



Is Now Part of



ON Semiconductor®

**To learn more about ON Semiconductor, please visit our website at
www.onsemi.com**

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

ON Semiconductor and the ON Semiconductor logo 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.

FGPF15N60UNDF

600 V, 15 A

Short Circuit Rated IGBT

Features

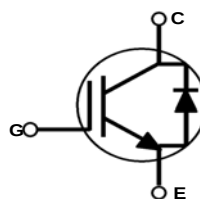
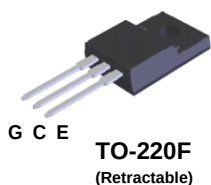
- Short Circuit Rated 10us
- High Current Capability
- High Input Impedance
- Fast Switching
- RoHS Compliant

General Description

Using advanced NPT IGBT technology, Fairchild's the NPT IGBTs offer the optimum performance for low-power inverter-driven applications where low-losses and short-circuit ruggedness features are essential, such as sewing machine, CNC, motor control and home appliances.

Applications

- Sewing Machine, CNC, Home Appliances, Motor Control



Absolute Maximum Ratings

Symbol	Description	Ratings	Unit
V_{CES}	Collector to Emitter Voltage	600	V
V_{GES}	Gate to Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	30	A
	Collector Current @ $T_C = 100^\circ\text{C}$	15	A
$I_{CM(1)}$	Pulsed Collector Current @ $T_C = 25^\circ\text{C}$	45	A
I_F	Diode Forward Current @ $T_C = 25^\circ\text{C}$	15	A
	Diode Forward Current @ $T_C = 100^\circ\text{C}$	7.5	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	42	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	17	W
T_J	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

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	-	3.0	$^\circ\text{C/W}$
$R_{\theta JC}(\text{Diode})$	Thermal Resistance, Junction to Case	-	4.9	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (PCB Mount)(2)	-	62.5	$^\circ\text{C/W}$

Notes:

2: Mountde on 1" square PCB (FR4 or G-10 material)

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FGPF15N60UNDF	FGPF15N60UNDF	TO-220F	-	-	50ea

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} = 0 V, I _C = 250 μA	600	-	-	V
I _{CES}	Collector Cut-Off Current	V _{CE} = V _{CES} , V _{GE} = 0 V	-	-	1	mA
I _{GES}	G-E Leakage Current	V _{GE} = V _{GES} , V _{CE} = 0 V	-	-	±10	μA
On Characteristics						
V _{GE(th)}	G-E Threshold Voltage	I _C = 15 mA, V _{CE} = V _{GE}	5.5	6.8	8.5	V
V _{CE(sat)}	Collector to Emitter Saturation Voltage	I _C = 15 A, V _{GE} = 15 V	-	2.2	2.7	V
		I _C = 15 A, V _{GE} = 15 V, T _C = 125°C	-	2.7	-	V
Dynamic Characteristics						
C _{ies}	Input Capacitance	V _{CE} = 30 V, V _{GE} = 0 V, f = 1MHz	-	619	-	pF
C _{oes}	Output Capacitance		-	80	-	pF
C _{res}	Reverse Transfer Capacitance		-	24	-	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{CC} = 400 V, I _C = 15 A, R _G = 10 Ω, V _{GE} = 15 V, Inductive Load, T _C = 25°C	-	9.3	-	ns
t _r	Rise Time		-	9.8	-	ns
t _{d(off)}	Turn-Off Delay Time		-	54.8	-	ns
t _f	Fall Time		-	9.9	12.8	ns
E _{on}	Turn-On Switching Loss		-	0.37	-	mJ
E _{off}	Turn-Off Switching Loss		-	0.067	-	mJ
E _{ts}	Total Switching Loss		-	0.44	-	mJ
t _{d(on)}	Turn-On Delay Time	V _{CC} = 400 V, I _C = 15 A, R _G = 10 Ω, V _{GE} = 15 V, Inductive Load, T _C = 125°C	-	8.9	-	ns
t _r	Rise Time		-	9.9	-	ns
t _{d(off)}	Turn-Off Delay Time		-	56.6	-	ns
t _f	Fall Time		-	13.2	-	ns
E _{on}	Turn-On Switching Loss		-	0.54	-	mJ
E _{off}	Turn-Off Switching Loss		-	0.11	-	mJ
E _{ts}	Total Switching Loss		-	0.65	-	mJ
T _{sc}	Short Circuit Withstand Time	V _{CC} = 350 V, R _G = 100 Ω, V _{GE} = 15 V, T _C = 150°C	10	-	-	μs

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

Q_g	Total Gate Charge	$V_{CE} = 400\text{ V}, I_C = 15\text{ A},$ $V_{GE} = 15\text{ V}$	-	43	-	nC
Q_{ge}	Gate to Emitter Charge		-	6	-	nC
Q_{gc}	Gate to Collector Charge		-	26	-	nC

Electrical Characteristics of the 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 = 15 A	T _C = 25°C	-	1.6	2.2	V
			T _C = 125°C	-	1.5	-	
t _{rr}	Diode Reverse Recovery Time	I _F = 15 A, dI _F /dt = 200 A/μs	T _C = 25°C	-	82.4		ns
			T _C = 125°C	-	142	-	
Q _{rr}	Diode Reverse Recovery Charge		T _C = 25°C	-	213	-	nC
			T _C = 125°C	-	541	-	

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

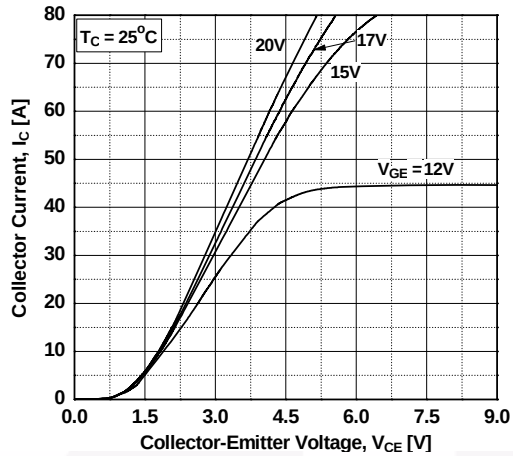


Figure 2. Typical Output Characteristics

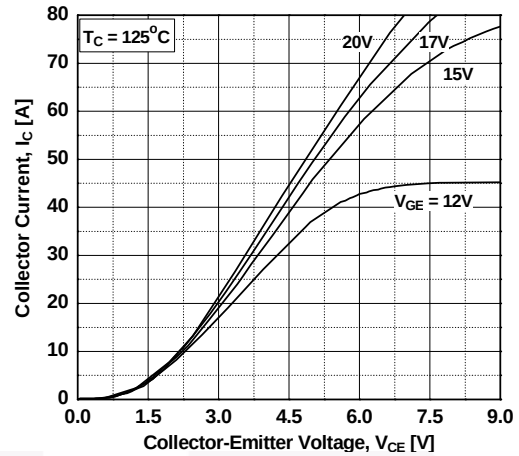


Figure 3. Typical Saturation Voltage Characteristics

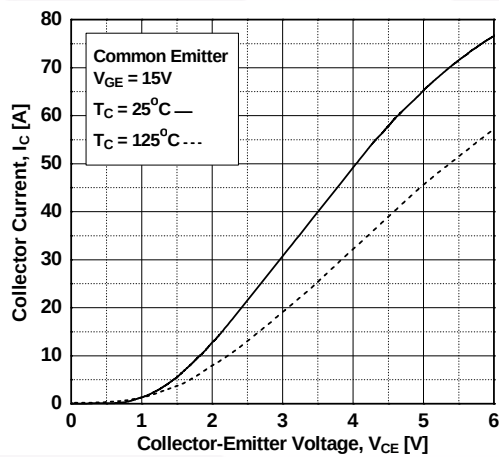


Figure 4. Transfer Characteristics

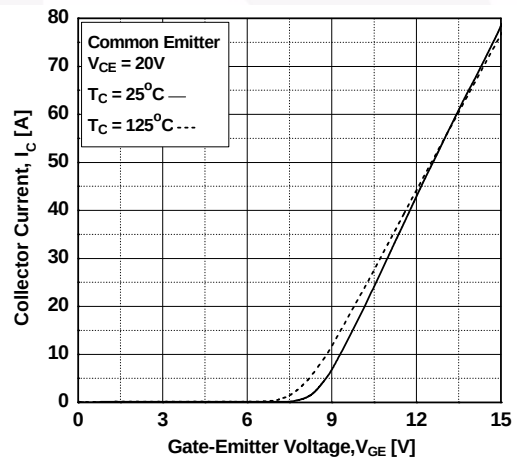


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

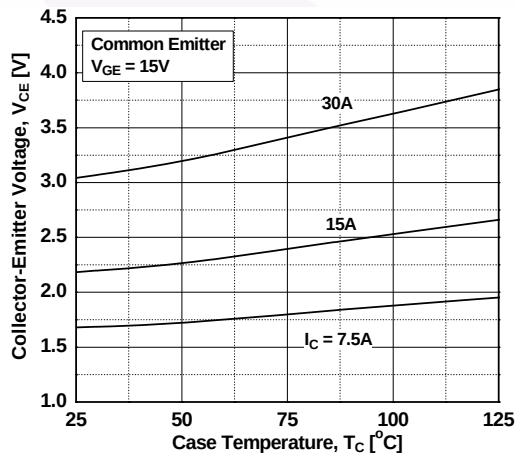
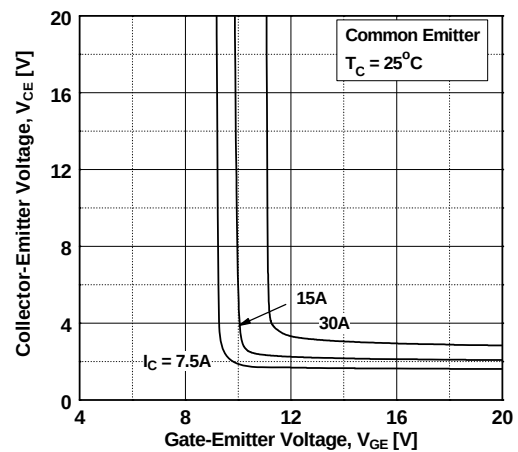


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

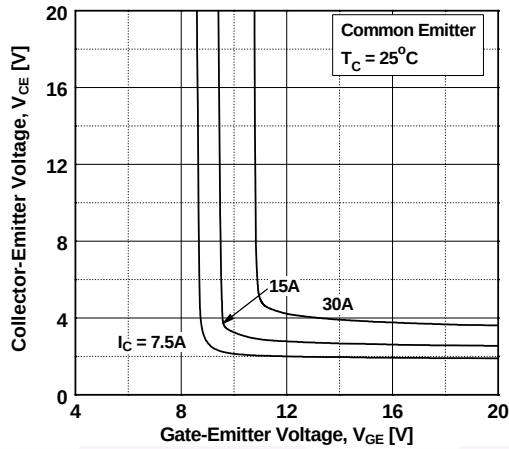


Figure 8. Capacitance Characteristics

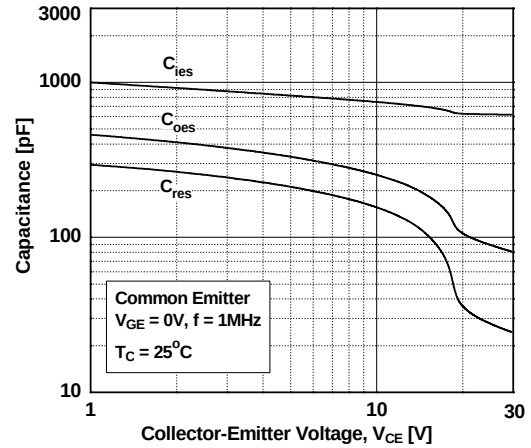


Figure 9. Gate charge Characteristics

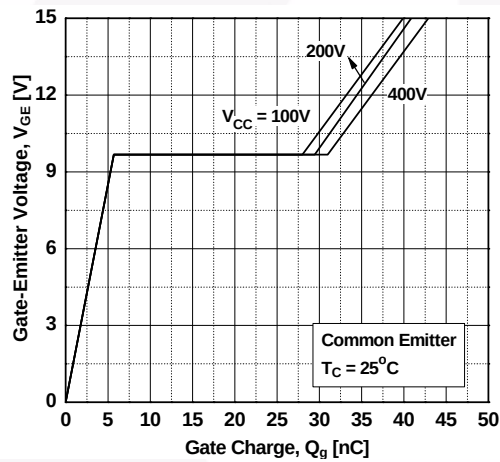


Figure 10. SOA Characteristics

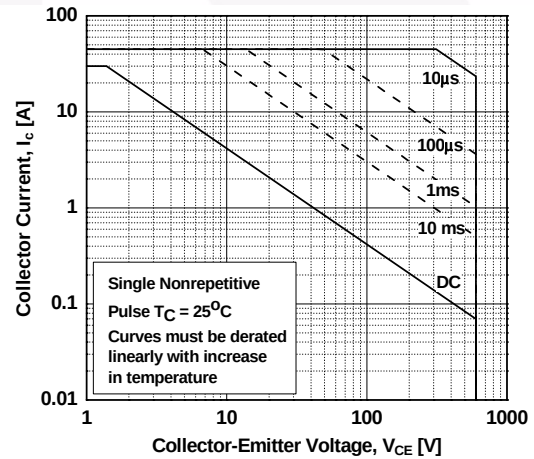


Figure 11. Turn-on Characteristics vs. Gate Resistance

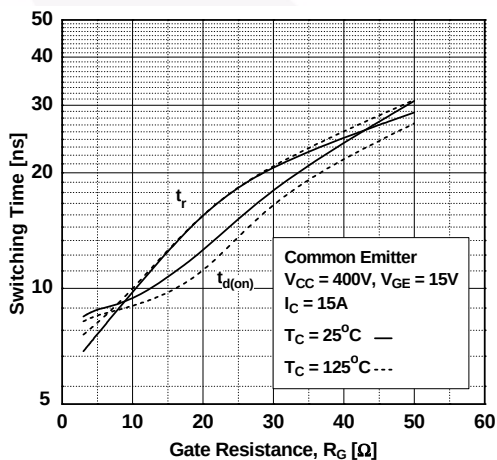
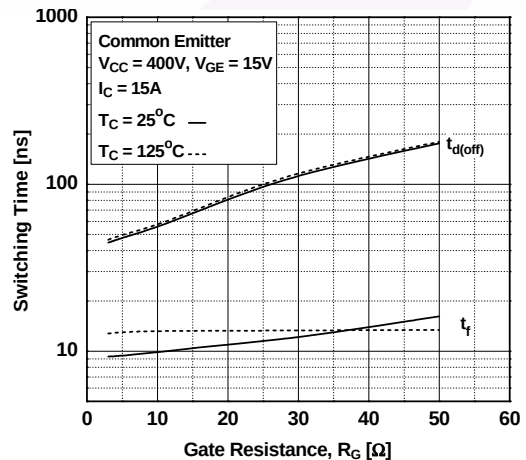


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

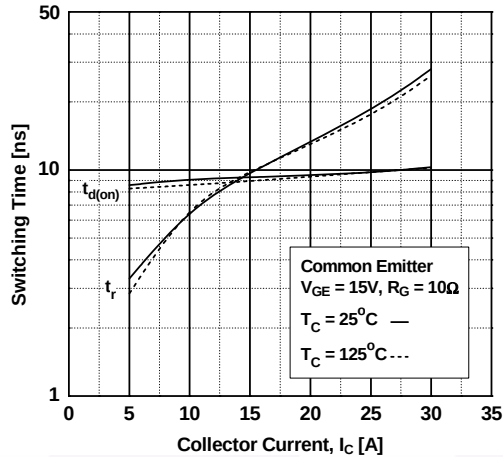


Figure 14. Turn-off Characteristics vs. Collector Current

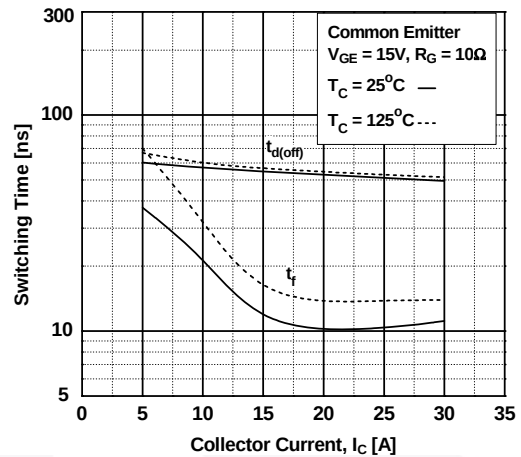


Figure 15. Switching Loss vs. Gate Resistance

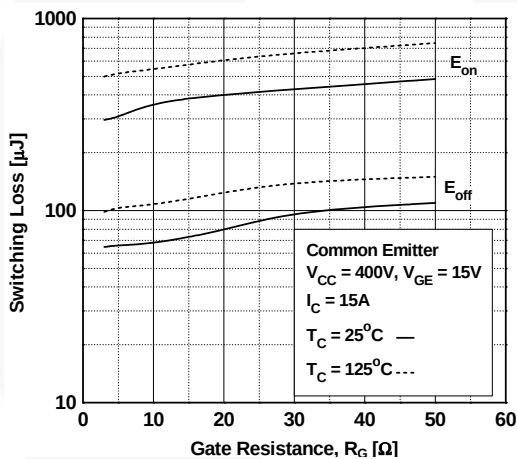


Figure 16. Switching Loss vs. Collector Current

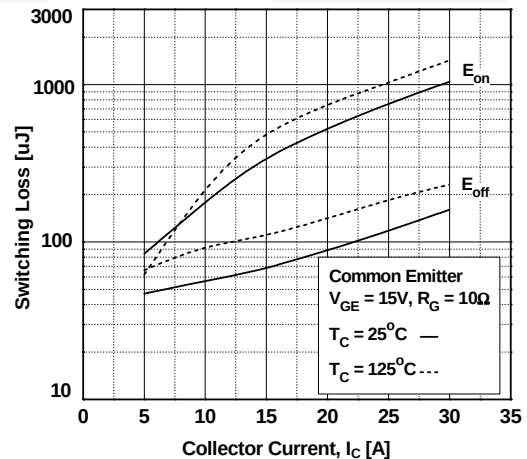


Figure 17. Turn off Switching SOA Characteristics

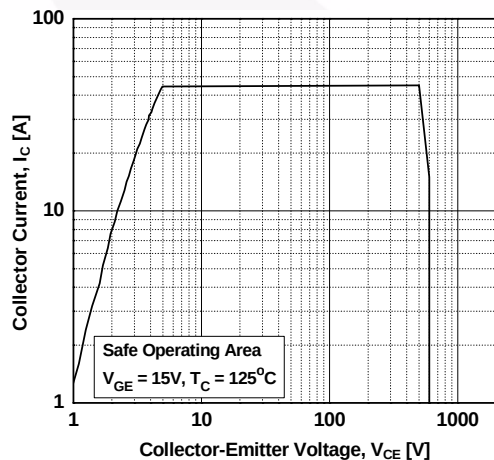
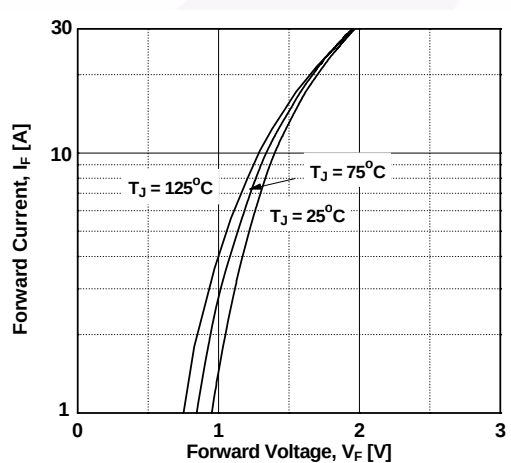


Figure 18. Forward Characteristics



Typical Performance Characteristics

Figure 19. Reverse Current

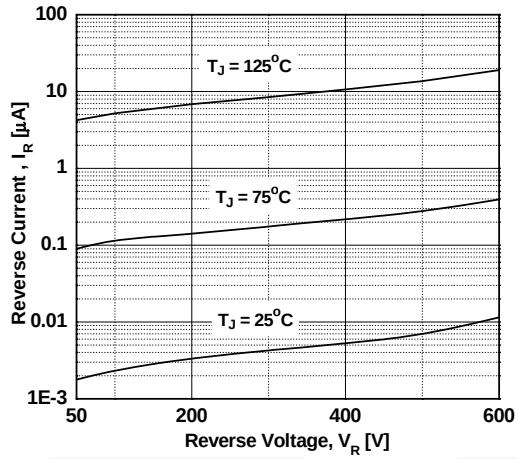


Figure 20. Stored Charge

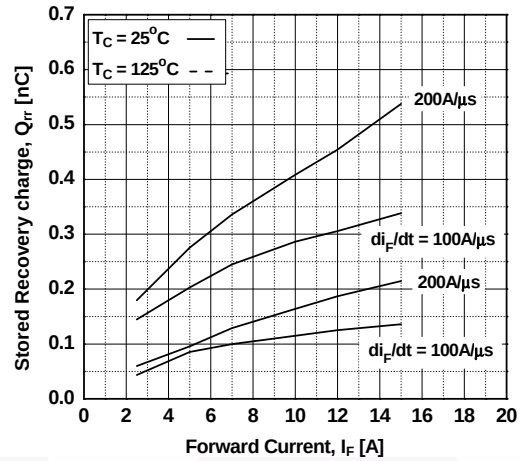


Figure 21. Reverse Recovery Time

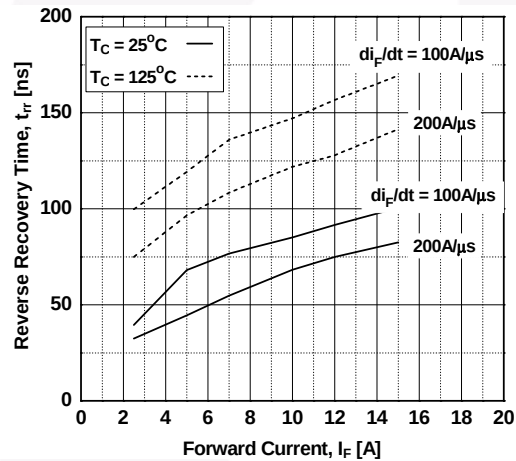
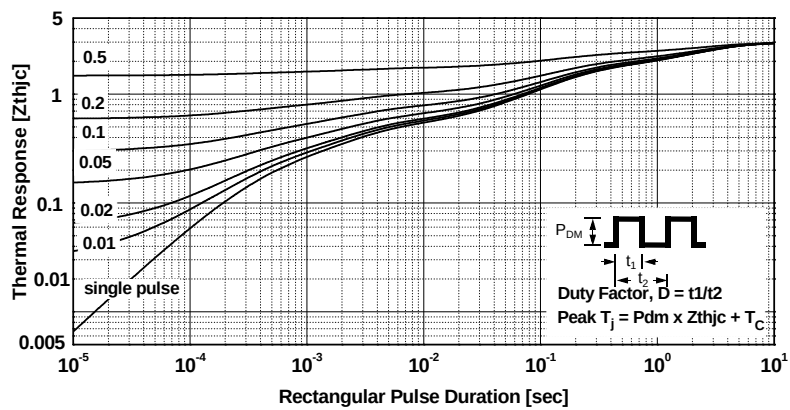


Figure 22. Transient Thermal Impedance of IGBT



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