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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.

FGA30N120FTD
1200 V, 30 A Field Stop Trench IGBT

Features

• Field Stop Trench Technology
• High Speed Switching
• Low Saturation Voltage: $V_{CE(sat)}$ = 1.6 V @ I_C = 30 A
• High Input Impedance

General Description

Using advanced field stop trench technology, Fairchild®'s 1200V trench IGBTs offer superior conduction and switching performances for soft switching applications. The device can operate in parallel configuration with exceptional avalanche ruggedness. This device is designed for induction heating and microwave oven.

Applications

• Solar Inverter, UPS, Welder, PFC

TO-3P
G C E
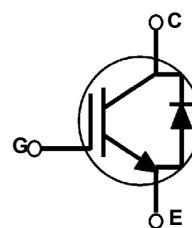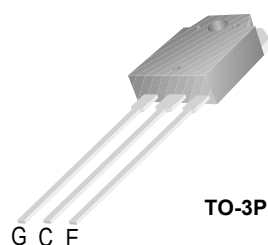
Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CES}	Collector to Emitter Voltage		1200	V
V_{GES}	Gate to Emitter Voltage		± 25	V
I_C	Collector Current	@ T_C = 25°C	60	A
	Collector Current	@ T_C = 100°C	30	A
$I_{CM\,(1)}$	Pulsed Collector Current	@ T_C = 25°C	90	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	30	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	339	W
	Maximum Power Dissipation	@ T_C = 100°C	132	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	-	0.38	°C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	-	1.2	°C/W

R$_{\theta JA}$	Thermal Resistance, Junction to Ambient		-	40	^{o}C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Eco Status	Packaging Type	Qty per Tube
FGA30N120FTD	FGA30N120FTDTU	TO-3PN	RoHS	Tube	30ea

For Fairchild's definition of "green" Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

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 to Emitter Breakdown Voltage	V$_{GE}$ = 0V, I$_C$ = 250μA	1200	-	-	V
I$_{CES}$	Collector Cut-Off Current	V$_{CE}$ = V$_{CES}$, V$_{GE}$ = 0V	-	-	1	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$_C$ = 30mA, V$_{CE}$ = V$_{GE}$	3.5	6	7.5	V
V$_{CE(sat)}$	Collector to Emitter Saturation Voltage	I$_C$ = 30A, V$_{GE}$ = 15V	-	1.6	2	V
		I$_C$ = 30A, V$_{GE}$ = 15V, T$_C$ = 125°C	-	2.0	-	V
Dynamic Characteristics						
C$_{ies}$	Input Capacitance	V$_{CE}$ = 30V, V$_{GE}$ = 0V, f = 1MHz	-	5140	-	pF
C$_{oes}$	Output Capacitance		-	150	-	pF
C$_{res}$	Reverse Transfer Capacitance		-	95	-	pF
Switching Characteristics						
t$_{d(on)}$	Turn-On Delay Time	V$_{CC}$ = 600V, I$_C$ = 30A, R$_G$ = 10Ω, V$_{GE}$ = 15V, Resistive Load, T$_C$ = 25°C	-	31	-	ns
t$_r$	Rise Time		-	101	-	ns
t$_{d(off)}$	Turn-Off Delay Time		-	198	-	ns
t$_f$	Fall Time		-	259	-	ns
E$_{on}$	Turn-On Switching Loss		-	0.54	-	mJ
E$_{off}$	Turn-Off Switching Loss		-	1.16	1.51	mJ
E$_{ts}$	Total Switching Loss		-	1.70	-	mJ
t$_{d(on)}$	Turn-On Delay Time	V$_{CC}$ = 600V, I$_C$ = 30A, R$_G$ = 10Ω, V$_{GE}$ = 15V, Resistive Load, T$_C$ = 125°C	-	40	-	ns
t$_r$	Rise Time		-	127	-	ns
t$_{d(off)}$	Turn-Off Delay Time		-	211	-	ns
t$_f$	Fall Time		-	364	-	ns
E$_{on}$	Turn-On Switching Loss		-	0.74	-	mJ
E$_{off}$	Turn-Off Switching Loss		-	1.63	-	mJ
E$_{ts}$	Total Switching Loss		-	2.37	-	mJ
Q$_g$	Total Gate Charge	V$_{CE}$ = 600V, I$_C$ = 30A, V$_{GE}$ = 15V	-	208	-	nC
Q$_{ge}$	Gate to Emitter Charge		-	41	-	nC
Q$_{gc}$	Gate to Collector Charge		-	97	-	nC

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

Symbol	Parameter	Test Conditions		Min.	Typ.	Max	Unit
V_{FM}	Diode Forward Voltage	$I_F = 30A$	$T_C = 25^oC$	-	1.3	1.7	V
			$T_C = 125^oC$	-	1.3	-	
t_{rr}	Diode Reverse Recovery Time	$I_F = 30A$, di/dt = 200A/μs	$T_C = 25^oC$	-	730	-	ns
			$T_C = 125^oC$	-	775	-	
I_{rr}	Diode Peak Reverse Recovery Current		$T_C = 25^oC$	-	43	-	A
			$T_C = 125^oC$	-	47	-	
Q_{rr}	Diode Reverse Recovery Charge		$T_C = 25^oC$	-	5.9	-	μC
			$T_C = 125^oC$	-	18.2	-	

FGA30N120FTD 1200 V, 30 A Field Stop Trench IGBT

Typical Performance Characteristics

Figure 1. Typical Output Characteristics
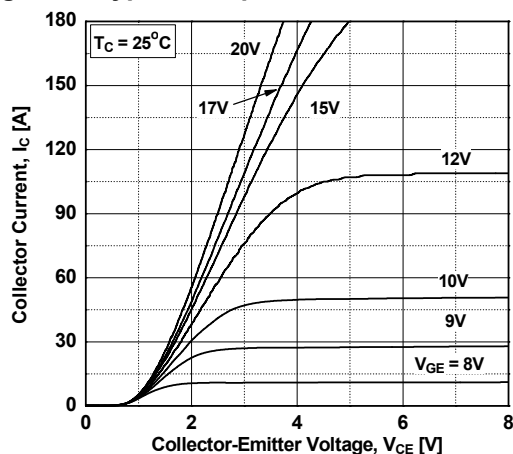
Figure 2. Typical Output Characteristics
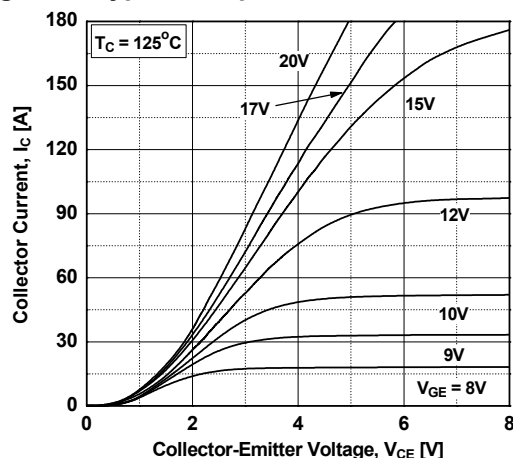
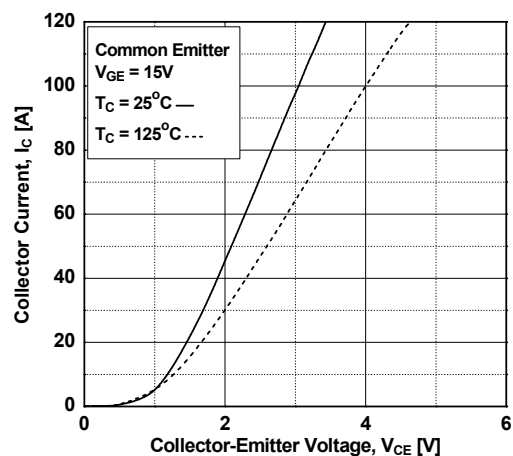### Figure 3. Typical Saturation Voltage Characteristics

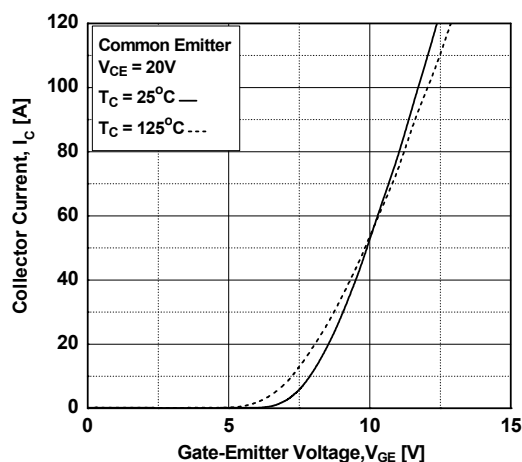### Figure 4. Transfer Characteristics

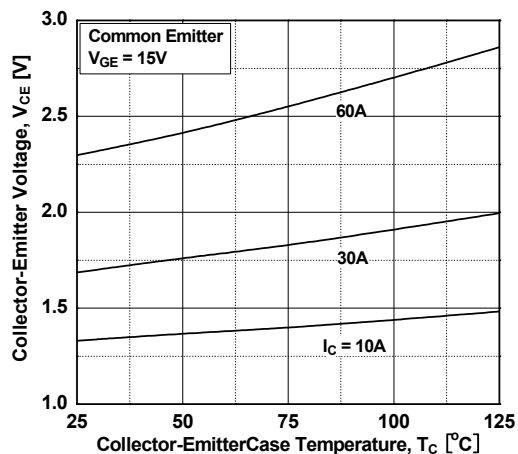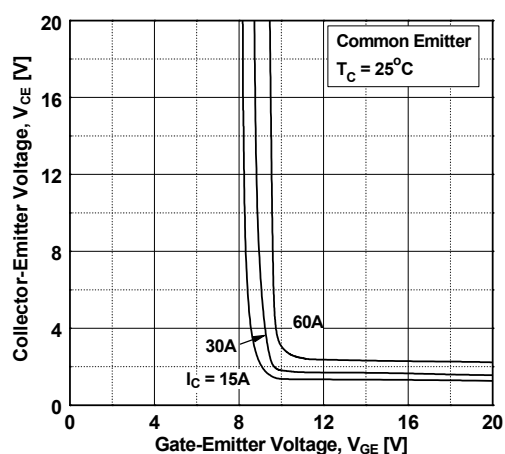### Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

Figure 6. Saturation Voltage vs. V_{GE}

Typical Performance Characteristics
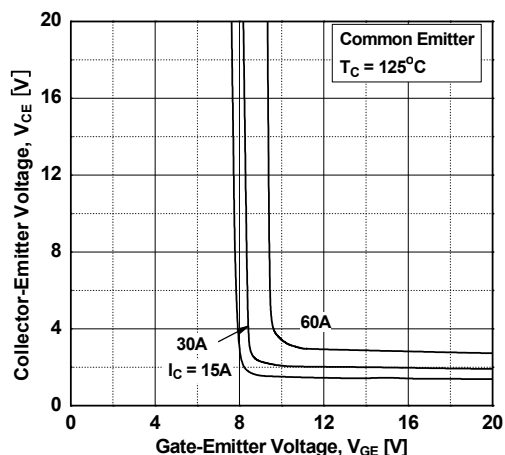
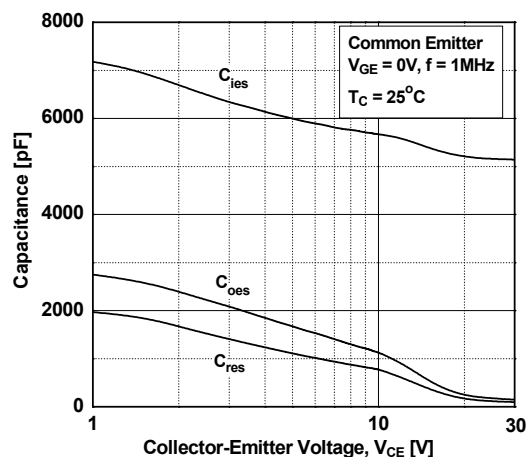### Figure 7. Saturation Voltage vs. V$_{GE}$

Figure 8. Capacitance Characteristics
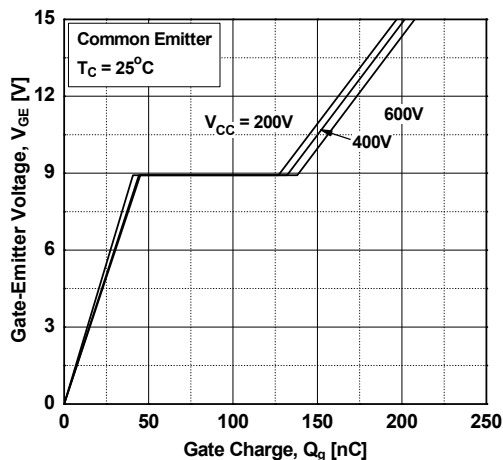

Figure 9. Gate charge Characteristics

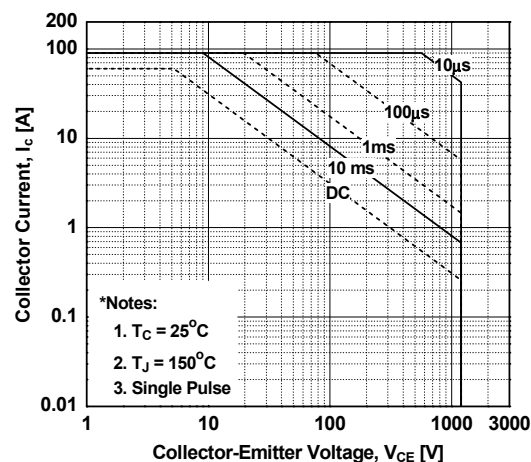### Figure 10. SOA Characteristics

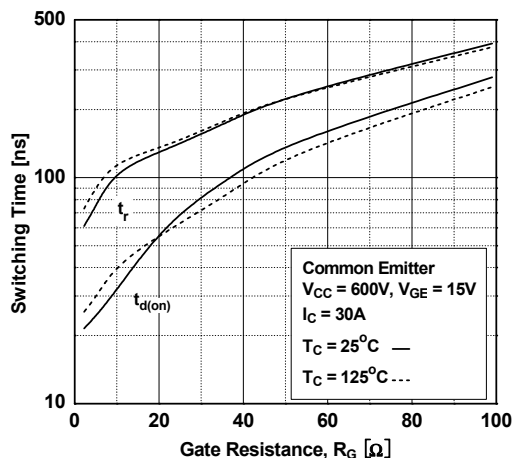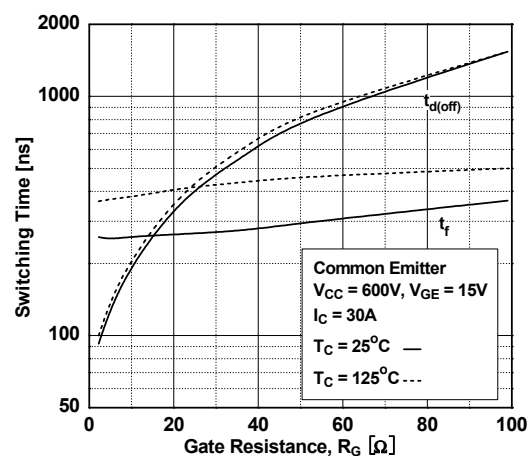### Figure 11. Turn-on Characteristics vs. Gate Resistance

Figure 12. Turn-off Characteristics vs. Gate Resistance

Typical Performance Characteristics

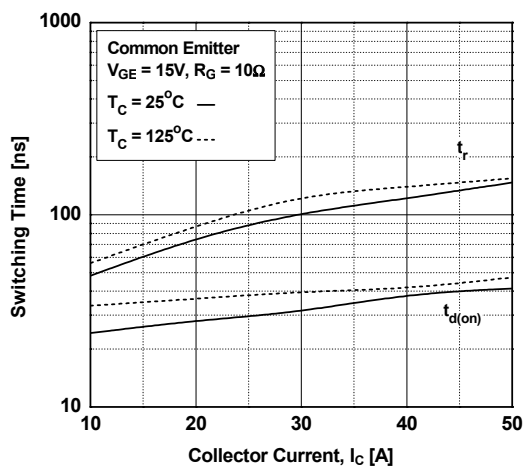**Figure 13. Turn-on Characteristics vs. Collector Current**

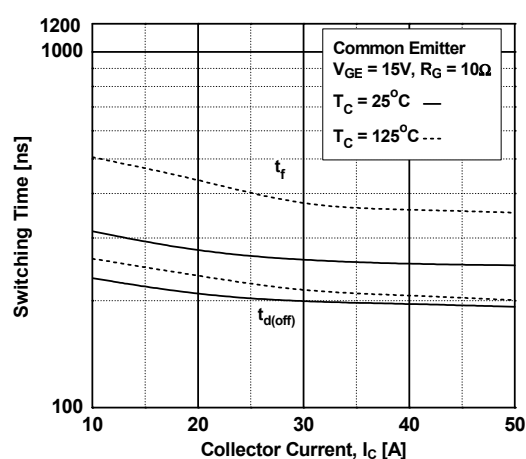**Figure 14. Turn-off Characteristics vs. Collector Current**

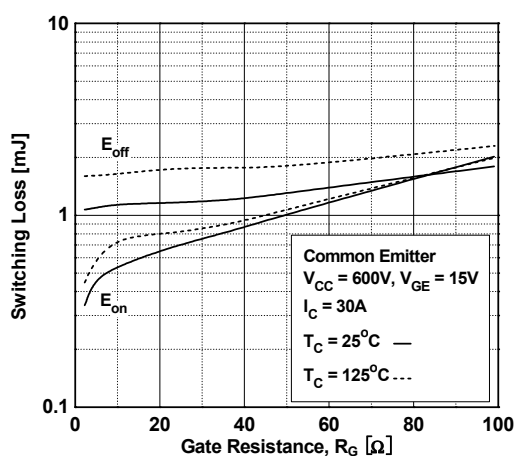**Figure 15. Switching Loss vs. Gate Resistance**

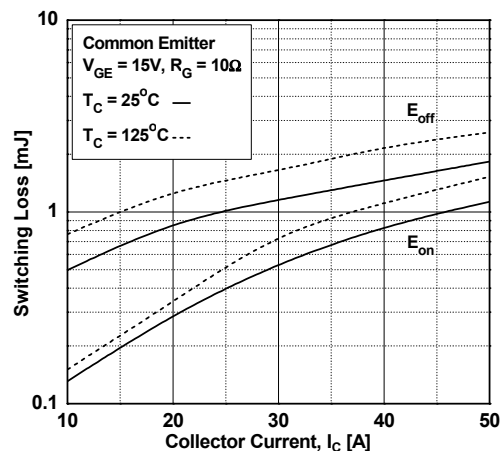**Figure 16. Switching Loss vs. Collector Current**

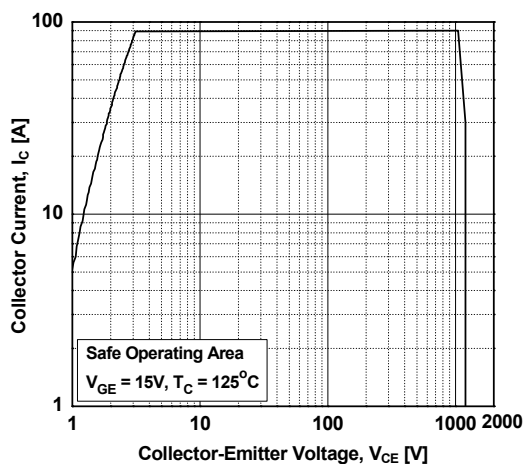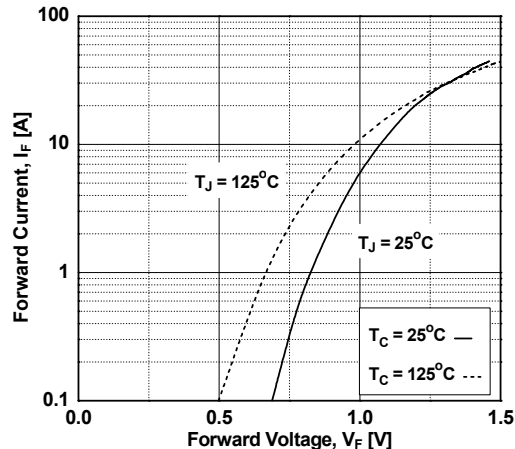**Figure 17. Turn off Switching SOA Characteristics**

Figure 18. Forward Characteristics

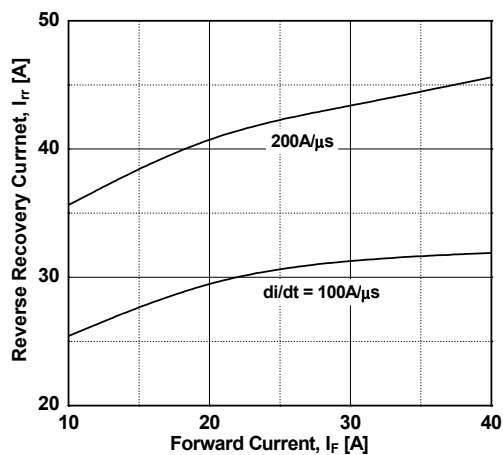## Typical Performance Characteristics

Figure 19. Reverse Current
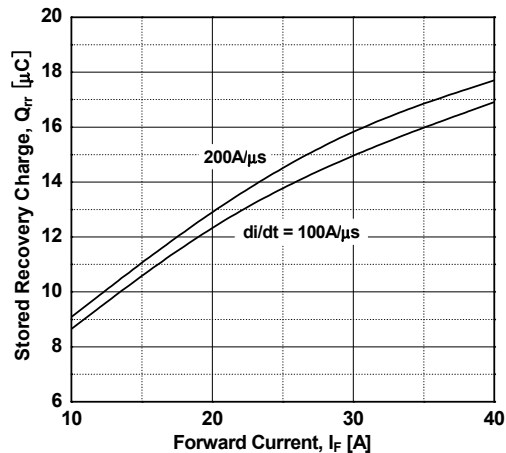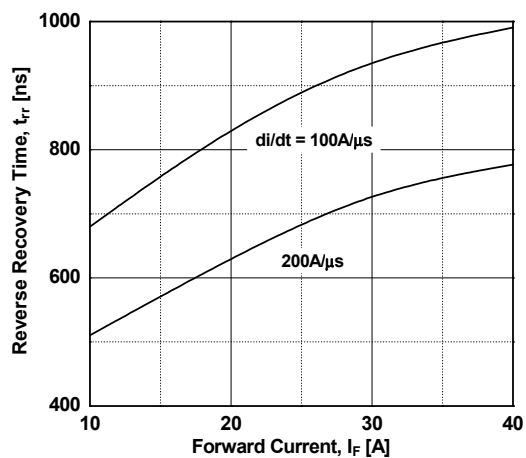

Figure 20. Stored Charge

Figure 21. Reverse Recovery Time

Figure 22. Transient Thermal Impedance of IGBT
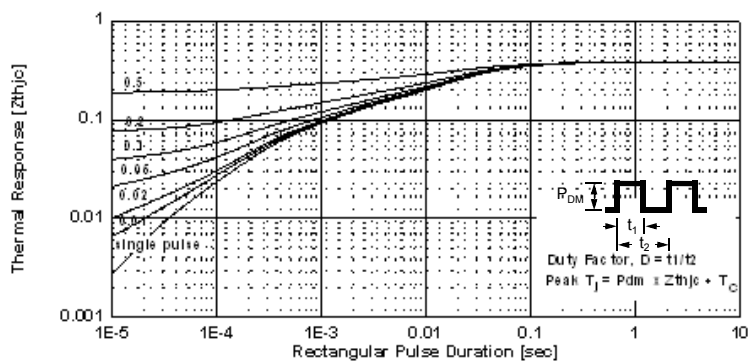
Mechanical Dimensions

TO-3PN

Ø 3.30
3.10

15,80
15,40

5.20
4.80

20.10
19,70

3.70
3.30

(1.85)

2,20
1.80

3,20
2.80

⊕ Ø0.55Ⓜ 1.20
0.80

1

3

5.45   5.45

(R0,50)

5.00
4.60

1,65
1,45

(R0.50)

18,90
18,50

2.60
2.20

0,75
0,55

20,30
19,70
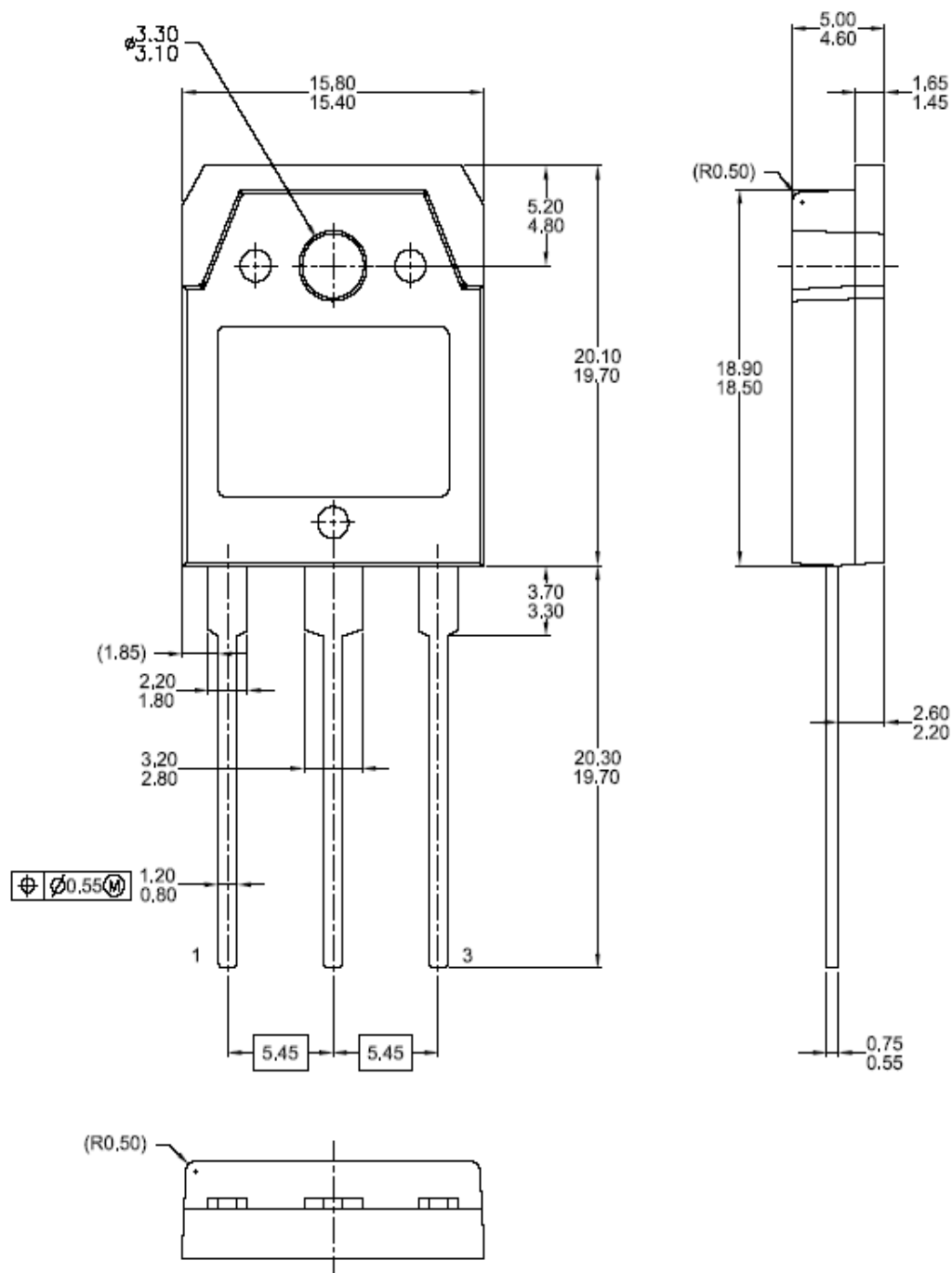
Dimensions in Millimeters

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Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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Rev. I64

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