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# FGH80N60FD2

## 600 V Field Stop IGBT

### Features

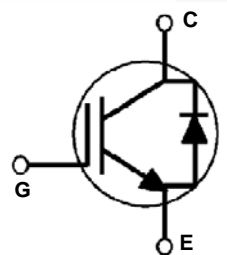
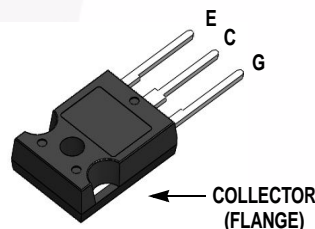
- High Current Capability
- Low Saturation Coltage:  $V_{CE(sat)} = 1.8\text{ V @ } I_C = 40\text{ A}$
- High Input Impedance
- Fast Switching
- RoHS Compliant

### Applications

- Induction Heating, PFC

### General Description

Using novel field stop IGBT technology, Fairchild's field stop IGBTs offer the optimum performance for induction heating and PFC applications where low conduction and switching losses are essential.



### 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 @ $T_C = 25^\circ\text{C}$	80	A
	Collector Current @ $T_C = 100^\circ\text{C}$	40	A
$I_{CM} (1)$	Pulsed Collector Current @ $T_C = 25^\circ\text{C}$	160	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	290	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	116	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	--	0.43	$^\circ\text{C/W}$
$R_{\theta JC}(\text{Diode})$	Thermal Resistance, Junction-to-Case	--	1.45	$^\circ\text{C/W}$
$R_{\theta JA}$	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
FGH80N60FD2TU	FGH80N60FD2	TO-247	Tube	N/A	N/A	30

## Electrical Characteristics of the IGBT T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV <sub>CES</sub>	Collector-Emitter Breakdown Voltage	V <sub>GE</sub> = 0 V, I <sub>C</sub> = 250 uA	600	--	--	V
ΔBV <sub>CES</sub> / ΔT <sub>J</sub>	Temperature Coefficient of Breakdown Voltage	V <sub>GE</sub> = 0 V, I <sub>C</sub> = 250 uA	--	0.6	--	V/°C
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0 V	--	--	250	uA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0 V	--	--	±400	nA
On Characteristics						
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 250 uA, V <sub>CE</sub> = V <sub>GE</sub>	4.5	5.5	7.0	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 40 A, V <sub>GE</sub> = 15 V	--	1.8	2.4	V
		I <sub>C</sub> = 40 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 125°C	--	2.05	--	V
Dynamic Characteristics						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 30 V, V <sub>GE</sub> = 0 V, f = 1 MHz	--	2110	--	pF
C <sub>oes</sub>	Output Capacitance		--	200	--	pF
C <sub>res</sub>	Reverse Transfer Capacitance		--	60	--	pF
Switching Characteristics						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 400 V, I <sub>C</sub> = 40 A, R <sub>G</sub> = 10 Ω, V <sub>GE</sub> = 15 V, Inductive Load, T <sub>C</sub> = 25°C	--	21	--	ns
t <sub>r</sub>	Rise Time		--	56	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	126	--	ns
t <sub>f</sub>	Fall Time		--	50	100	ns
E <sub>on</sub>	Turn-On Switching Loss		--	1	1.5	mJ
E <sub>off</sub>	Turn-Off Switching Loss		--	0.52	0.78	mJ
E <sub>ts</sub>	Total Switching Loss	V <sub>CC</sub> = 400 V, I <sub>C</sub> = 40 A, R <sub>G</sub> = 10 Ω, V <sub>GE</sub> = 15 V, Inductive Load, T <sub>C</sub> = 125°C	--	1.52	2.28	mJ
t <sub>d(on)</sub>	Turn-On Delay Time		--	20	--	ns
t <sub>r</sub>	Rise Time		--	54	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	131	--	ns
t <sub>f</sub>	Fall Time		--	70	--	ns
E <sub>on</sub>	Turn-On Switching Loss		--	1.1	--	mJ
E <sub>off</sub>	Turn-Off Switching Loss	V <sub>CE</sub> = 400 V, I <sub>C</sub> = 40 A, V <sub>GE</sub> = 15 V	--	0.78	--	mJ
E <sub>ts</sub>	Total Switching Loss		--	1.88	--	mJ
Q <sub>g</sub>	Total Gate Charge		--	120	--	nC
Q <sub>ge</sub>	Gate-Emitter Charge	V <sub>CE</sub> = 400 V, I <sub>C</sub> = 40 A, V <sub>GE</sub> = 15 V	--	14	--	nC
Q <sub>gc</sub>	Gate-Collector Charge		--	58	--	nC

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

Symbol	Parameter	Test Conditions		Min.	Typ.	Max	Unit
V <sub>FM</sub>	Diode Forward Voltage	I <sub>F</sub> = 15 A	T <sub>C</sub> = 25°C	-	1.2	1.5	V
			T <sub>C</sub> = 125°C	-	1.0	-	
t <sub>rr</sub>	Diode Reverse Recovery Time	I <sub>F</sub> = 15 A, di <sub>F</sub> /dt = 200 A/μs	T <sub>C</sub> = 25°C	-	61	-	ns
			T <sub>C</sub> = 125°C	-	125	-	
I <sub>rr</sub>	Diode Reverse Recovery Current		T <sub>C</sub> = 25°C	-	4.8	-	A
			T <sub>C</sub> = 125°C	-	8.4	-	
Q <sub>rr</sub>	Diode Reverse Recovery Charge		T <sub>C</sub> = 25°C	-	146	-	nC
			T <sub>C</sub> = 125°C	-	525	-	

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

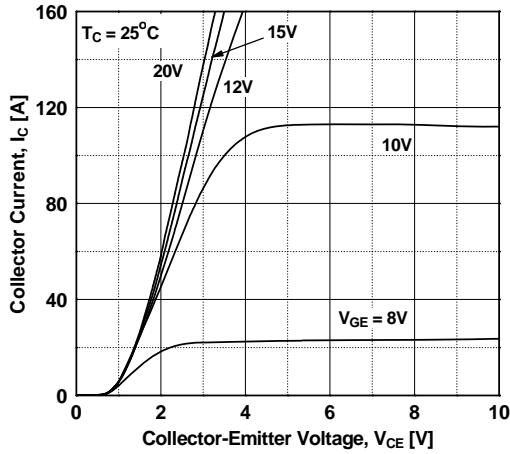


Figure 2. Typical Saturation Voltage Characteristics

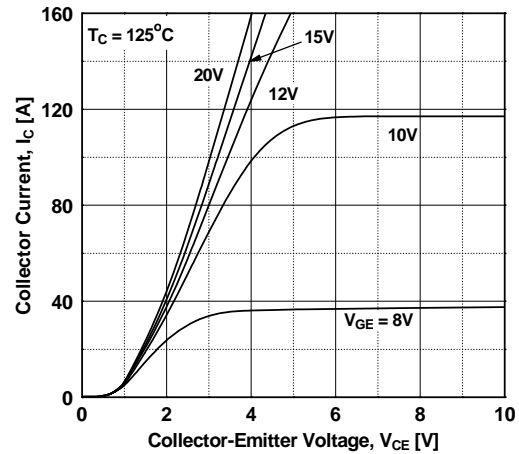


Figure 3. Typical Saturation Voltage Characteristics

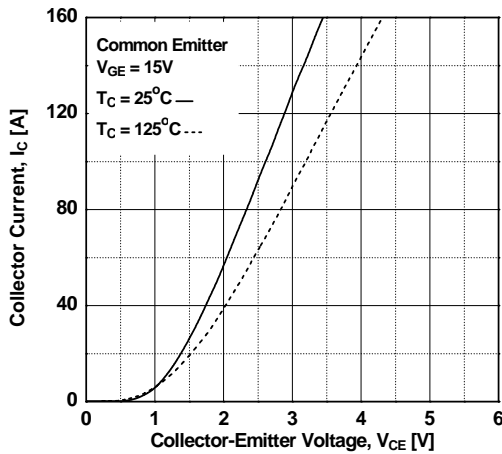


Figure 4. Transfer Characteristics

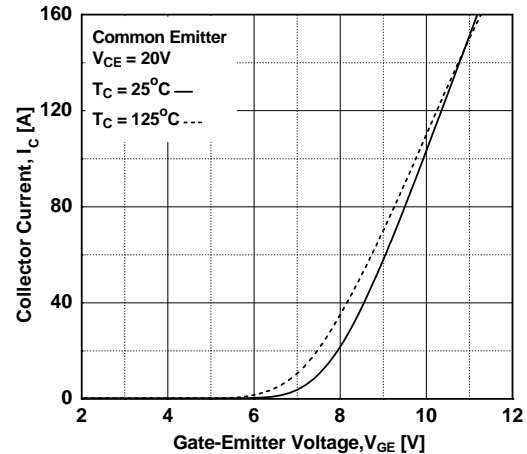


Figure 5. Saturation Voltage vs. Case

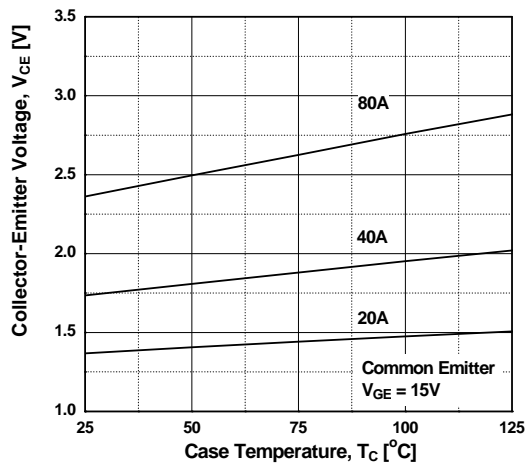
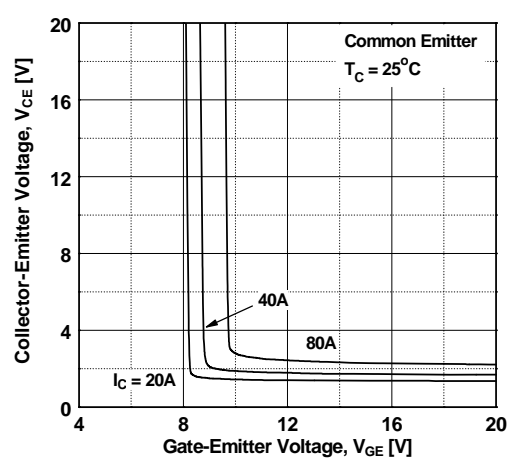


Figure 6. Saturation Voltage vs. Vge



## Typical Performance Characteristics (Continued)

Figure 7. Saturation Voltage vs.  $V_{GE}$

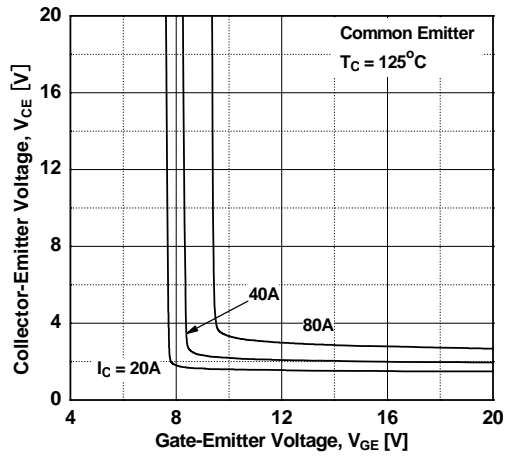


Figure 8. Capacitance Characteristics

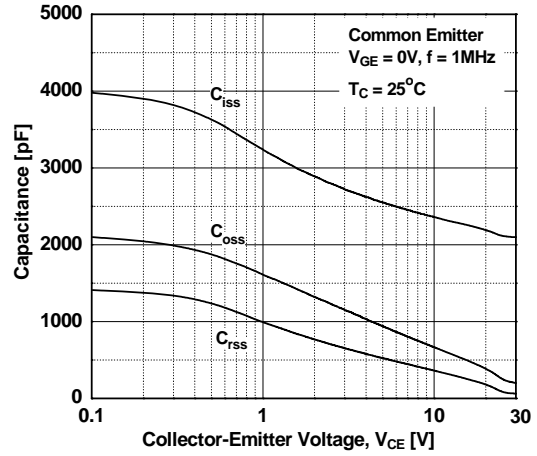


Figure 9. Gate Charge Characteristics

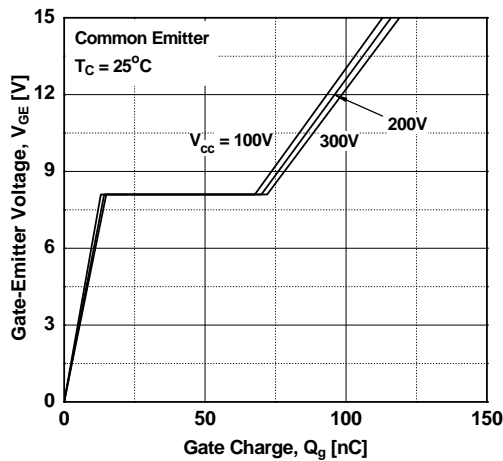


Figure 10. SOA Characteristics

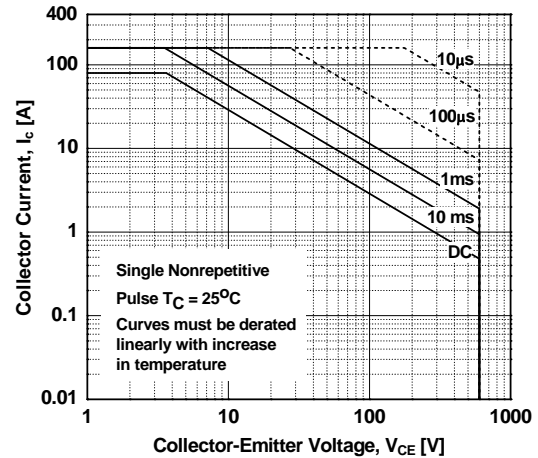


Figure 11. Turn-Off Switching SOA Characteristics

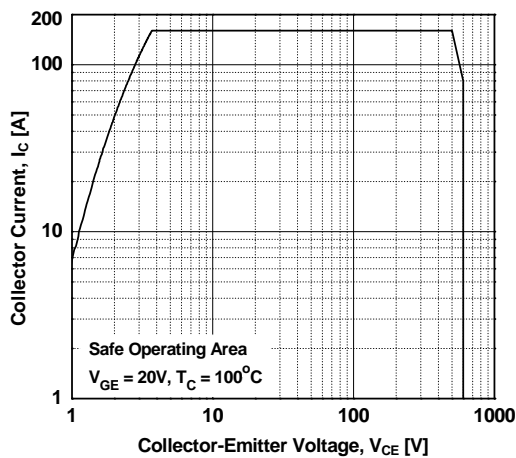
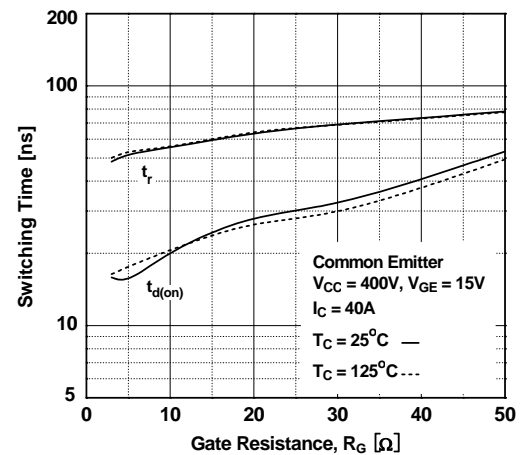


Figure 12. Turn-On Characteristics vs. Gate Resistance



## Typical Performance Characteristics (Continued)

Figure 13. Turn-Off Characteristics vs. Gate Resistance

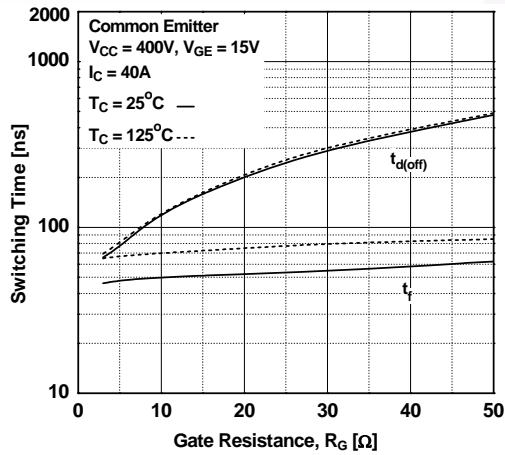


Figure 14. Turn-On Characteristics vs. Collector Current

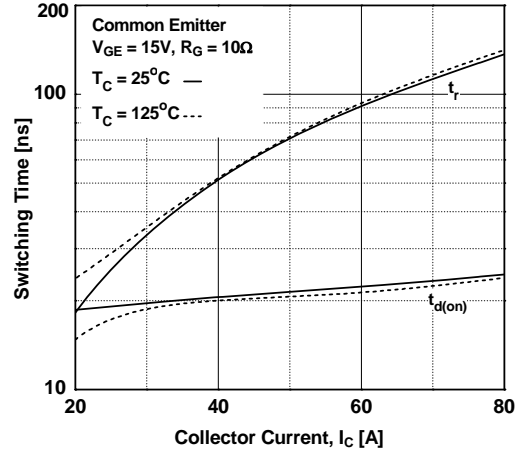


Figure 15. Turn-Off Characteristics vs. Collector Current

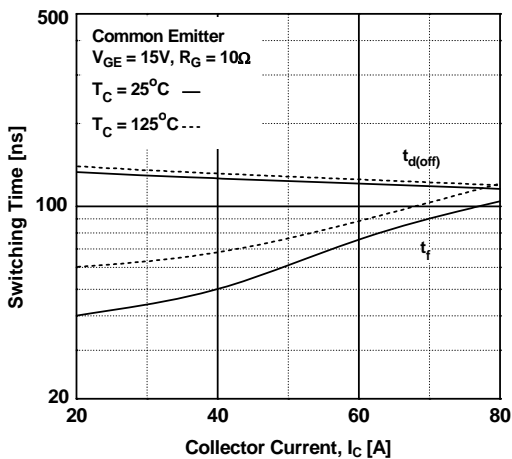


Figure 16. Switching Loss vs Gate Resistance

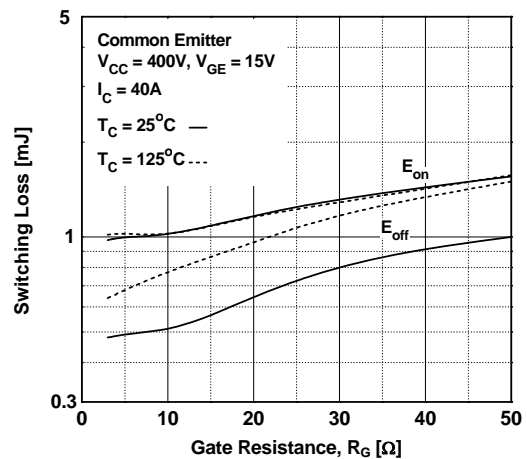
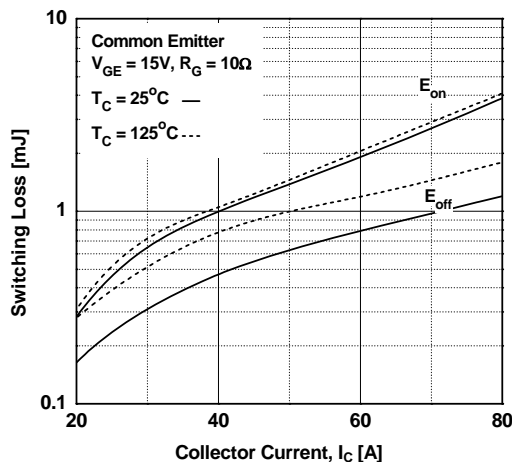


Figure 17. Switching Loss vs Collector Current



## Typical Performance Characteristics (Continued)

Figure 18. Transient Thermal Impedance of IGBT

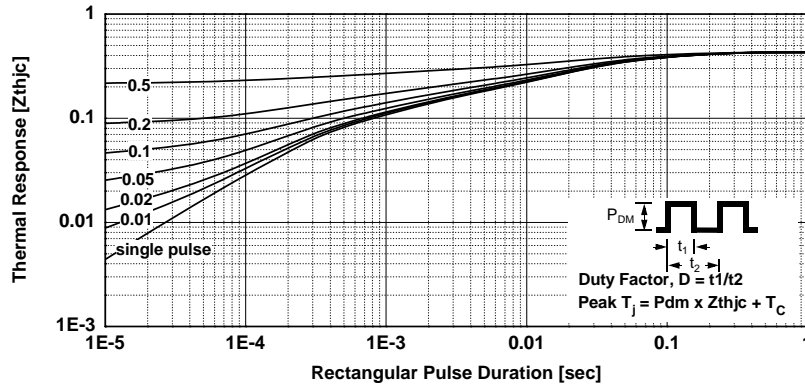


Figure 19. Forward Characteristics

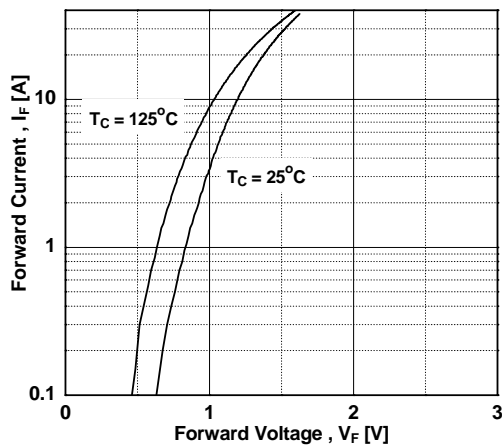


Figure 20. Stored Charge

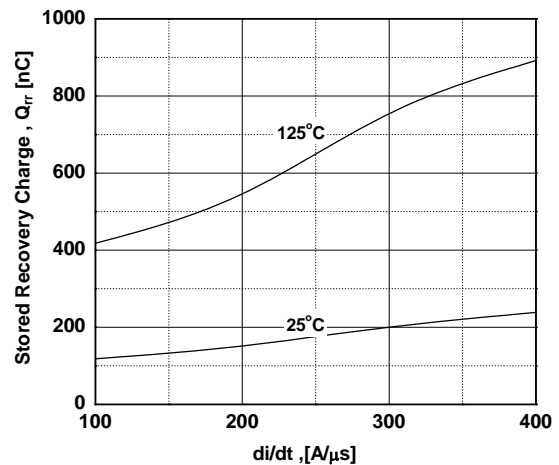


Figure 21. Reverse Recovery Time

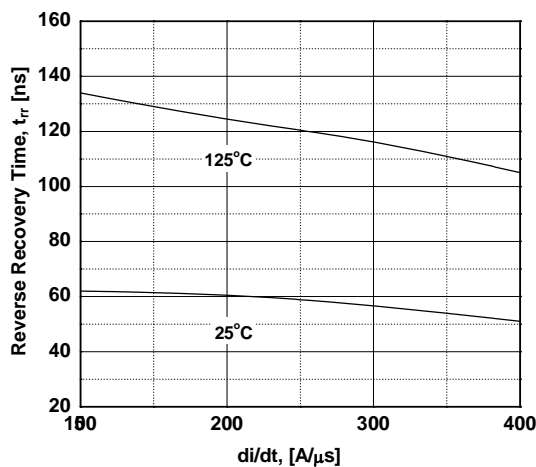
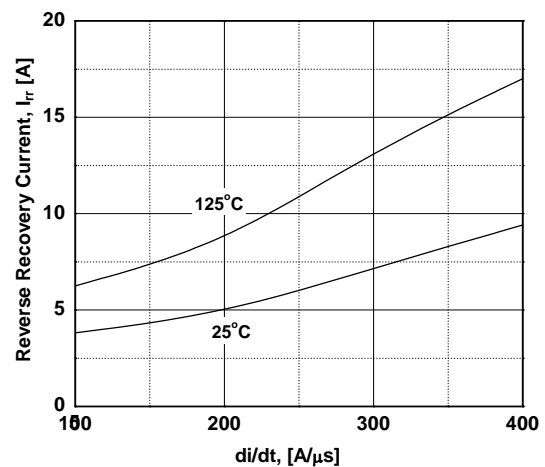


Figure 22. Reverse Recovery Current









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