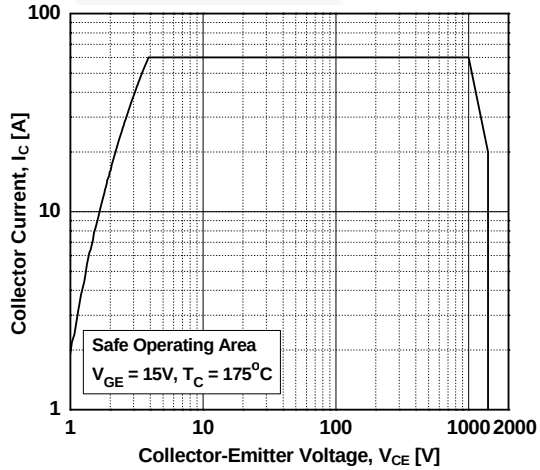


Figure 18. Forward Characteristics

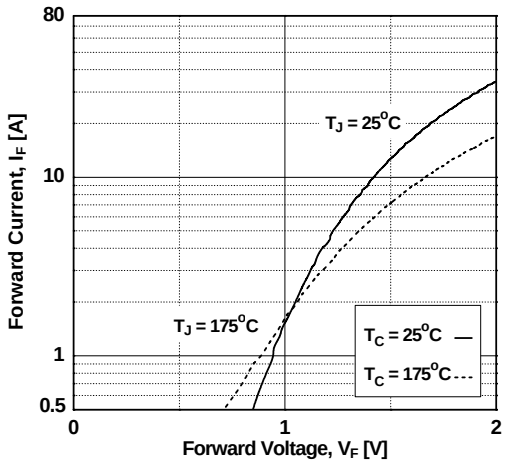
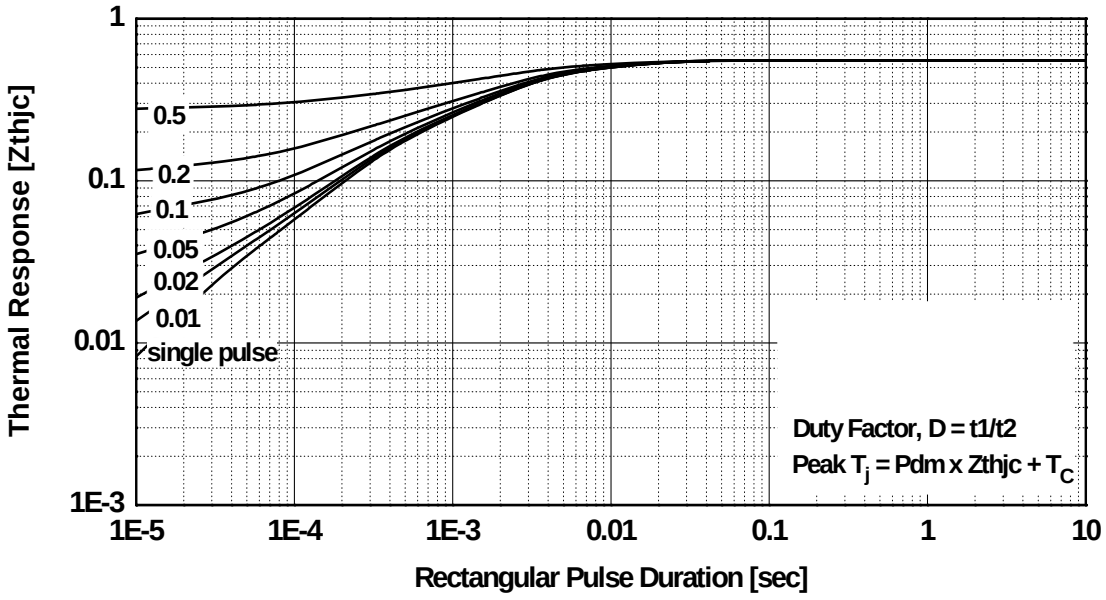


Figure 19. Transient Thermal Impedance of IGBT



Mechanical Dimensions

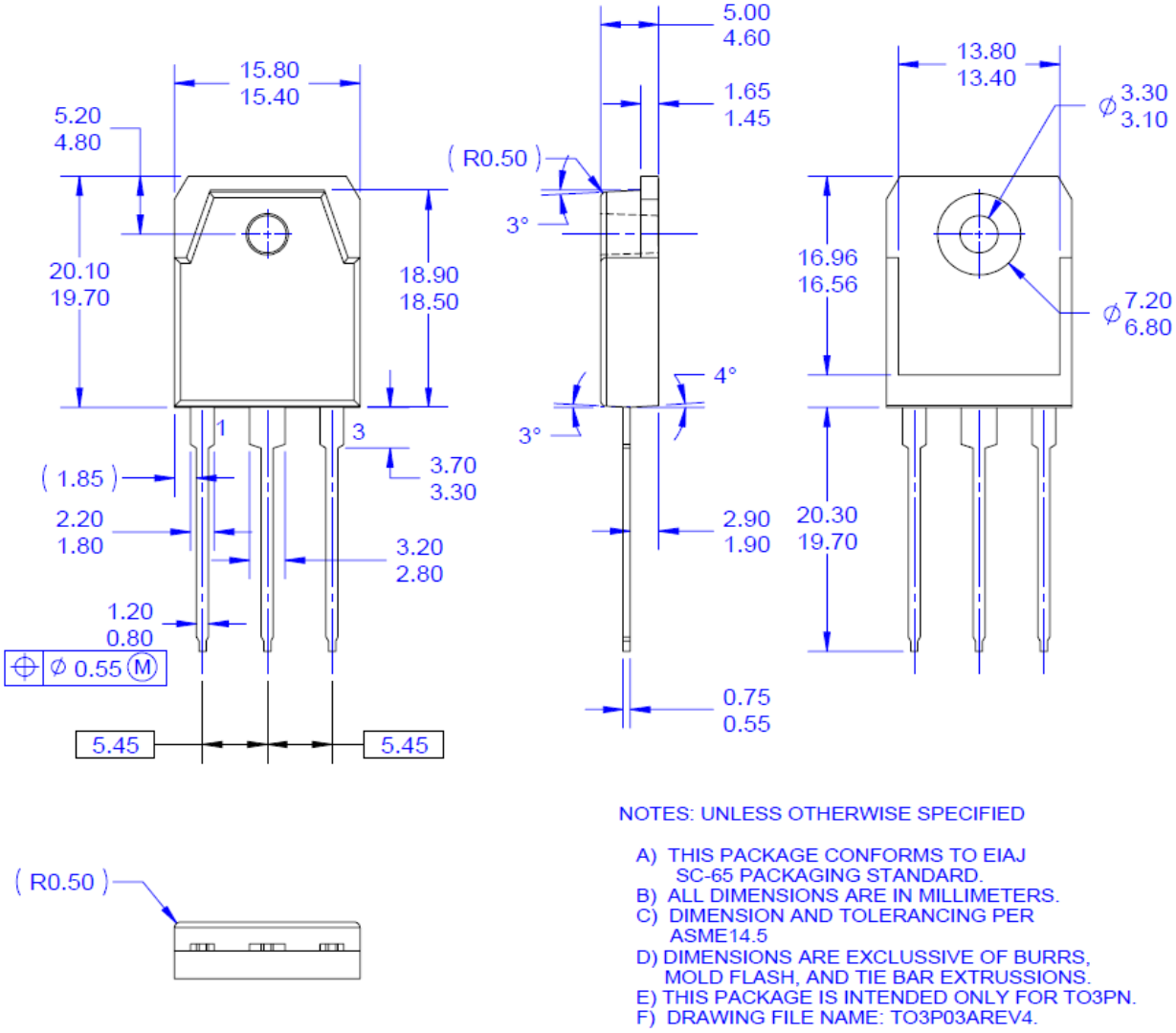


Figure 20. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65

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Dimensions in Millimeters

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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

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