FAIRCHILD

SEMICONDUCTOR®

October 2012

FGH30S130P
## Shorted Anode™ IGBT

Features

• High speed switching
• Low saturation voltage: $V_{CE(sat)}$ =1.75V @ I_C = 30A
• High input impedance
• RoHS compliant

Applications

• Induction Heating and Microwave Oven
• Soft Switching Applications

General Description

Using advanced Field Stop Trench and Shorted Anode technology, Fairchild's Shorted Anode™ Trench IGBTs offer superior conduction and switching performances, and easy parallel operation with exceptional avalanche capability. This device is designed for induction heating and microwave oven.
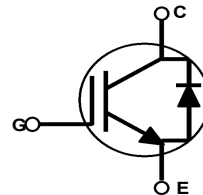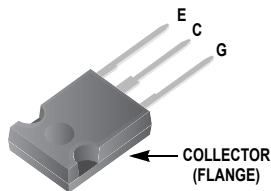
Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description		Ratings	Units
V_{CES}	Collector to Emitter Voltage		1300	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		90	A
I_F	Diode Continuous Forward Current	@ T_C = 25°C	60	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	30	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	500	W
	Maximum Power Dissipation	@ T_C = 100°C	250	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.	Units
$R_{\theta JC}$(IGBT)	Thermal Resistance, Junction to Case, Max	--	0.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max	--	40	°C/W

Notes:
1: Limited by Tjmax

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGH30S130P	FGH30S130P	TO-247	-	-	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	$V_{CE} = 1300$, $V_{GE} = 0V$	-	-	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	$I_C = 30mA$, $V_{CE} = V_{GE}$	4.5	6.0	7.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 30A$, $V_{GE} = 15V$ $T_C = 25°C$	-	1.75	2.3	V
		$I_C = 30A$, $V_{GE} = 15V$, $T_C = 125°C$	-	1.85	-	V
		$I_C = 30A$, $V_{GE} = 15V$, $T_C = 175°C$	-	1.9	-	V
V_{FM}	Diode Forward Voltage	$I_F = 30A$, $T_C = 25°C$	-	1.7	2.2	V
		$I_F = 30A$, $T_C = 175°C$	-	2.1	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30V$, $V_{GE} = 0V$, $f = 1MHz$	-	3345	-	pF
C_{oes}	Output Capacitance		-	75	-	pF
C_{res}	Reverse Transfer Capacitance		-	60	-	pF
Switching Characcteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600V$, $I_C = 30A$, $R_G = 10\Omega$, $V_{GE} = 15V$, Resistive Load, $T_C = 25°C$	-	39	-	ns
t_r	Rise Time		-	360	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	620	-	ns
t_f	Fall Time		-	160	210	ns
E_{on}	Turn-On Switching Loss		-	1.3	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.22	1.6	mJ
E_{ts}	Total Switching Loss		-	2.52	-	mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 600V$, $I_C = 30A$, $R_G = 10\Omega$, $V_{GE} = 15V$, Resistive Load, $T_C = 175°C$	-	38	-	ns
t_r	Rise Time		-	375	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	635	-	ns
t_f	Fall Time		-	270	-	ns
E_{on}	Turn-On Switching Loss		-	1.59	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.78	-	mJ
E_{ts}	Total Switching Loss		-	3.37	-	mJ
Q_g	Total Gate Charge	$V_{CE} = 600V$, $I_C = 30A$, $V_{GE} = 15V$	-	78	-	nC
Q_{ge}	Gate to Emitter Charge		-	4.2	-	nC
Q_{gc}	Gate to Collector Charge		-	33.3	-	nC

Typical Performance Characteristics

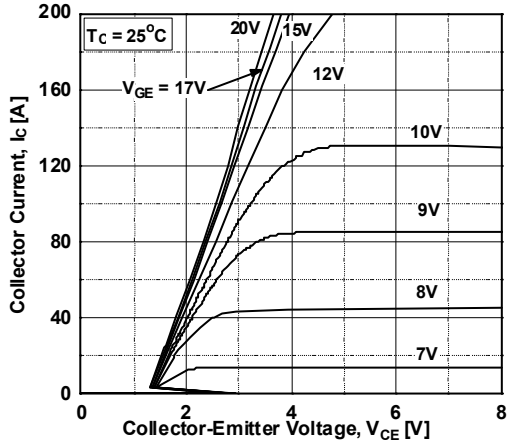### Figure 1. Typical Output Characteristics

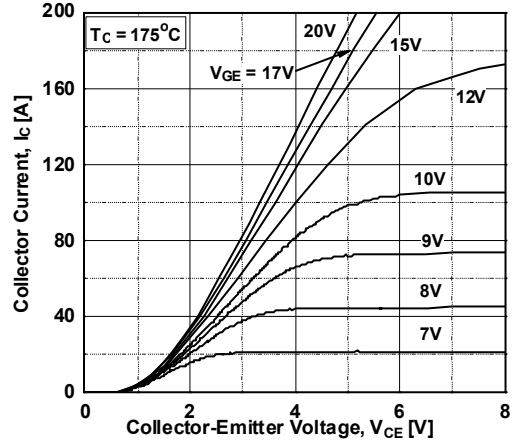### Figure 2. Typical Output Characteristics

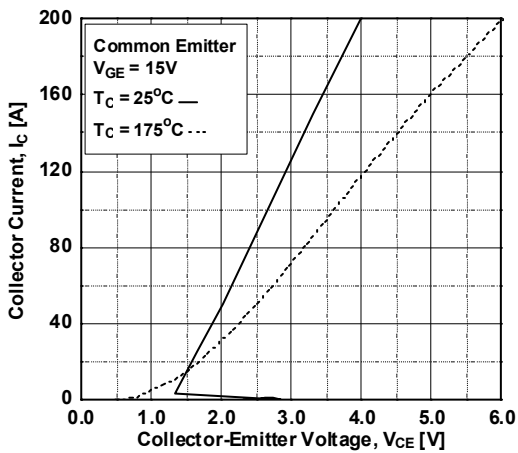### Figure 3. Typical Saturation Voltage Characteritics

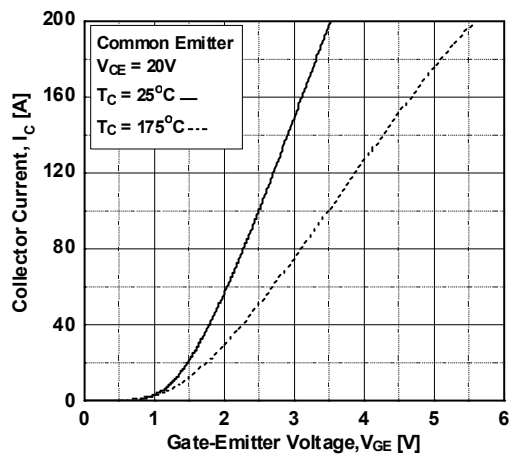

Figure 4. Transfer Characteristics

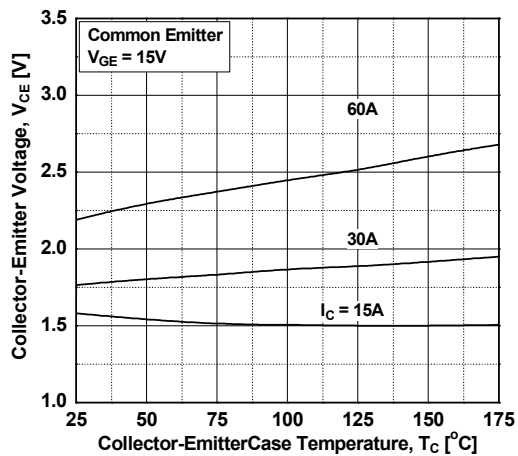### Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

Figure 6. Saturation Voltage vs. V$_{GE}$
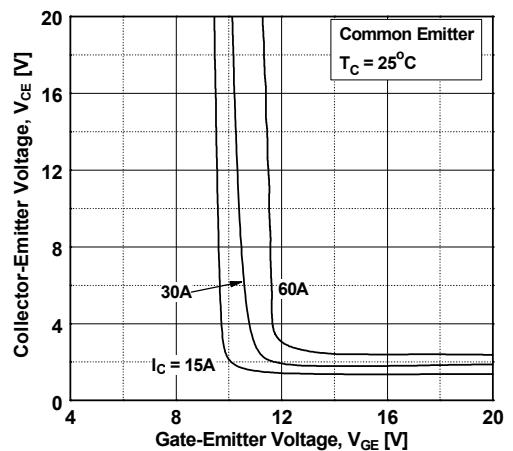
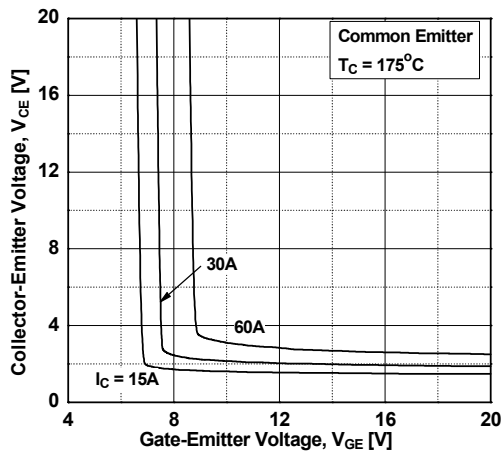## Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

Common Emitter
$T_C = 175^{\circ}C$

Collector-Emitter Voltage, V_{CE} [V]

30A

60A

$I_C = 15A$

Gate-Emitter Voltage, V_{GE} [V]

Figure 8. Capacitance Characteristics

Capacitance [pF]

C_{ies}

C_{oes}

C_{res}

Common Emitter
$V_{GE} = 0V$, $f = 1MHz$
$T_C = 25^{\circ}C$

Collector-Emitter Voltage, V_{CE} [V]
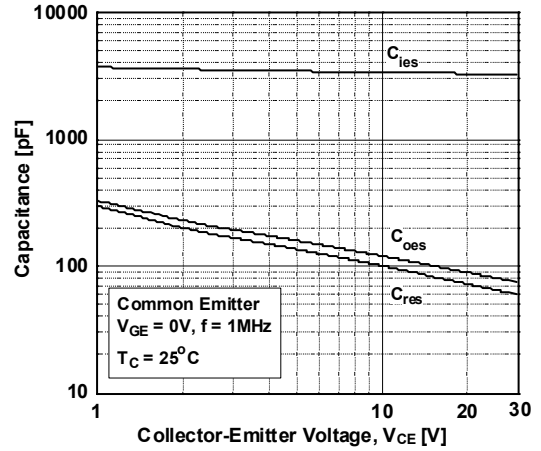
Figure 9. Gate Charge Characteristics

Common Emitter
$T_C = 25^{\circ}C$

400V

600V

$V_{CC} = 200V$

Gate-Emitter Voltage, V_{GE} [V]

Gate Charge, Q_g [nC]
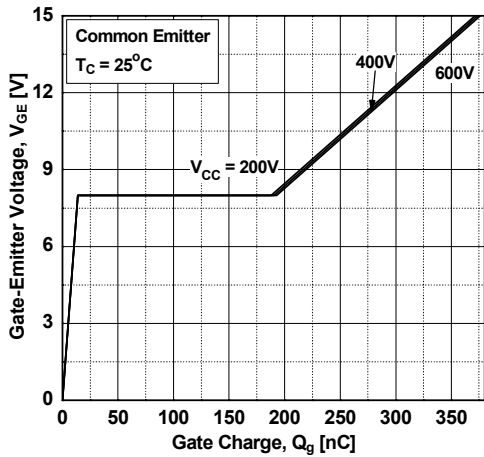
Figure 10. SOA Characteristics

Collector Current, I_C [A]

10μs
100μs
1ms
10 ms
DC

*Notes:
1. $T_C = 25^{\circ}C$
2. $T_J = 175^{\circ}C$
3. Single Pulse

Collector-Emitter Voltage, V_{CE} [V]
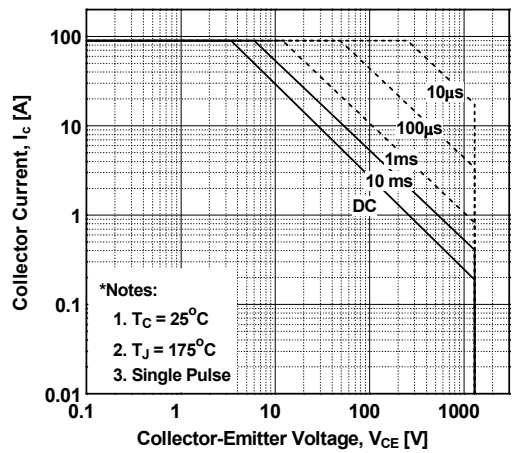
Figure 11. Turn-On Characteristics vs Gate Resistance

Switching Time [ns]

t_r

$t_{d(on)}$

Common Emitter
$V_{CC} = 600V$, $V_{GE} = 15V$
$I_C = 30A$
$T_C = 25^{\circ}C$ —
$T_C = 175^{\circ}C$ ---

Gate Resistance, R_G [Ω]
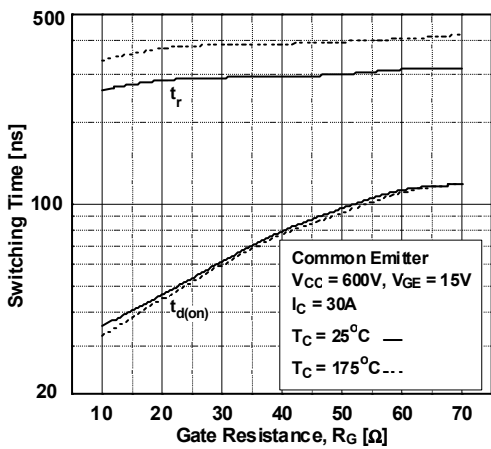
Figure 12. Turn-off Characteristics vs. Gate Resistance

Switching Time [ns]

Common Emitter
$V_{CC} = 600V$, $V_{GE} = 15V$
$I_C = 30A$
$T_C = 25^{\circ}C$ —
$T_C = 175^{\circ}C$ ---

$t_{d(off)}$

t_f

Gate Resistance, R_G [Ω]
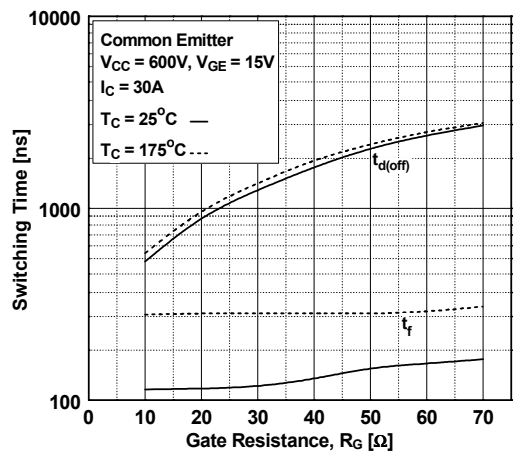
Typical Performance Characteristics

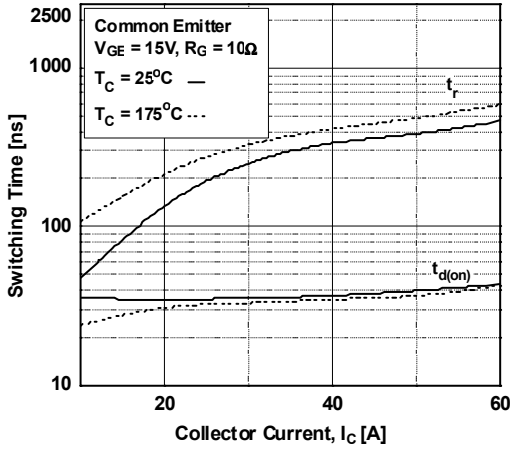**Figure 13. Turn-on Characteristics VS. Collector Current**

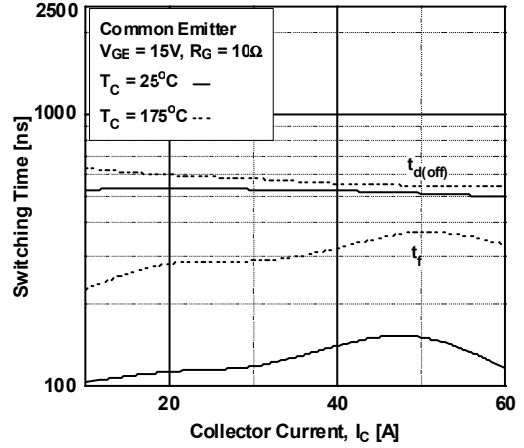**Figure 14.Turn-off Characteristics VS. Collector Current**

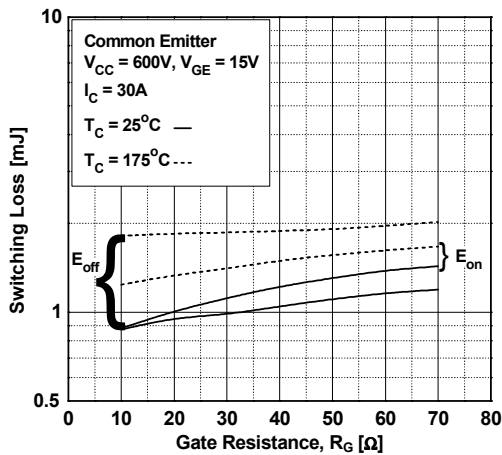**Figure 15. Switching Loss VS. Gate Resistance**

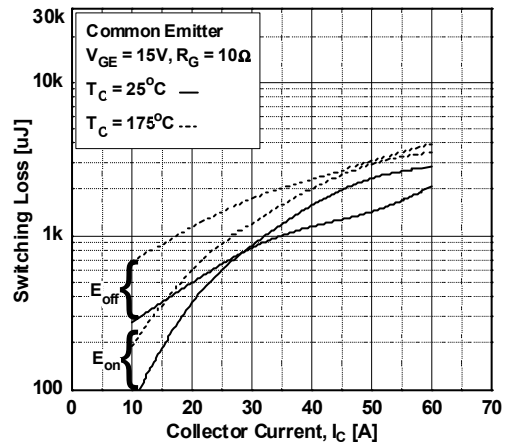**Figure 16. Switching Loss VS. Collector Current**

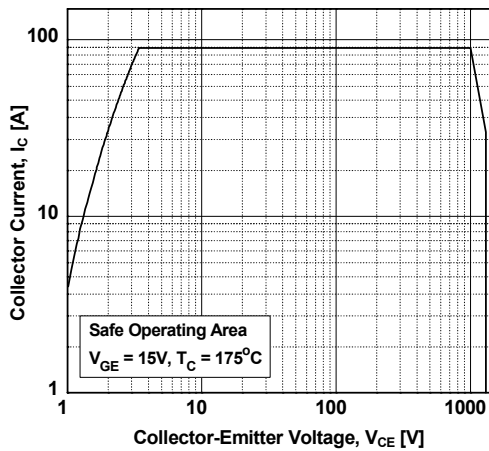**Figure 17. Turn off Switching SOA Characteristics**
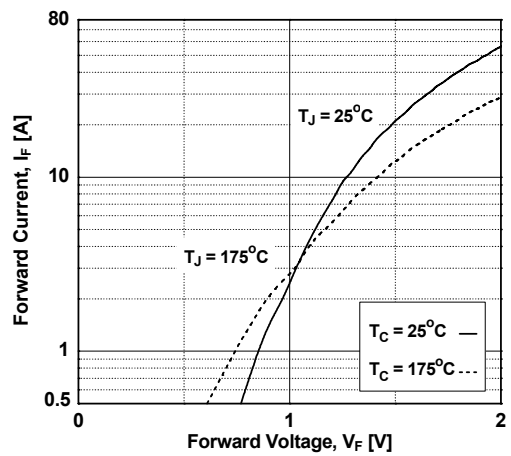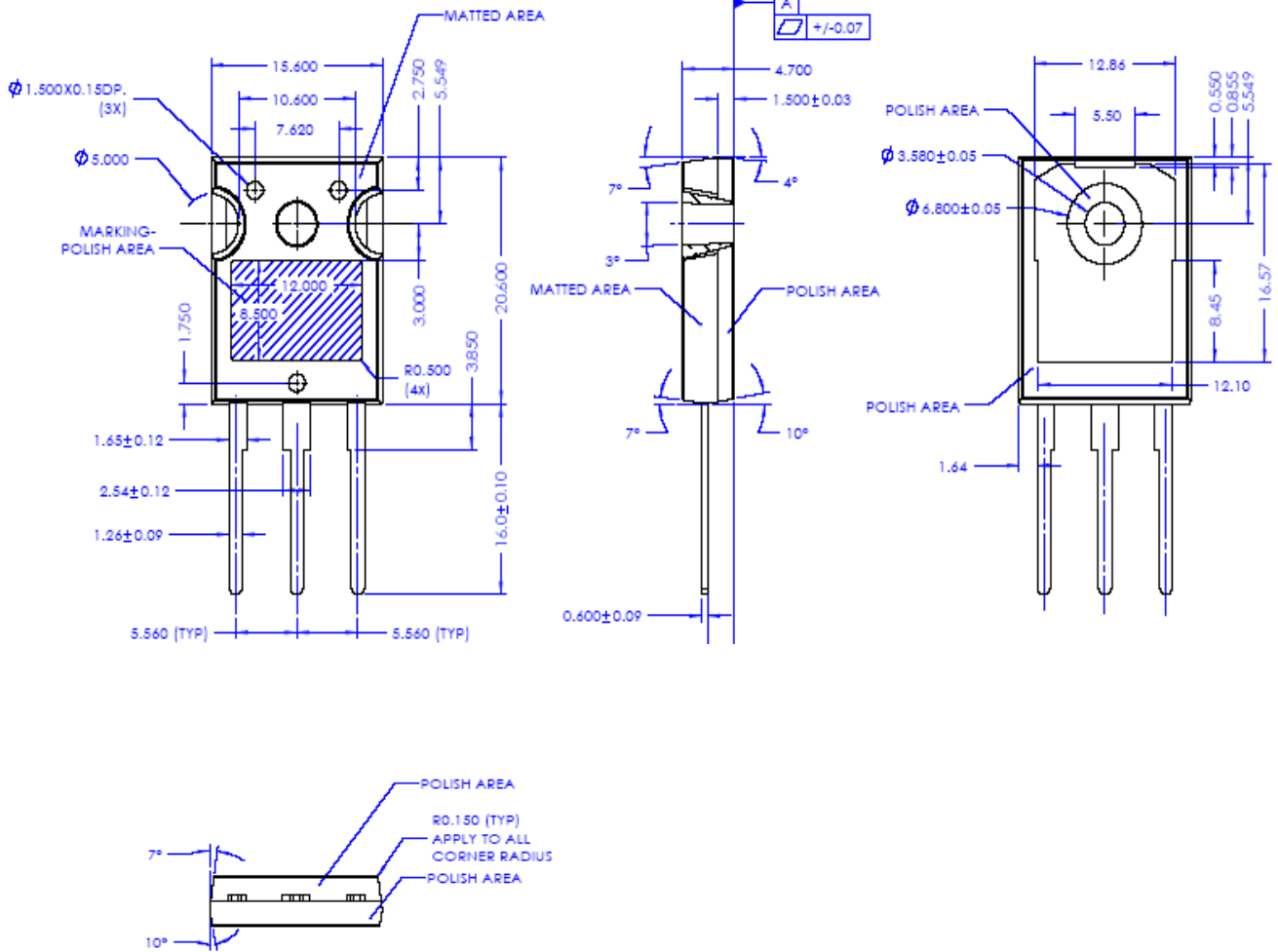

Figure 18. Forward Characteristics

Figure 19. Transient Thermal Impedance of IGBT

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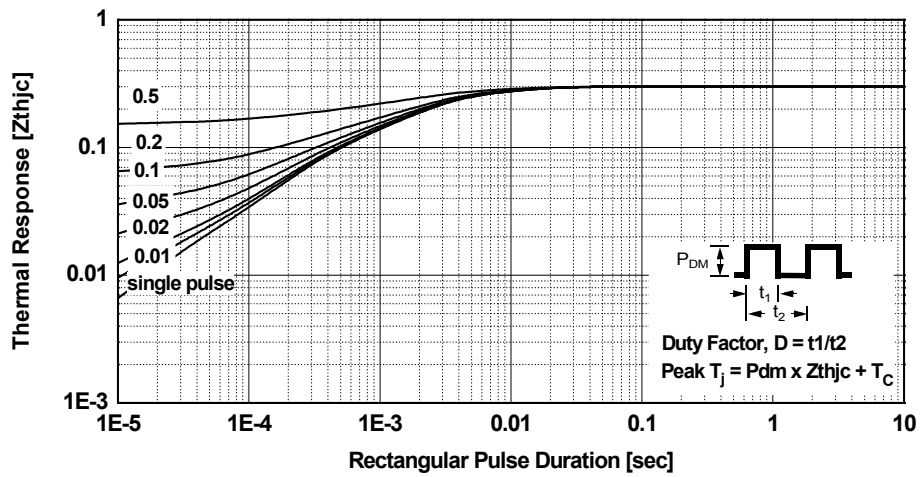
Mechanical Dimensions

TO - 247AB (FKS PKG CODE 001)

FGH30S130P Rev. C1

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