

ON Semiconductor

Is Now

onsemi™

To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and **onsemi** and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi** product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.



ON Semiconductor®

FGA25N120ANTDTU

1200 V, 25 A NPT Trench IGBT

Features

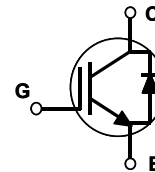
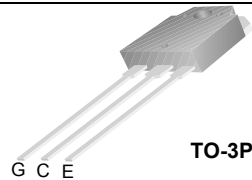
- NPT Trench Technology, Positive Temperature Coefficient
- Low Saturation Voltage: $V_{CE(sat), typ} = 2.0\text{ V}$
@ $I_C = 25\text{ A}$ and $T_C = 25^\circ\text{C}$
- Low Switching Loss: $E_{off, typ} = 0.96\text{ mJ}$
@ $I_C = 25\text{ A}$ and $T_C = 25^\circ\text{C}$
- Extremely Enhanced Avalanche Capability

Description

Using ON Semiconductor's proprietary trench design and advanced NPT technology, the 1200V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation. This device is well suited for the resonant or soft switching application such as induction heating, microwave oven.

Applications

- Induction Heating, Microwave Oven



Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CES}	Collector-Emitter Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ $T_C = 25^\circ\text{C}$	50	A
	Collector Current	@ $T_C = 100^\circ\text{C}$	25	A
$I_{CM(1)}$	Pulsed Collector Current		90	A
I_F	Diode Continuous Forward Current	@ $T_C = 25^\circ\text{C}$	50	A
	Diode Continuous Forward Current	@ $T_C = 100^\circ\text{C}$	25	A
I_{FM}	Diode Maximum Forward Current		150	A
P_D	Maximum Power Dissipation	@ $T_C = 25^\circ\text{C}$	312	W
	Maximum Power Dissipation	@ $T_C = 100^\circ\text{C}$	125	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	--	0.4	$^\circ\text{C}/\text{W}$
$R_{\theta JC}(\text{DIODE})$	Thermal Resistance, Junction-to-Case	--	2.0	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGA25N120ANTDTU-F109	FGA25N120ANTDTU	TO-3PN	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						
I _{CES}	Collector Cut-Off Current	V _{CE} = V _{CES} , V _{GE} = 0 V	--	--	3	mA
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 = 25 mA, V _{CE} = V _{GE}	3.5	5.5	7.5	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C = 25 A, V _{GE} = 15 V	--	2.0	--	V
		I _C = 25 A, V _{GE} = 15 V, T _C = 125°C	--	2.15	--	V
		I _C = 50 A, V _{GE} = 15 V	--	2.65	--	V
Dynamic Characteristics						
C _{ies}	Input Capacitance	V _{CE} = 30 V, V _{GE} = 0 V, f = 1 MHz	--	3700	--	pF
C _{oes}	Output Capacitance		--	130	--	pF
C _{res}	Reverse Transfer Capacitance		--	80	--	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{CC} = 600 V, I _C = 25 A, R _G = 10 Ω, V _{GE} = 15 V, Inductive Load, T _C = 25°C	--	50	--	ns
t _r	Rise Time		--	60	--	ns
t _{d(off)}	Turn-Off Delay Time		--	190	--	ns
t _f	Fall Time		--	100	--	ns
E _{on}	Turn-On Switching Loss		--	4.1	--	mJ
E _{off}	Turn-Off Switching Loss		--	0.96	--	mJ
E _{ts}	Total Switching Loss		--	5.06	--	mJ
t _{d(on)}	Turn-On Delay Time	V _{CC} = 600 V, I _C = 25 A, R _G = 10Ω, V _{GE} = 15 V, Inductive Load, T _C = 125°C	--	50	--	ns
t _r	Rise Time		--	60	--	ns
t _{d(off)}	Turn-Off Delay Time		--	200	--	ns
t _f	Fall Time		--	154	--	ns
E _{on}	Turn-On Switching Loss		--	4.3	--	mJ
E _{off}	Turn-Off Switching Loss		--	1.5	--	mJ
E _{ts}	Total Switching Loss		--	5.8	--	mJ
Q _g	Total Gate Charge	V _{CE} = 600 V, I _C = 25 A, V _{GE} = 15 V	--	200	--	nC
Q _{ge}	Gate-Emitter Charge		--	15	--	nC
Q _{gc}	Gate-Collector Charge		--	100	--	nC

Electrical Characteristics of DIODE $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
V_{FM}	Diode Forward Voltage	$I_F = 25\text{ A}$	$T_C = 25^\circ\text{C}$	--	2.0	3.0	V
			$T_C = 125^\circ\text{C}$	--	2.1	--	
t_{rr}	Diode Reverse Recovery Time	$I_F = 25\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	--	235	350	ns
			$T_C = 125^\circ\text{C}$	--	300	--	
I_{rr}	Diode Peak Reverse Recovery Current	$I_F = 25\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	--	27	40	A
			$T_C = 125^\circ\text{C}$	--	31	--	
Q_{rr}	Diode Reverse Recovery Charge	$I_F = 25\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	--	3130	4700	nC
			$T_C = 125^\circ\text{C}$	--	4650	--	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

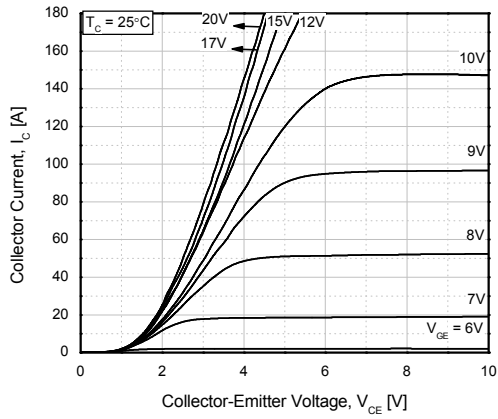


Figure 2. Typical Saturation Voltage Characteristics

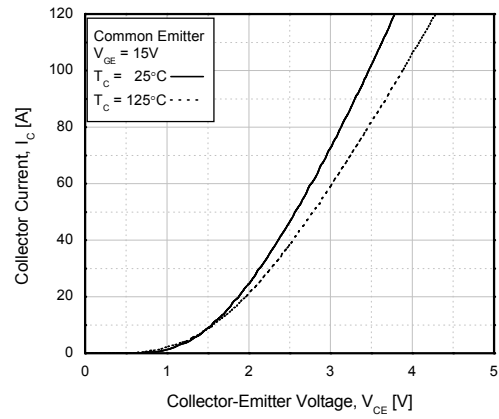


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

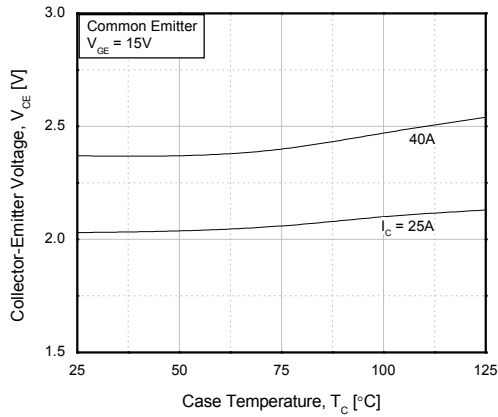


Figure 4. Saturation Voltage vs. V_GE

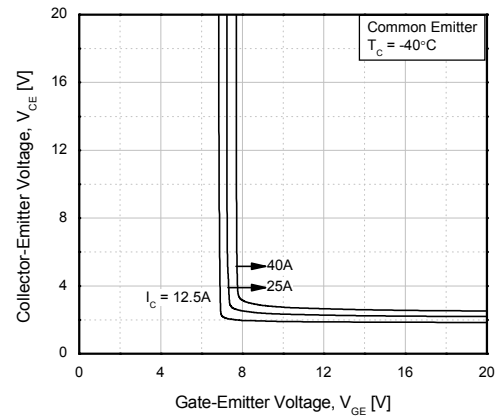


Figure 5. Saturation Voltage vs. V_GE

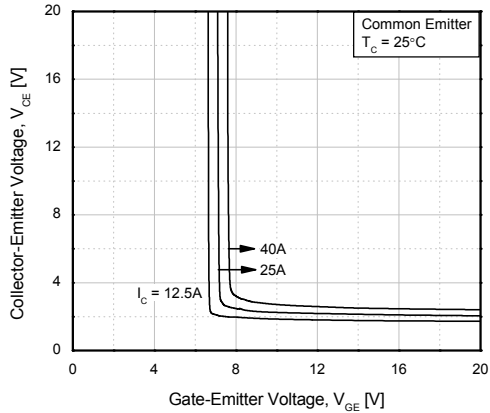
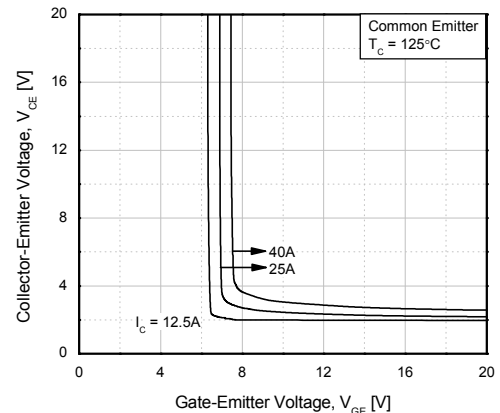


Figure 6. Saturation Voltage vs. V_GE



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

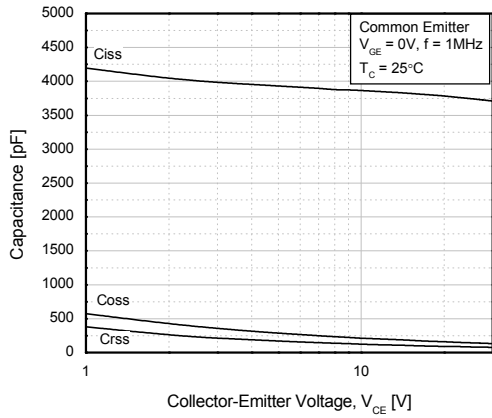


Figure 8. Turn-On Characteristics vs. Gate Resistance

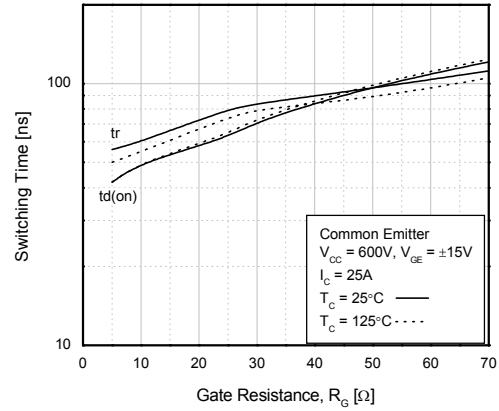


Figure 9. Turn-Off Characteristics vs. Gate Resistance

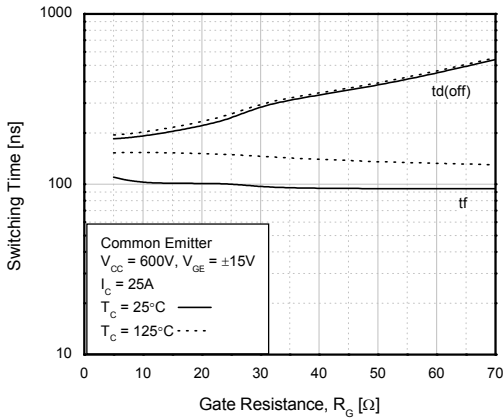


Figure 10. Switching Loss vs. Gate Resistance

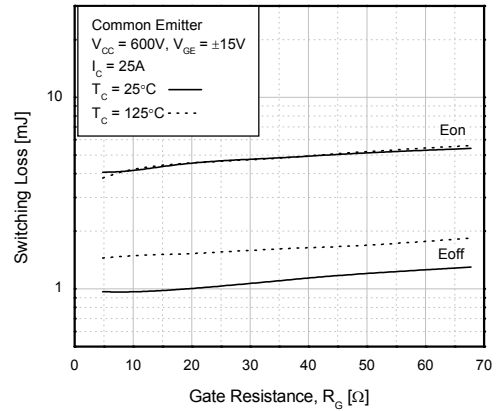


Figure 11. Turn-On Characteristics vs. Collector Current

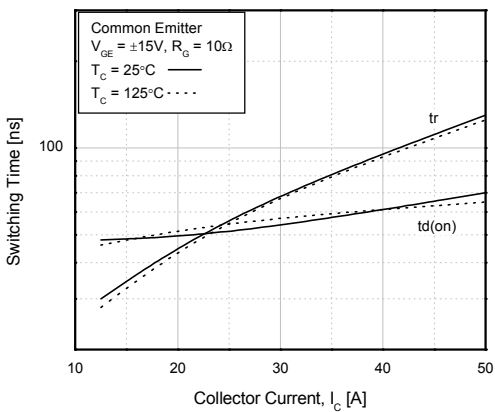
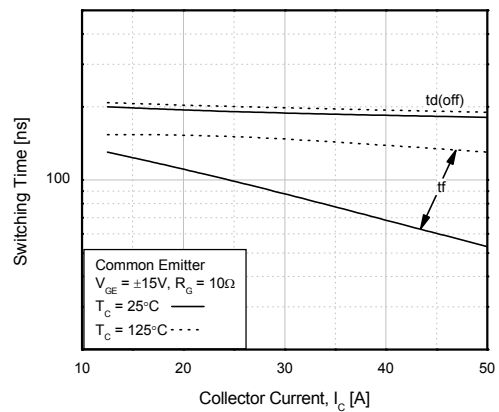


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

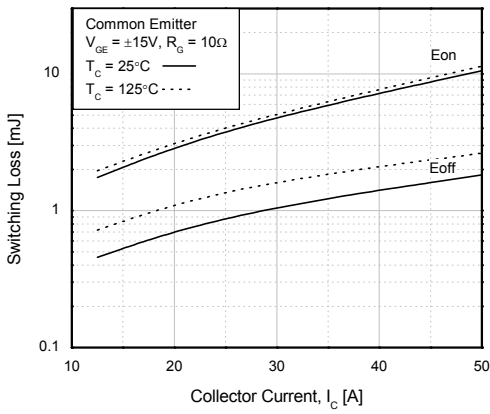


Figure 14. Gate Charge Characteristics

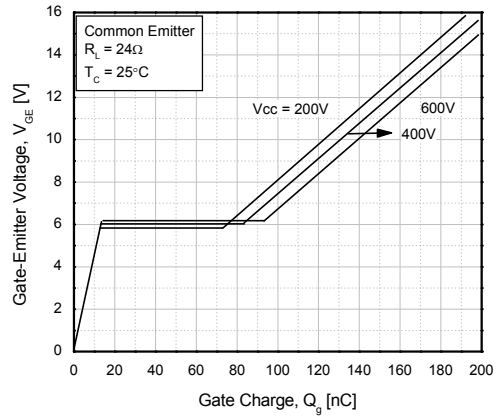


Figure 15. SOA Characteristics

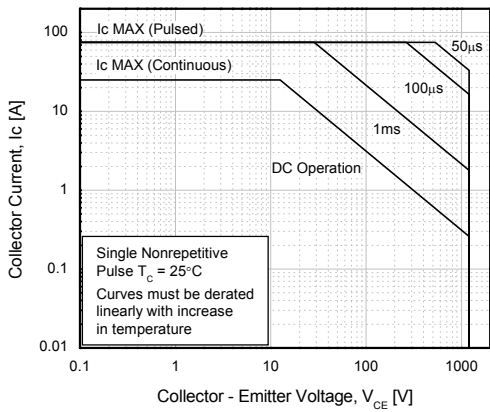


Figure 16. Turn-Off SOA

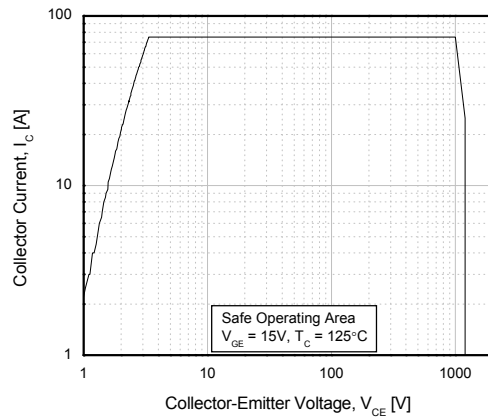
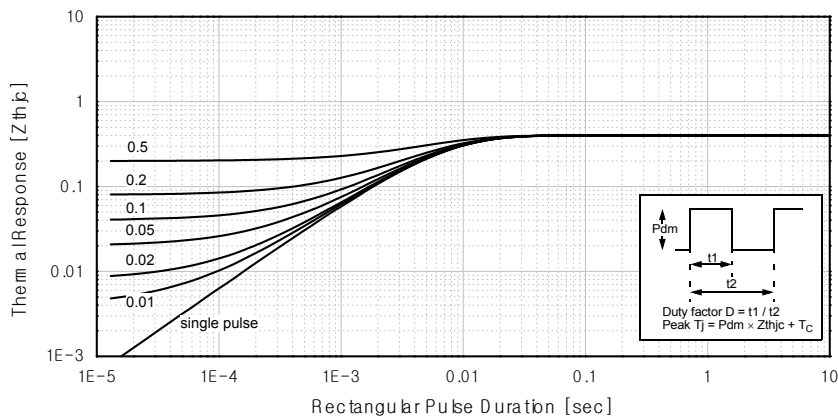


Figure 17. Transient Thermal Impedance of IGBT



Typical Performance Characteristics (Continued)

Figure 18. Forward Characteristics

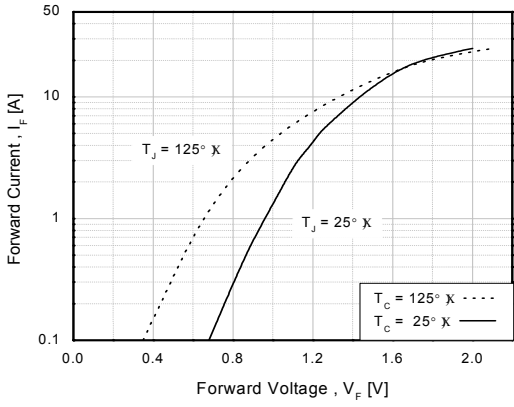


Figure 19. Reverse Recovery Current

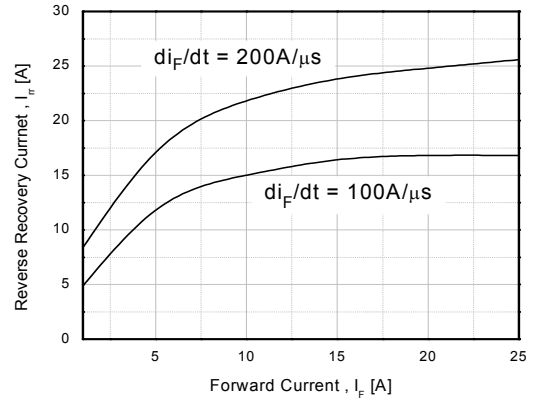


Figure 20. Stored Charge

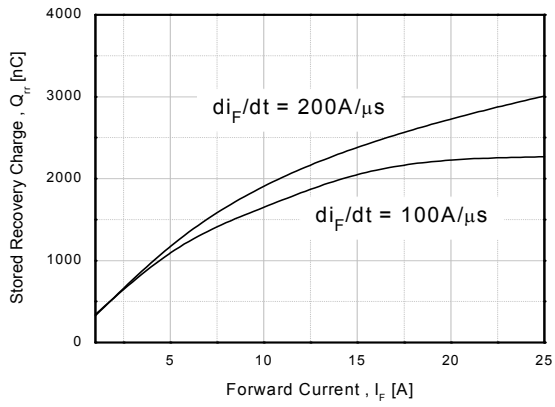
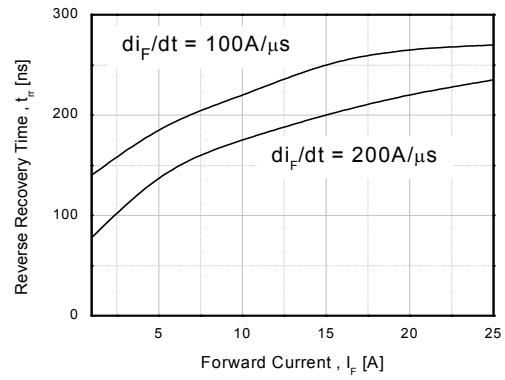
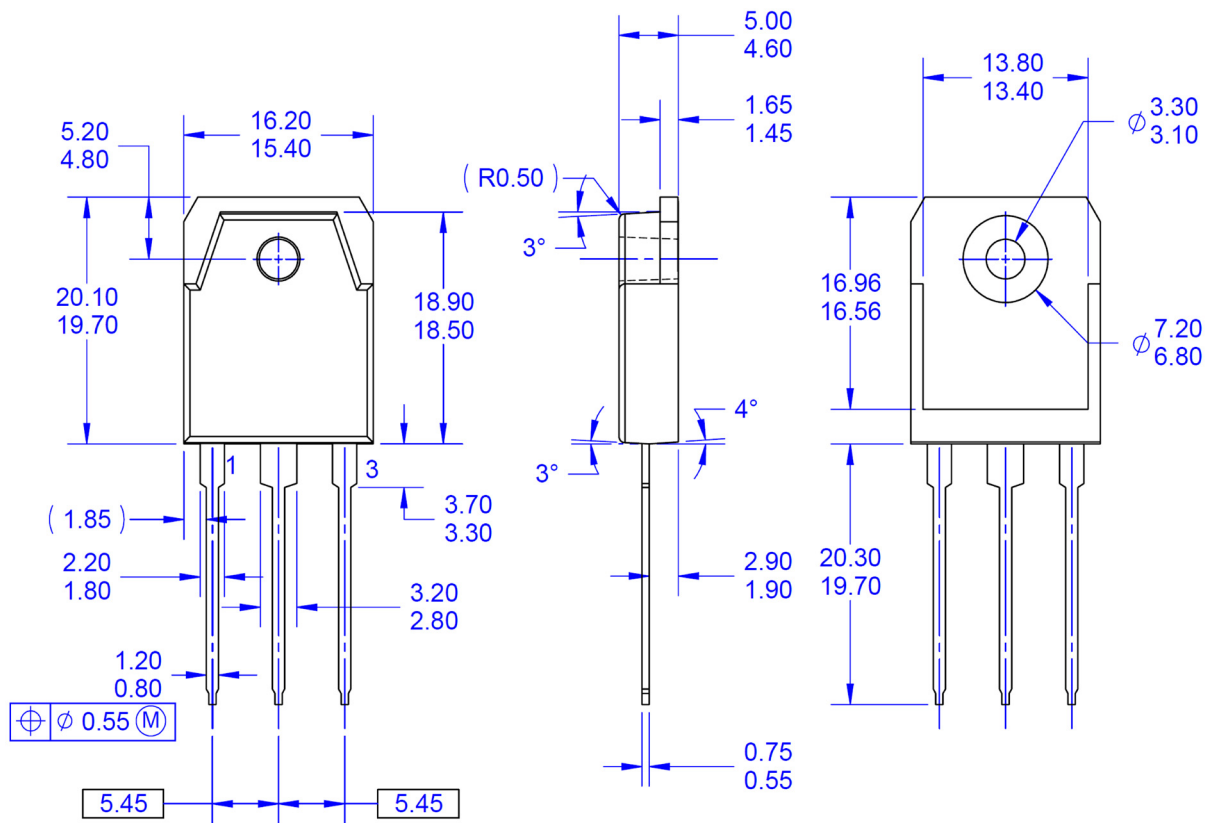


Figure 21. Reverse Recovery Time



Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- E) DRAWING FILE NAME: TO3PN03AREV1.

Figure 22. TO3PN, 3-Lead, Plastic, EIAJ SC-65

Package drawings are provided as a service to customers considering ON Semiconductor components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a ON Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of ON Semiconductor's worldwide terms and conditions, specifically the warranty therein, which covers ON Semiconductor products.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local
Sales Representative