FAIRCHILD
SEMICONDUCTOR®

FGA15N120FTD
1200 V, 15 A Field Stop Trench IGBT

Features

- Field Stop Trench Technology
- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)}$ = 1.58 V @ I_C = 15 A
- High Input Impedance
- RoHS Complaint

Applications

- Induction Heating, Microwave Oven

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.

TO-3PN

G C E
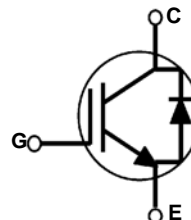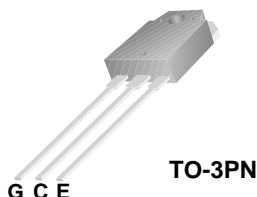
Absolute Maximum Ratings

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	30	A
	Collector Current	@ T_C = 100°C	15	A
$I_{CM (1)}$	Pulsed Collector Current		45	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	15	A
I_{FM}	Diode Maximum Forward Current		90	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	220	W
	Maximum Power Dissipation	@ T_C = 100°C	88	W
T_J	Operating Junction Temperature		-55 to +150	^{o}C
T_{stg}	Storage Temperature Range		-55 to +150	^{o}C
T_L	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds		300	^{o}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	-	0.57	^{o}C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction to Case	-	2.1	^{o}C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	62.5	^{o}C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGA15N120FTD	FGA15N120FTDTU	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						
BV_{CES}	Collector to Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 1mA	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 = 15mA, V_{CE} = V_{GE}	3.5	6	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 15A, V_{GE} = 15V	-	1.58	2	V
		I_C = 15A, V_{GE} = 15V, T_C = 125°C	-	1.83	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz	-	2350	-	pF
C_{oes}	Output Capacitance		-	70	-	pF
C_{res}	Reverse Transfer Capacitance		-	45	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600V, I_C = 15A, R_G = 15Ω, V_{GE} = 15V, Resistive Load, T_C = 25°C	-	33	-	ns
t_r	Rise Time		-	80	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	160	-	ns
t_f	Fall Time		-	255	330	ns
E_{on}	Turn-On Switching Loss		-	0.3	-	mJ
E_{off}	Turn-Off Switching Loss		-	0.58	0.74	mJ
E_{ts}	Total Switching Loss		-	0.88	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 600V, I_C = 15A, R_G = 15Ω, V_{GE} = 15V, Resistive Load, T_C = 125°C	-	30	-	ns
t_r	Rise Time		-	115	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	170	-	ns
t_f	Fall Time		-	390	-	ns
E_{on}	Turn-On Switching Loss		-	0.38	-	mJ
E_{off}	Turn-Off Switching Loss		-	0.89	-	mJ
E_{ts}	Total Switching Loss		-	1.27	-	mJ
Q_g	Total Gate Charge	V_{CE} = 600V, I_C = 15A, V_{GE} = 15V	-	100	-	nC
Q_{ge}	Gate to Emitter Charge		-	19	-	nC
Q_{gc}	Gate to Collector Charge		-	45	-	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	$I_F = 15A$	$T_C = 25^oC$	-	1.4	1.8	V
			$T_C = 125^oC$	-	1.42	-	
t_{rr}	Diode Reverse Recovery Time	$I_{ES} = 15A$, $dI/dt = 200A/\mu s$	$T_C = 25^oC$	-	575	-	ns
			$T_C = 125^oC$	-	577	-	
I_{rr}	Diode Peak Reverse Recovery Cyrrent		$T_C = 25^oC$	-	30	-	A
			$T_C = 125^oC$	-	37	-	
Q_{rr}	Diode Reverse Recovery Charge		$T_C = 25^oC$	-	8.7	-	μC
			$T_C = 125^oC$	-	10.7	-	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics
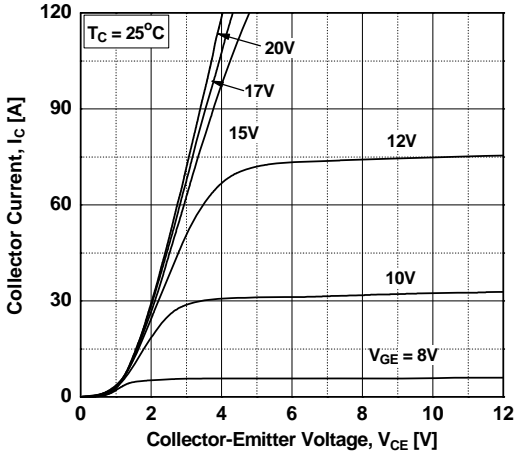
Figure 2. Typical Output Characteristics
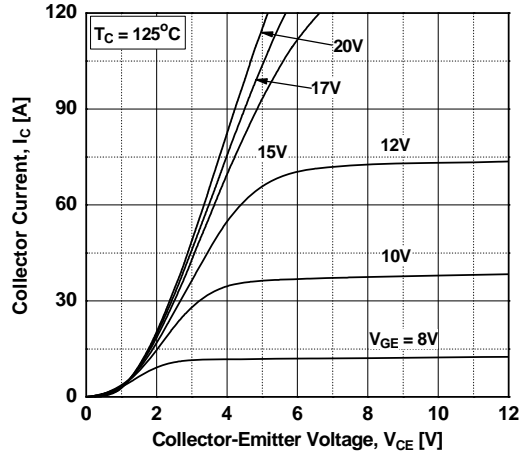
Figure 3. Typical Saturation Voltage Characteristics
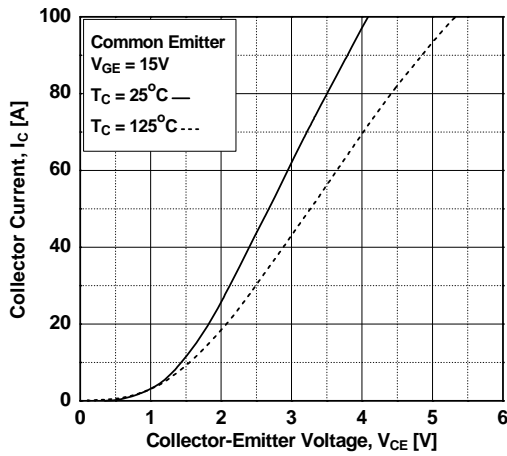
Figure 4. Transfer Characteristics
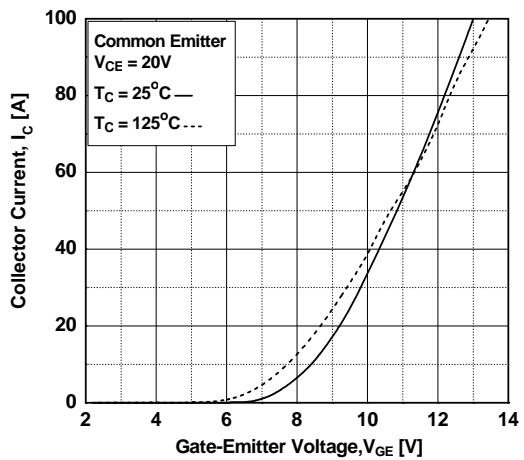
Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level
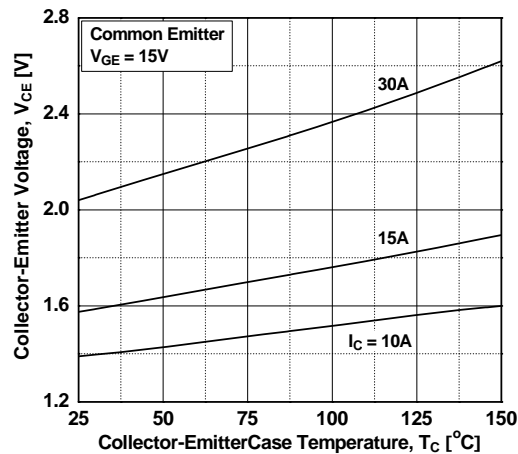
Figure 6. Saturation Voltage vs. V_{GE}
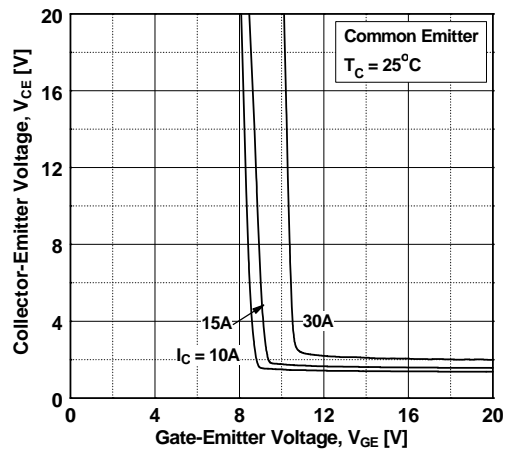
Typical Performance Characteristics
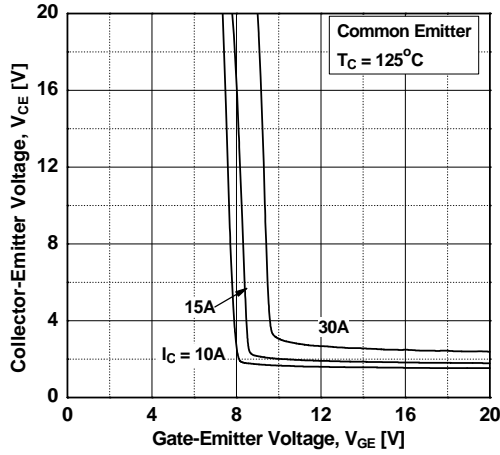
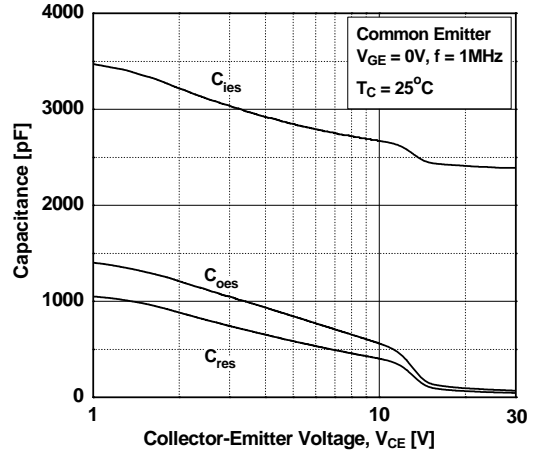### Figure 7. Saturation Voltage vs. V_{GE}

Figure 8. Capacitance Characteristics

Figure 9. Gate charge Characteristics
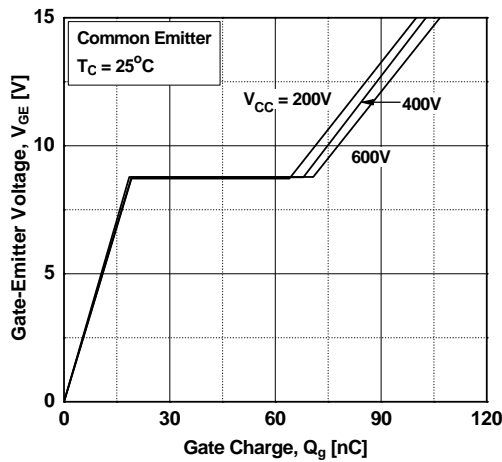
Figure 10. SOA Characteristics
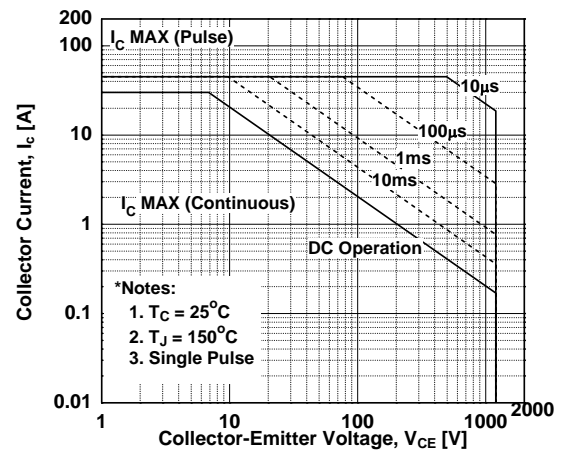
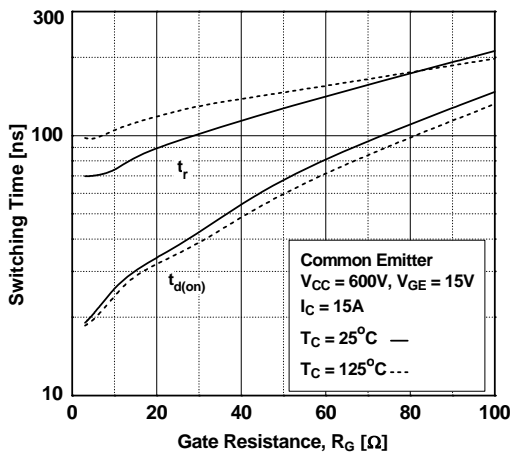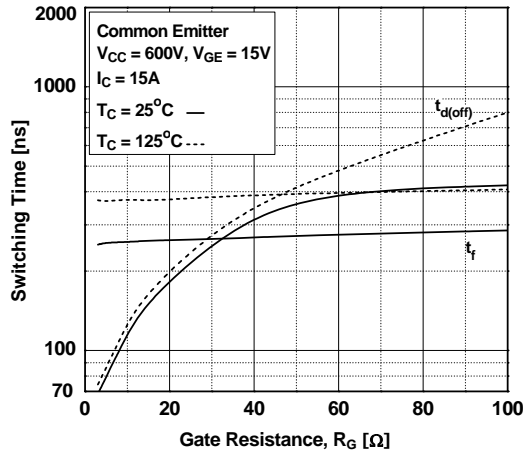### Figure 11. Turn-on Characteristics vs. Gate Resistance

Figure 12. Turn-off Characteristics vs. Gate Resistance

Typical Performance Characteristics

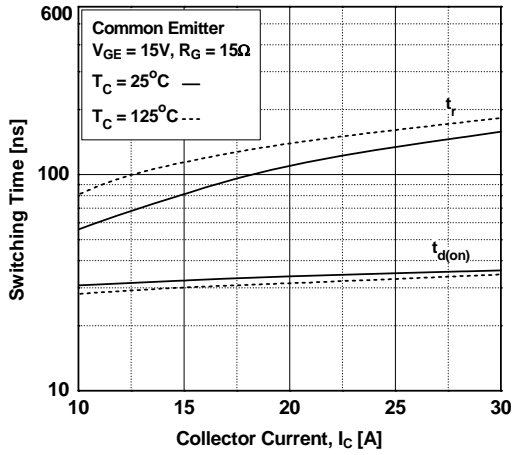### Figure 13. Turn-on Characteristics vs. Collector Current

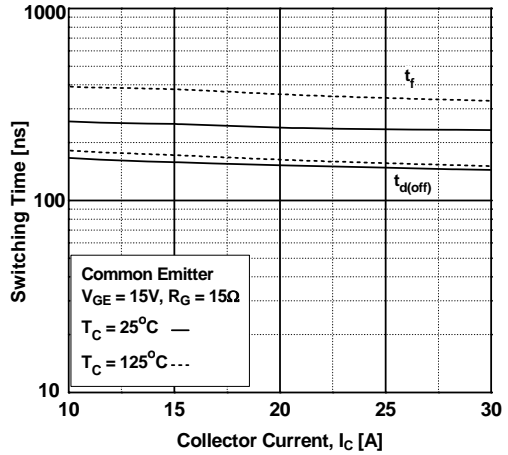

Figure 14. Turn-off Characteristics vs. Collector Current

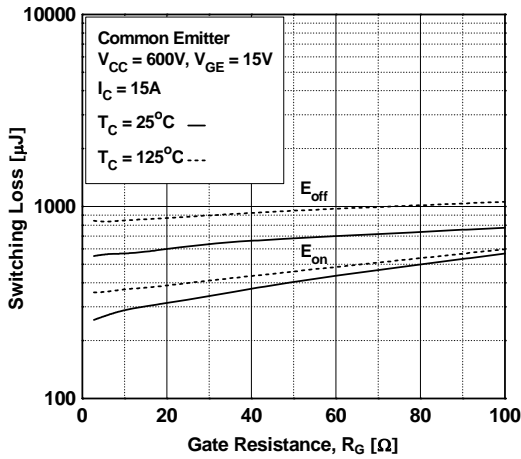### Figure 15. Switching Loss vs. Gate Resistance

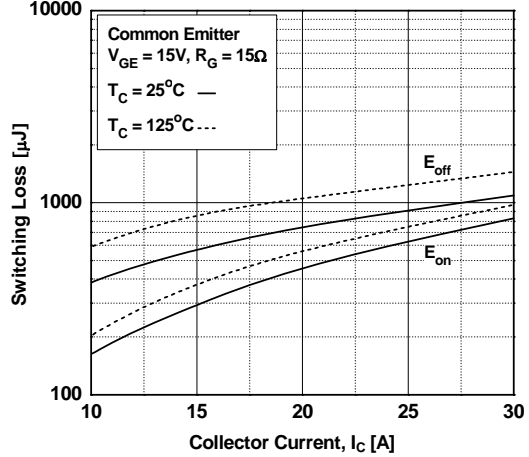### Figure 16. Switching Loss vs. Collector Current

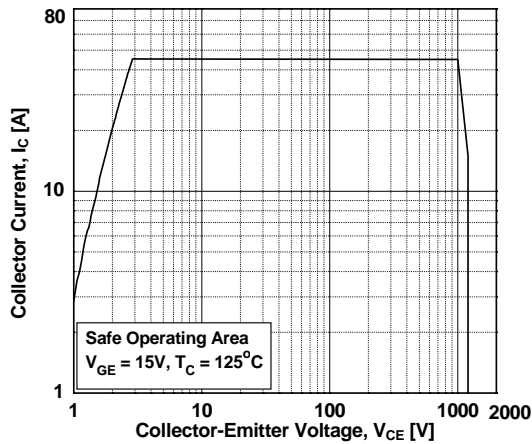### Figure 17. Turn off Switching SOA Characteristics
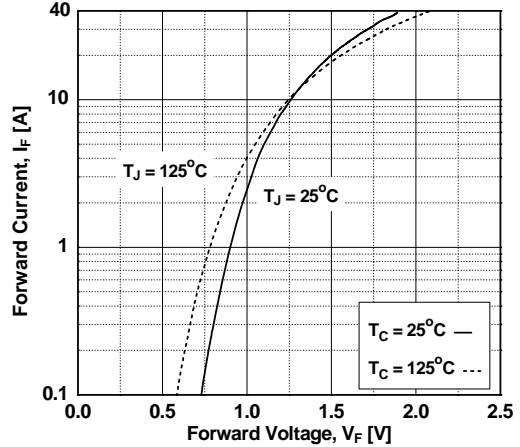

Figure 18. Forward Characteristics

Typical Performance Characteristics
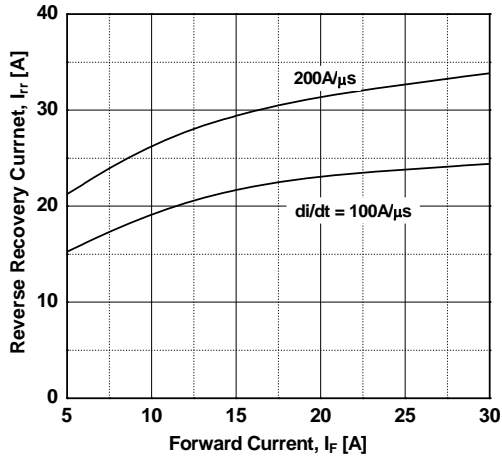
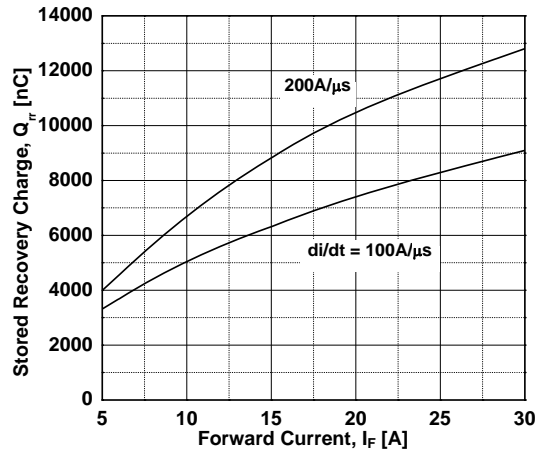**Figure 19. Reverse Recovery Current**

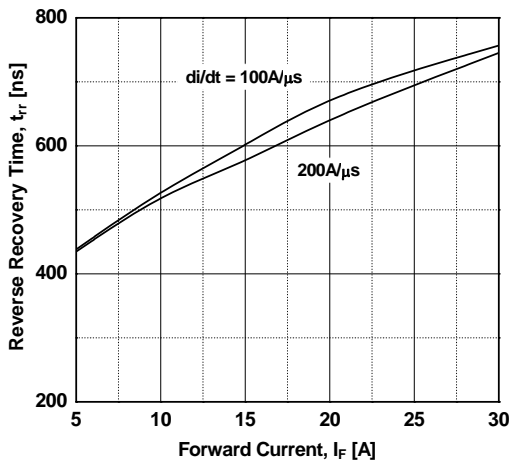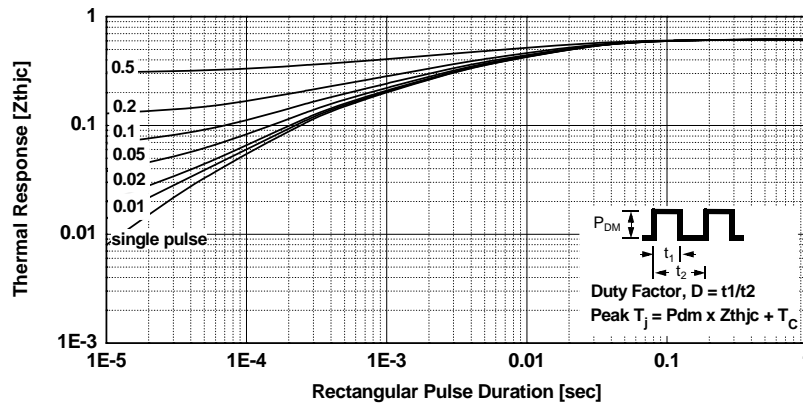
Figure 20. Stored Charge
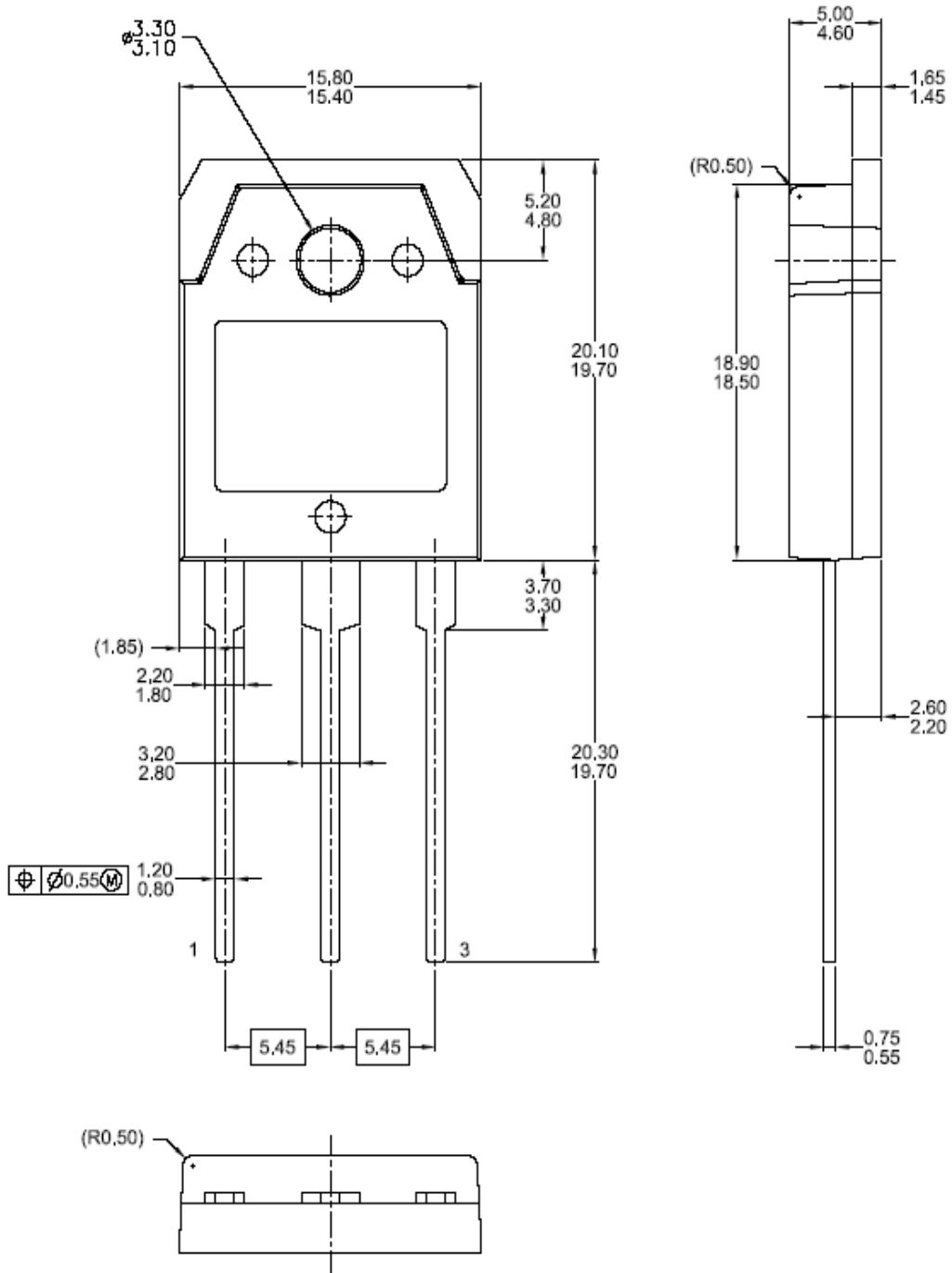

Figure 21.Reverse Recovery Time

Figure 22.Transient Thermal Impedance of IGBT

Mechanical Dimensions

TO-3PN

Dimensions in Millimeters

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Rev. I64