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SGH10N60RUFD

600V, 10 A Short Circuit Rated IGBT

Features

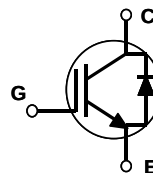
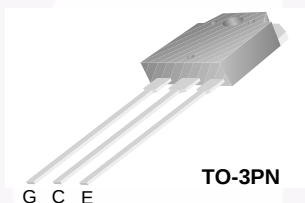
- Short Circuit Rated 10 us @ $T_C = 100^\circ\text{C}$, $V_{GE} = 15\text{ V}$
- High Speed Switching
- Low Saturation Voltage : $V_{CE(sat)} = 2.2\text{ V}$ @ $I_C = 10\text{ A}$
- High Input Impedance
- CO-PAK, IGBT with FRD : $t_{rr} = 42\text{ ns}$ (typ.)

Description

Fairchild's RUFD series of insulated gate bipolar transistors (IGBTs) provide low conduction and switching losses as well as short circuit ruggedness. The RUFD series is designed for applications such as motor control, uninterrupted power supplies (UPS) and general inverters where short circuit ruggedness is a required feature.

Applications

AC & DC Motors Controls, General Purpose Inverters, and Robotics, and Servo Controls



Absolute Maximum Ratings

$T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Description	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	16	A
	Collector Current @ $T_C = 100^\circ\text{C}$	10	A
$I_{CM(1)}$	Pulsed Collector Current	30	A
I_F	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	12	A
I_{FM}	Diode Maximum Forward Current	92	A
T_{SC}	Short Circuit Withstand Time @ $T_C = 100^\circ\text{C}$	10	us
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	75	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	30	W
T_J	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Notes :

(1) Repetitive rating : Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction-to-Case	--	1.6	$^\circ\text{C/W}$
$R_{\theta JC}(\text{DIODE})$	Thermal Resistance, Junction-to-Case	--	2.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	$^\circ\text{C/W}$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
SGH10N60RUFD	SGH10N60RUFD	TO-3PN	Tube	N/A	N/A	30 units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

BV _{CES}	Collector-Emitter Breakdown Voltage	V _{GE} = 0 V, I _C = 250 µA	600	--	--	V
ΔB _{VCES} / ΔT _J	Temperature Coefficient of Breakdown Voltage	V _{GE} = 0 V, I _C = 1 mA	--	0.6	--	V/°C
I _{CES}	Collector Cut-Off Current	V _{CE} = V _{CES} , V _{GE} = 0 V	--	--	250	µA
I _{GES}	G-E Leakage Current	V _{GE} = V _{GES} , V _{CE} = 0 V	--	--	± 100	nA

On Characteristics

V _{GE(th)}	G-E Threshold Voltage	I _C = 10 mA, V _{CE} = V _{GE}	5.0	6.0	8.5	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C = 10 A, V _{GE} = 15 V	--	2.2	2.8	V
		I _C = 16 A, V _{GE} = 15 V	--	2.5	--	V

Dynamic Characteristics

C _{ies}	Input Capacitance	V _{CE} = 30 V, V _{GE} = 0 V, f = 1 MHz	--	660	--	pF
C _{oes}	Output Capacitance		--	115	--	pF
C _{res}	Reverse Transfer Capacitance		--	25	--	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	V _{CC} = 300 V, I _C = 10 A, R _G = 20 Ω, V _{GE} = 15 V, Inductive Load, T _C = 25°C	--	15	--	ns
t _r	Rise Time		--	30	--	ns
t _{d(off)}	Turn-Off Delay Time		--	36	50	ns
t _f	Fall Time		--	158	200	ns
E _{on}	Turn-On Switching Loss		--	141	--	µJ
E _{off}	Turn-Off Switching Loss		--	215	--	µJ
E _{ts}	Total Switching Loss		--	356	500	µJ
t _{d(on)}	Turn-On Delay Time	V _{CC} = 300 V, I _C = 10 A, R _G = 20 Ω, V _{GE} = 15 V, Inductive Load, T _C = 125°C	--	16	--	ns
t _r	Rise Time		--	33	--	ns
t _{d(off)}	Turn-Off Delay Time		--	42	60	ns
t _f	Fall Time		--	242	350	ns
E _{on}	Turn-On Switching Loss		--	161	--	µJ
E _{off}	Turn-Off Switching Loss		--	452	--	µJ
E _{ts}	Total Switching Loss		--	613	860	µJ
T _{sc}	Short Circuit Withstand Time	V _{CC} = 300 V, V _{GE} = 15 V @ T _C = 100°C	10	--	--	us
Q _g	Total Gate Charge	V _{CE} = 300 V, I _C = 10 A, V _{GE} = 15 V	--	30	45	nC
Q _{ge}	Gate-Emitter Charge		--	5	10	nC
Q _{gc}	Gate-Collector Charge		--	8	16	nC
L _e	Internal Emitter Inductance	Measured 5mm from PKG	--	14	--	nH

Electrical Characteristics of DIODE T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V _{FM}	Diode Forward Voltage	I _F = 12 A	T _C = 25°C	--	1.4	1.7	V
			T _C = 100°C	--	1.3	--	
t _{rr}	Diode Reverse Recovery Time	I _F = 12 A, di/dt = 200 A/us	T _C = 25°C	--	42	60	ns
			T _C = 100°C	--	60	--	
I _{rr}	Diode Peak Reverse Recovery Current		T _C = 25°C	--	3.5	6.0	A
			T _C = 100°C	--	5.6	--	
Q _{rr}	Diode Reverse Recovery Charge		T _C = 25°C	--	80	180	nC
			T _C = 100°C	--	220	--	

Typical Characteristics

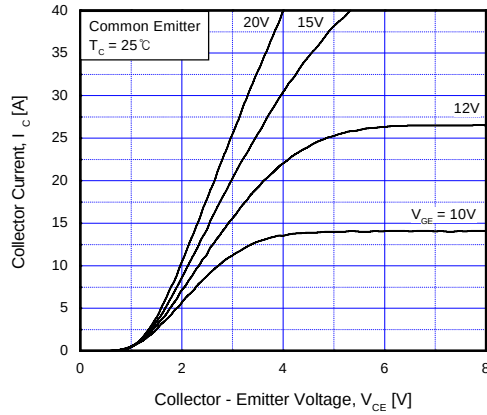


Fig 1. Typical Output Characteristics

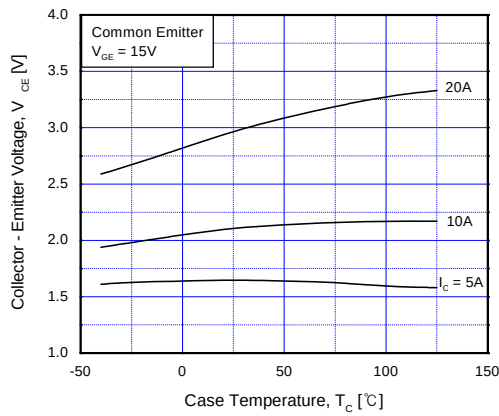
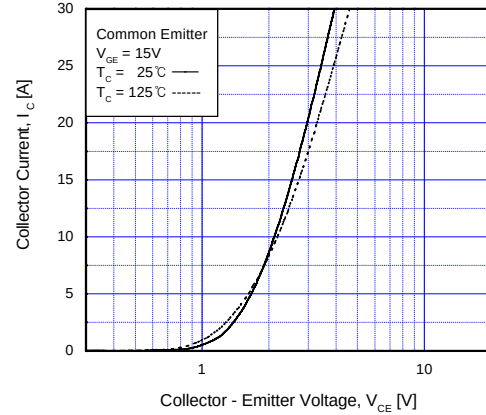


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

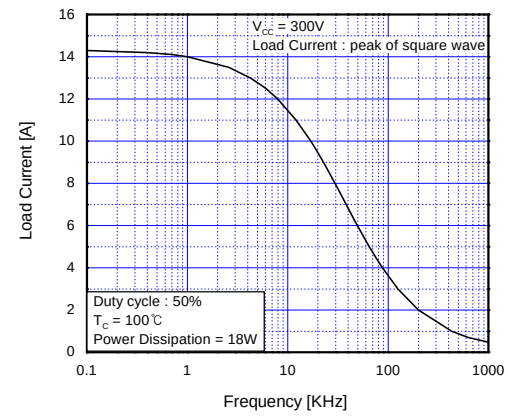


Fig 4. Load Current vs. Frequency

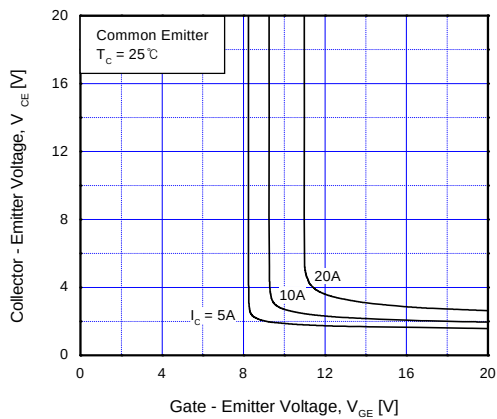


Fig 5. Saturation Voltage vs. V_{GE}

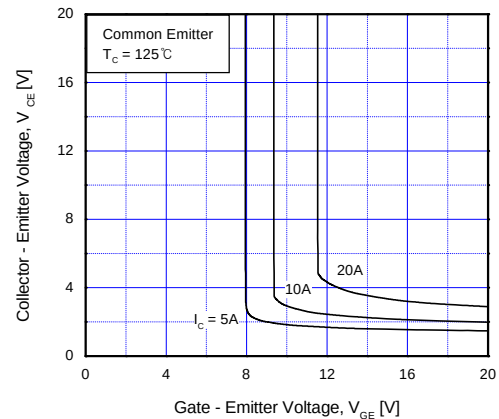


Fig 6. Saturation Voltage vs. V_{GE}

Typical Characteristics (continued)

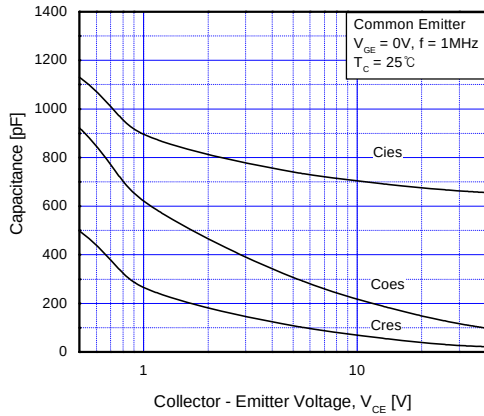


Fig 7. Capacitance Characteristics

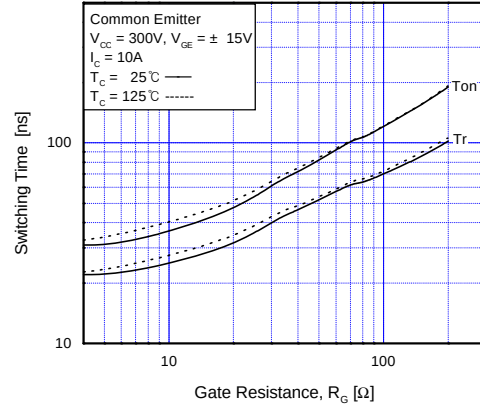


Fig 8. Turn-On Characteristics vs. Gate Resistance

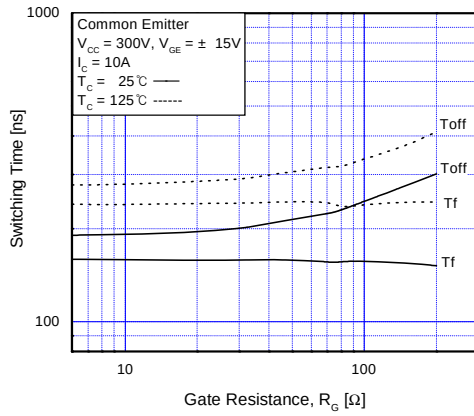


Fig 9. Turn-Off Characteristics vs. Gate Resistance

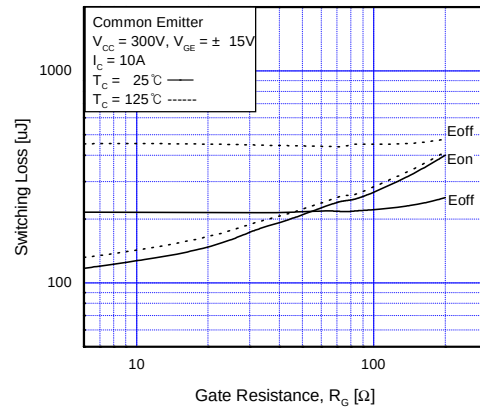


Fig 10. Switching Loss vs. Gate Resistance

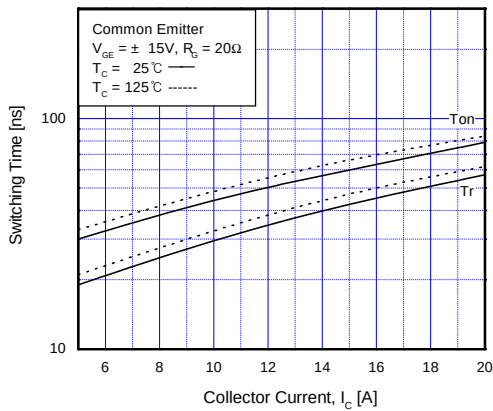


Fig 11. Turn-On Characteristics vs. Collector Current

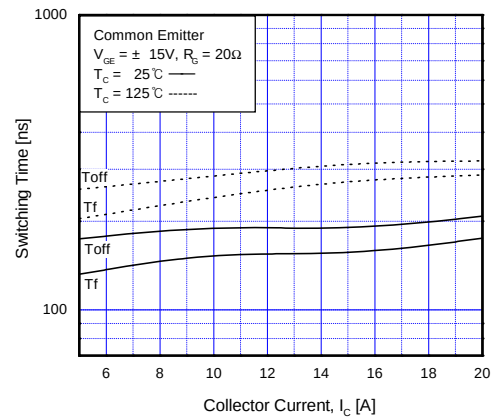


Fig 12. Turn-Off Characteristics vs. Collector Current

Typical Characteristics (continued)

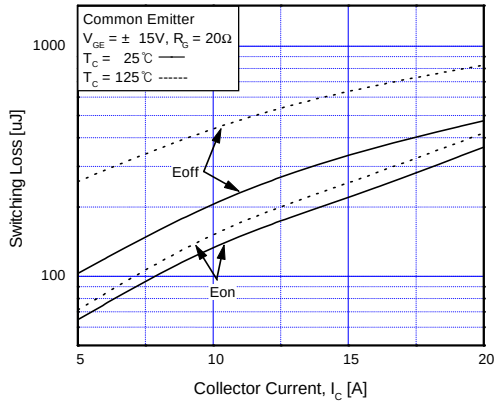


Fig 13. Switching Loss vs. Collector Current

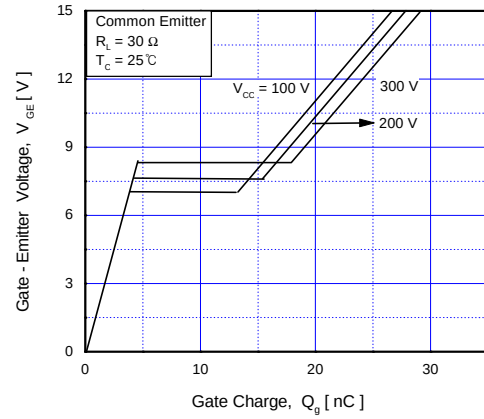


Fig 14. Gate Charge Characteristics

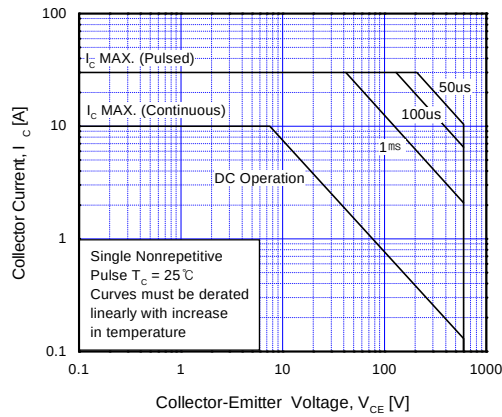


Fig 15. SOA Characteristics

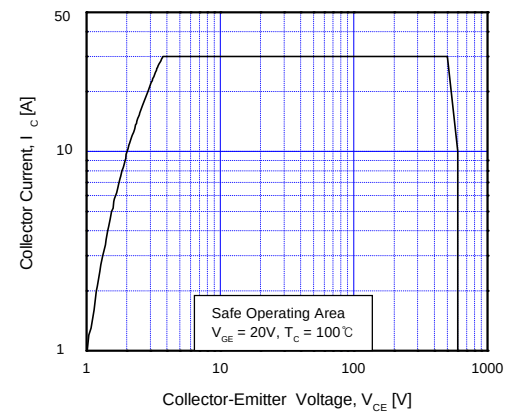


Fig 16. Turn-Off SOA Characteristics

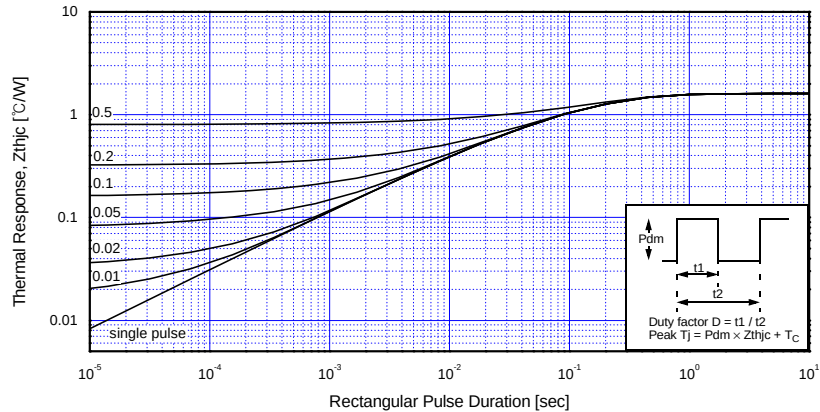


Fig 17. Transient Thermal Impedance of IGBT

Typical Characteristics (continued)

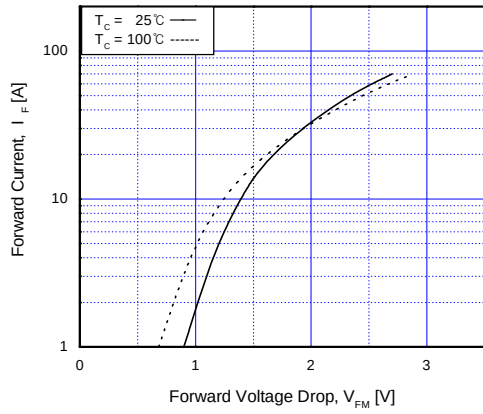


Fig 18. Forward Characteristics

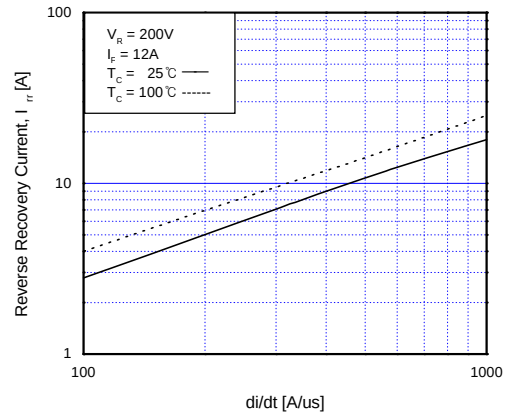


Fig 19. Reverse Recovery Current

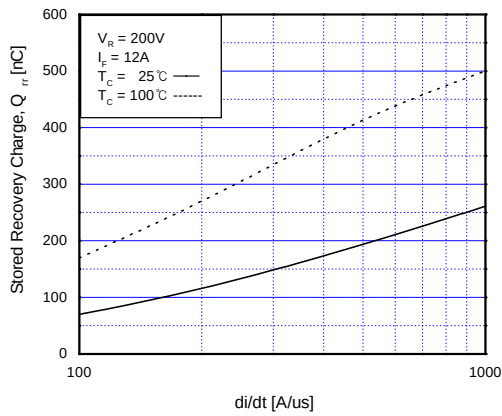


Fig 20. Stored Charge

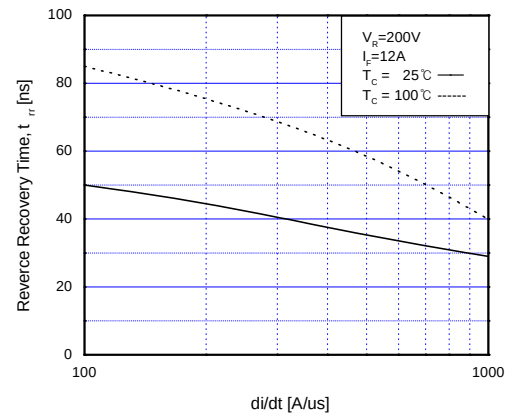


Fig 21. Reverse Recovery Time

Mechanical Dimensions

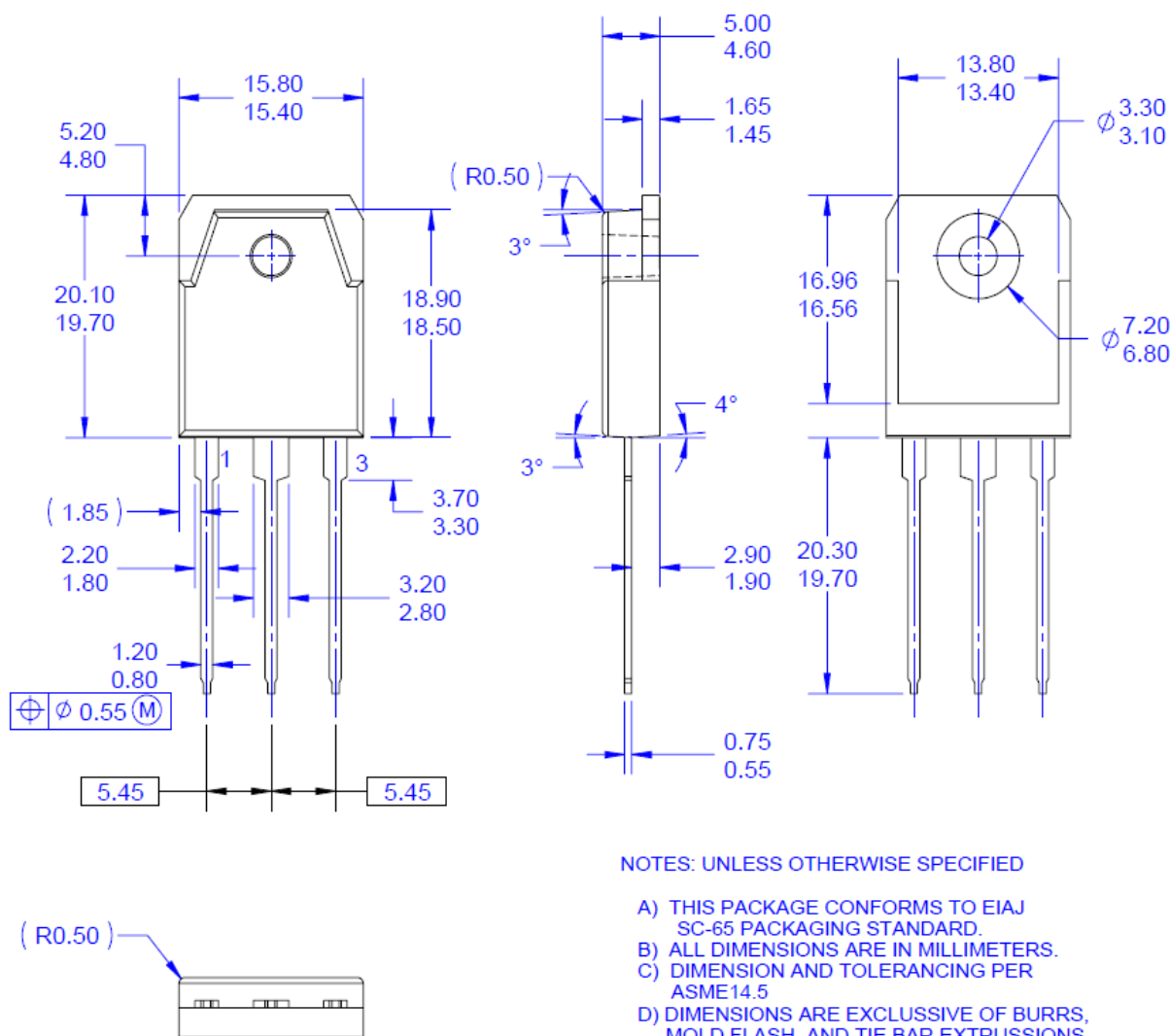


Figure 22. TO3, 3-Lead, Plastic, EIAJ SC-65

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