FAIRCHILD™

May 2014

FGA30N60LSD
600 V, 30 A PT IGBT

Features

- Low Saturation Voltage: $V_{CE(sat)}$ = 1.1 V @ I_C = 30 A
- High Input Impedance
- Low Conduction Loss

Applications

- Solar Inverter, UPS

General Description

Using Fairchild's advanced PT technology, the FGA30N60LSD IGBT offers superior conduction performances, which offer the optimum performance for medium switching application such as solar inverter, UPS applications where low conduction losses are the most important factor.

TO-3PN

G C E

C

G

E
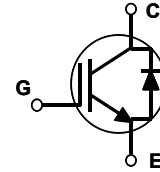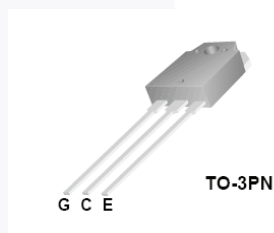
Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		$\pm$ 20	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_{FSM}	Non-repetitive Peak Surge Current 60Hz Single Half-Sine Wave		150	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	480	W
	Maximum Power Dissipation	@ T_C = 100°C	192	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	--	0.26	°C/W
$R_{\theta JC}$(Diode)	Thermal Resistance, Junction-to-Case	--	0.92	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGA30N60LSDTU	FGA30N60LSD	TO-3P	Tube	N/A	N/A	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-Emitter Breakdown Voltage	V_{GE} = 0 V, I_C = 250 uA	600	--	--	V
$\Delta B_{VCES}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0 V, I_C = 250 uA	--	0.6	--	V/°C
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0 V	--	--	250	uA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0 V	--	--	±250	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 250 uA, V_{CE} = V_{GE}	4.0	5.5	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 30 A, V_{GE} = 15 V	--	1.1	1.4	V
		I_C = 30 A, V_{GE} = 15 V, T_C = 125°C	--	1.0	--	V
		I_C = 60 A, V_{GE} = 15 V	--	1.3	--	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	--	3550	--	pF
C_{oes}	Output Capacitance		--	245	--	pF
C_{res}	Reverse Transfer Capacitance		--	90	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400 V, I_C = 30 A, R_G = 6.8 Ω, V_{GE} = 15 V, Inductive Load, T_C = 25°C	--	18	--	ns
t_r	Rise Time		--	46	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	250	--	ns
t_f	Fall Time		--	1.3	2.0	us
E_{on}	Turn-On Switching Loss		--	1.1	--	mJ
E_{off}	Turn-Off Switching Loss		--	21	--	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 400 V, I_C = 30 A, R_G = 6.8 Ω, V_{GE} = 15 V, Inductive Load, T_C = 125°C	--	17	--	ns
t_r	Rise Time		--	45	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	270	--	ns
t_f	Fall Time		--	2.6	--	us
E_{on}	Turn-On Switching Loss		--	1.1	--	mJ
E_{off}	Turn-Off Switching Loss		--	36	--	mJ
Q_g	Total Gate Charge	V_{CE} = 300 V, I_C = 30 A, V_{GE} = 15 V	--	225	--	nC
Q_{ge}	Gate-Emitter Charge		--	30	--	nC
Q_{gc}	Gate-Collector Charge		--	105	--	nC
L_e	Internal Emitter Inductance	Measured 5mm from PKG	--	7	--	nH

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

Parameter	Conditions		Min.	Typ.	Max	Unit
V_{FM}	I_F = 15 A	T_C = 25 °C	-	1.8	2.2	V
	I_F = 15 A	T_C = 125 °C	-	1.6	-	V
I_{RM}	V_R = 600 V	T_C = 25 °C	-	-	100	μA
t_{rr}	I_F =1 A, di_F/dt = 100 A/μs, V_R = 30 V	T_C = 25 °C	-	-	35	ns
	I_F =15 A, di_F/dt = 100 A/μs, V_R = 390 V	T_C = 25 °C	-	-	40	ns
t_a	I_F =15 A, di_F/dt = 100 A/μs, V_R = 390 V	T_C = 25 °C	-	18	-	ns
t_b		T_C = 25 °C	-	13	-	ns
Q_{rr}		T_C = 25 °C	-	27.5	-	nC

Typical Performance Characteristics

Figure 1.Typical Output Characteristics
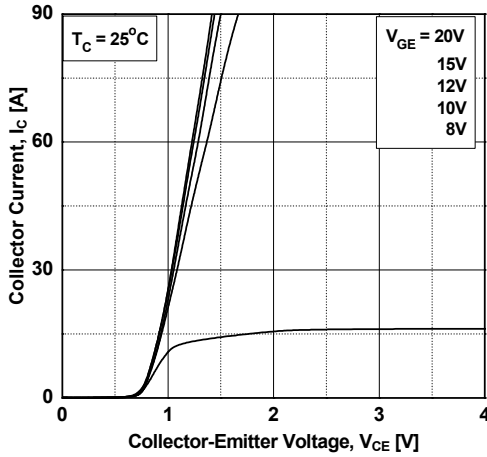
Figure 2. Typical Saturation Voltage Characteristics
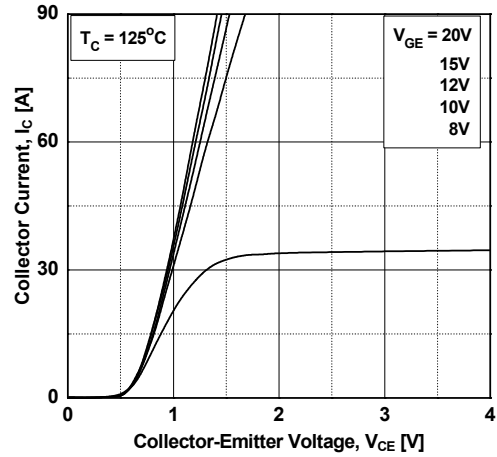
Figure 3. Typical Saturation Voltage Characteritics
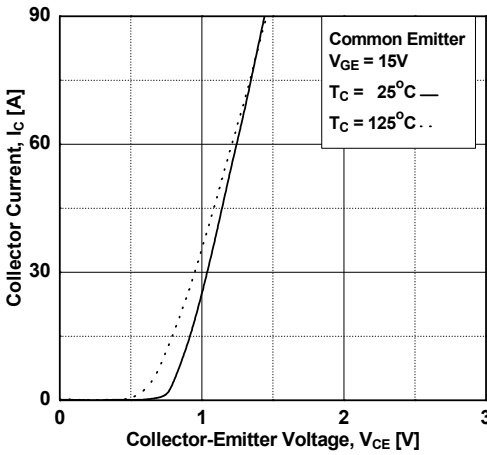
Figure 4. Transfer characteristics
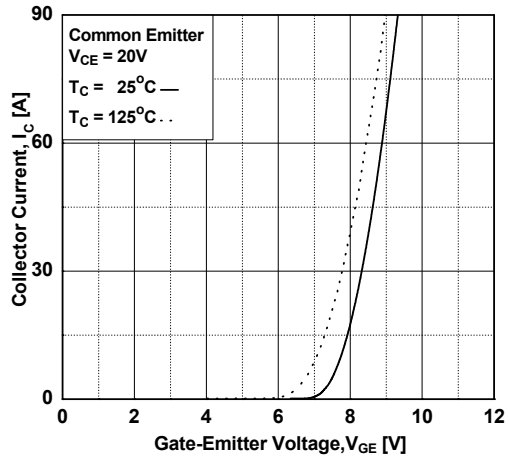
Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level
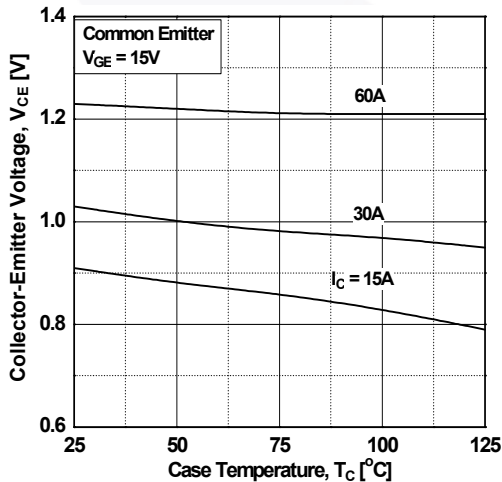
Figure 6. Saturation Voltage vs. Vge

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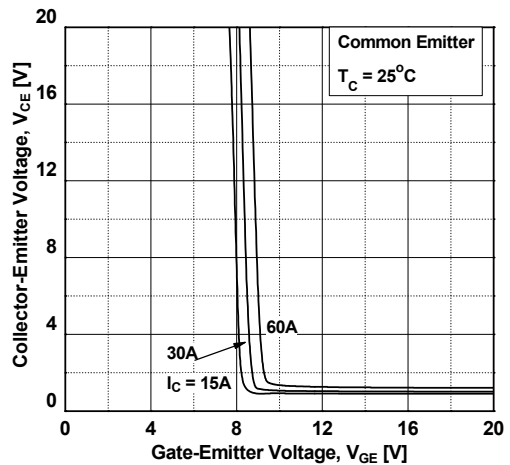
Typical Performance Characteristics (Continued)

Figure 7. Saturation Voltage vs. Vge

Common Emitter
$T_C = 125^oC$

30A 60A

$I_C = 15A$

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

Gate-Emitter Voltage, V_{GE} [V]
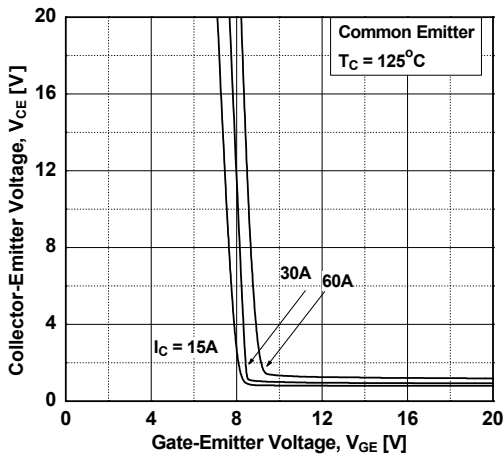
Figure 8. Capacitance characteristics

C_{ies}

C_{oes}

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

C_{res}

Capacitance [pF]

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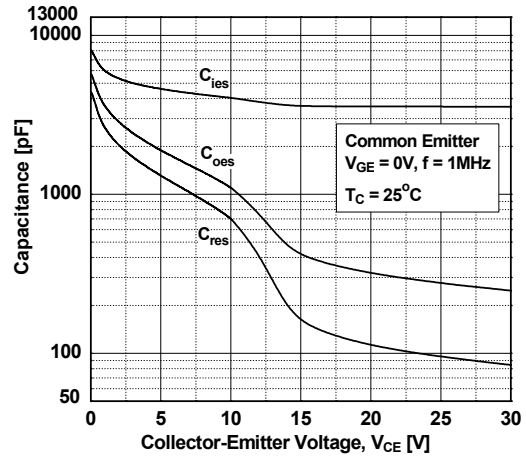
Figure 9. Gate Charge Characteristics

Common Emitter
$I_C = 30A$
$T_C = 25^oC$

$V_{cc} = 100V$

300V

200V

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

Gate Charge, Q_g [nC]

Figure 10. SOA Characeeristics

I_C MAX (Pulsed)

50µs

I_C MAX (Continuous)

100µs

1ms

Single Nonrepetitive
Pulse $T_C = 25^oC$
Curves must be derated
linearly with increase
in temperature

DC Operation

Collector Current, I_C [A]

Collector-Emitter Voltage, V_{CE} [V]
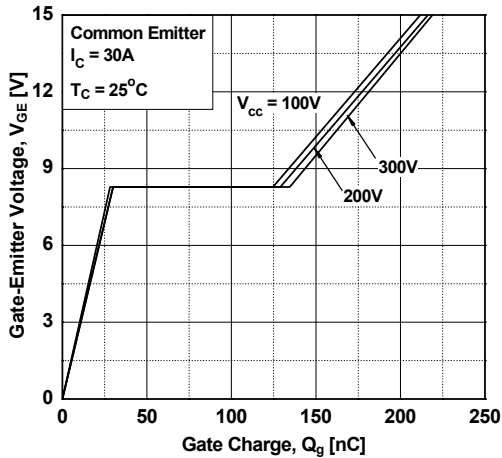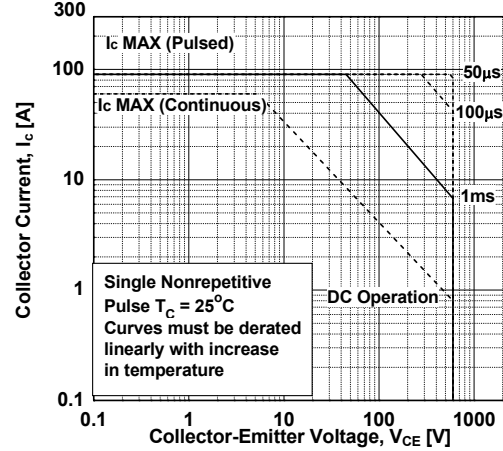
Figure 11. Load Current Vs. Frequency

$V_{cc} = 400V$
load Current : peak of square wave

Duty cycle : 50%
$T_C = 100^oC$
Powe Dissipation = 192W

Collector Current [A]

Frequency, f [kHz]
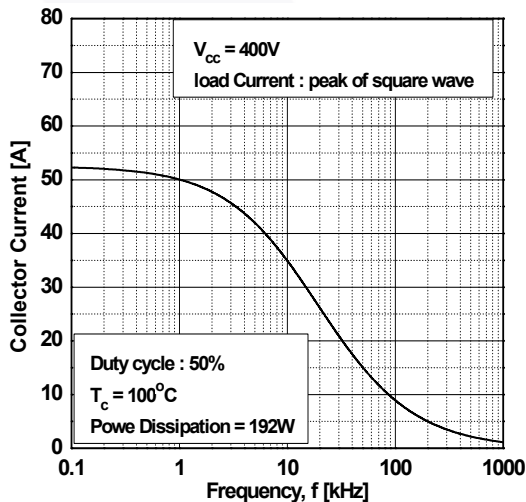
Figure 12. Turn-On Characteristics vs. Gate Resistance

t_r

$t_{d(on)}$

Common Emitter
$V_{CC} = 400V$, $V_{GE} = 15V$
$I_C = 30A$
$T_C = 25^oC$ —
$T_C = 125^oC$ ...

Switching Time [ns]

Gate Resistance, R_G [Ω]
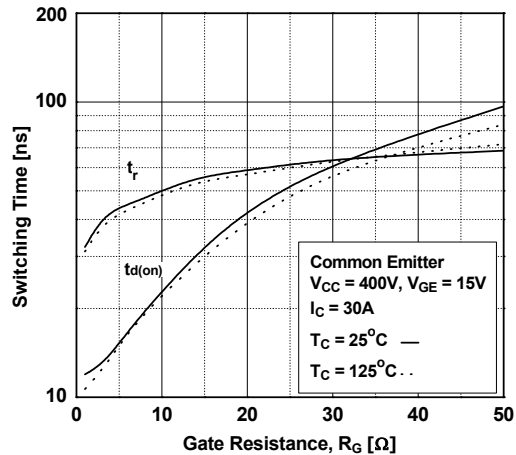
Typical Performance Characteristics (Continued)

Figure 13. Turn-Off Characteristics vs. Gate Resistance
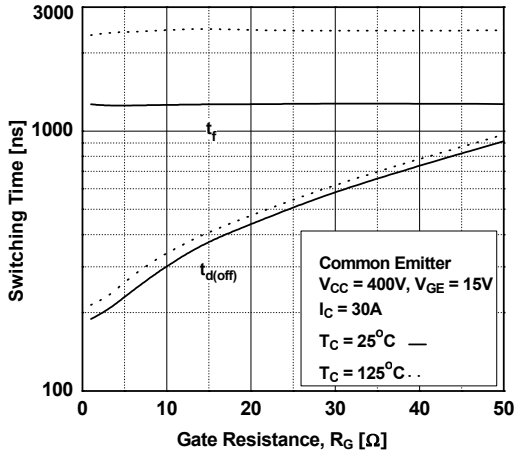
Figure 14. Turn-On Characteristics vs. Collector Current
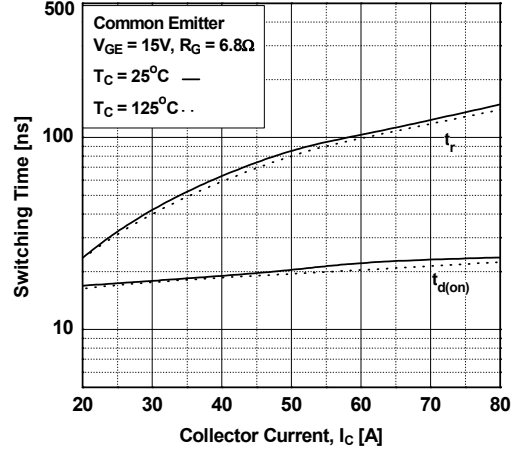
Figure 15. Turn-Off Characteristics vs. Collector Current
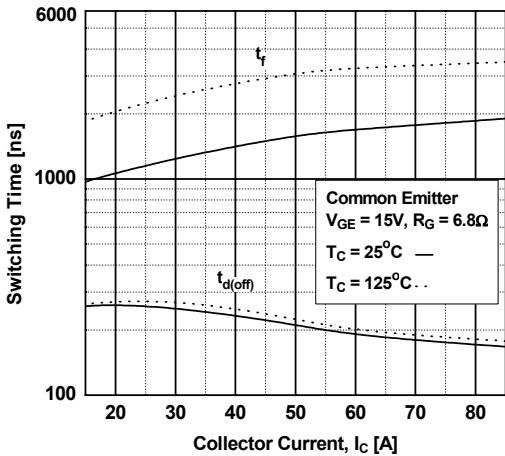
Figure 16. Switching Loss vs Gate Resistance
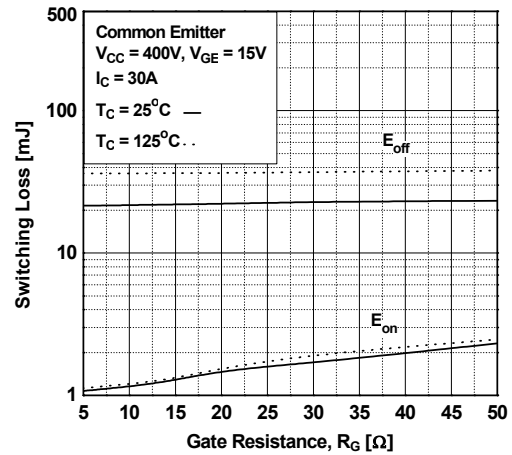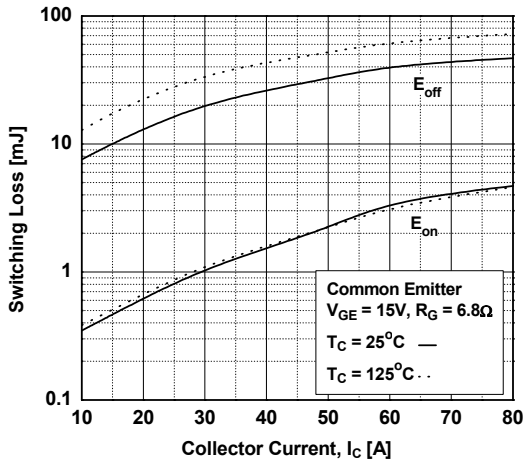

Figure 17.Switching Loss vs Collector Current
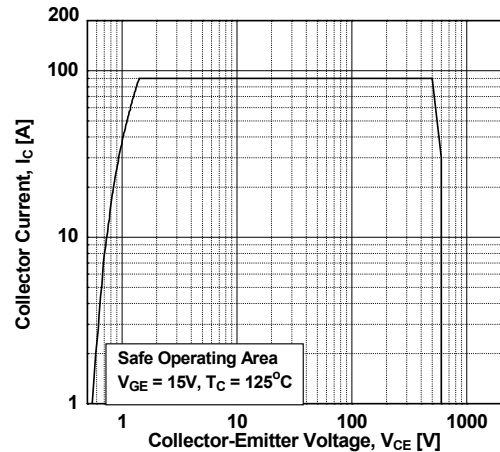

Figure 18. Turn-Off Switching
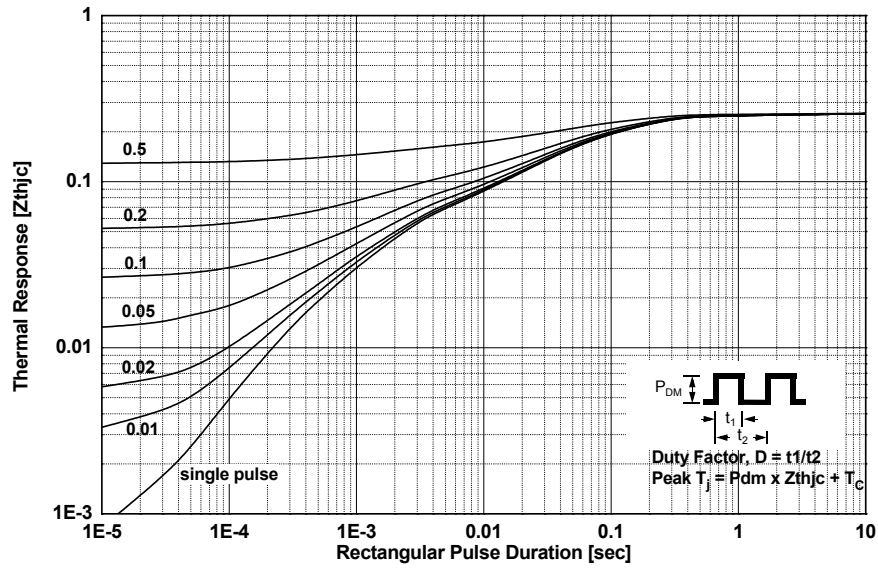
Figure 19. Transient Thermal Impedance of IGBT

Figure 20. Forward Voltage Drop
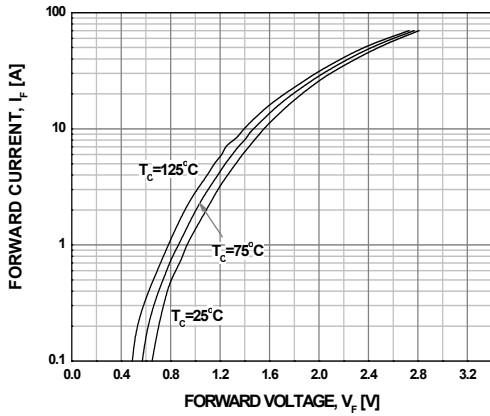
Figure 21. Reverse Current
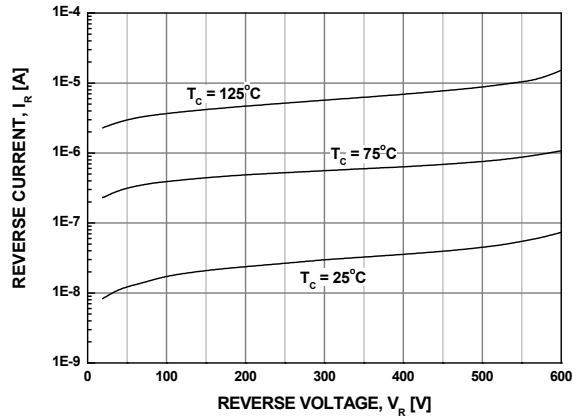
Figure 22. Reverse Recovery Time
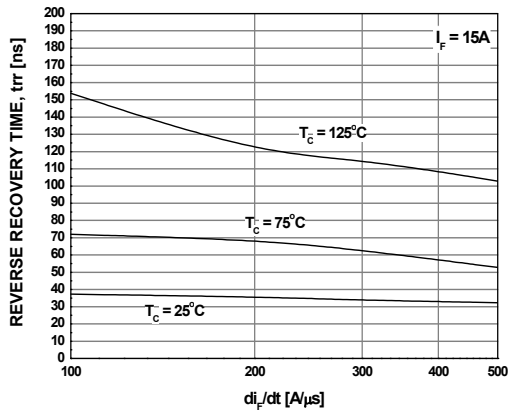
Mechanical Dimensions
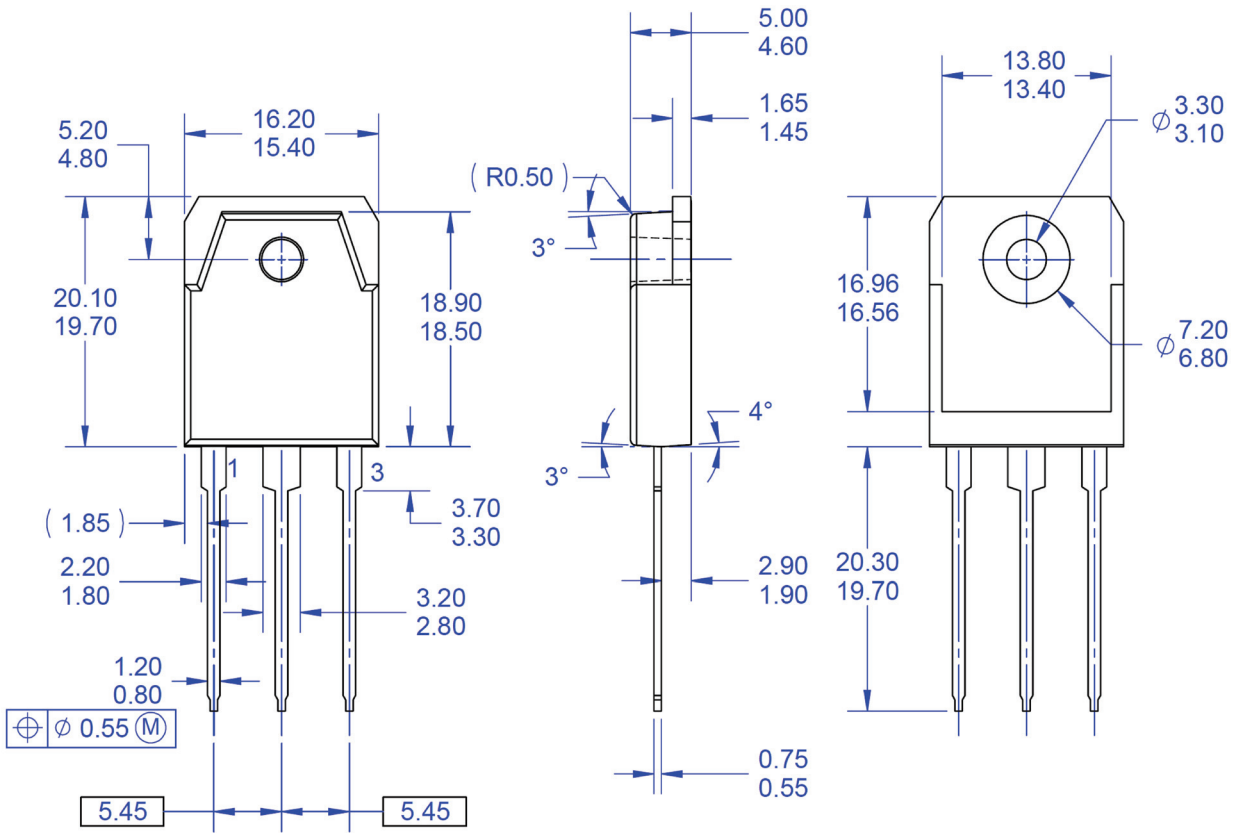
Figure 23. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65

NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO EIAJ
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   ASME14.5-2009.
D) DIMENSIONS ARE EXCLUSSIVE OF BURRS,
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