



# FGA70N33BTD

## 330V, 70A PDP IGBT

### Features

- High current capability
- Low saturation voltage:  $V_{CE(sat)} = 1.7V @ I_C = 70A$
- High input impedance
- Fast switching
- RoHS Compliant

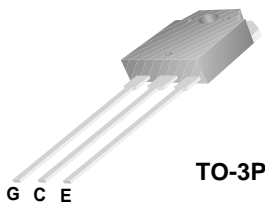
### Applications

- PDP System

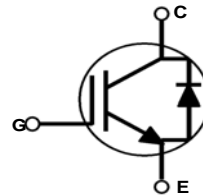


### General Description

Using Novel Trench IGBT Technology, Fairchild's new series of trench IGBTs offer the optimum performance for PDP applications where low conduction and switching losses are essential.



TO-3P



### Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Description	Ratings	Units
$V_{CES}$	Collector to Emitter Voltage	330	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 30$	V
$I_{C\ pulse(1)^*}$	Pulsed Collector Current @ $T_C = 25^\circ C$	160	A
$I_{C\ pulse(2)^*}$	Pulsed Collector Current @ $T_C = 25^\circ C$	220	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ C$	149	W
	Maximum Power Dissipation @ $T_C = 100^\circ C$	60	W
$V_{RRM}$	Peak Repetitive Reverse Voltage of Diode	330	V
$I_{F(AV)}$	Average Rectified Forward Current of diode @ $T_C = 100^\circ C$	10	A
$I_{FSM}$	Non-repetitive Peak Surge Current of diode 60Hz Single Half-Sine wave	100	A
$T_J, T_{stg}$	Operating Junction Temperature and Storage Temperature	-55 to +150	$^\circ C$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ C$

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(IGBT)$	Thermal Resistance, Junction to Case	--	0.84	$^\circ C/W$
$R_{\theta JC}(Diode)$	Thermal Resistance, Junction to Case	--	1.57	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	40	$^\circ C/W$

**Notes:**  
 1: Repetitive test, Pulse width=100usec, Duty=0.1  
 2: Half Sine Wave, D< 0.01, pluse width < 5usec  
 \* $I_{C\_pulse}$  limited by max  $T_J$

### Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGA70N33BTD	FGA70N33BTDU	TO-3P	Tube	30ea	--

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

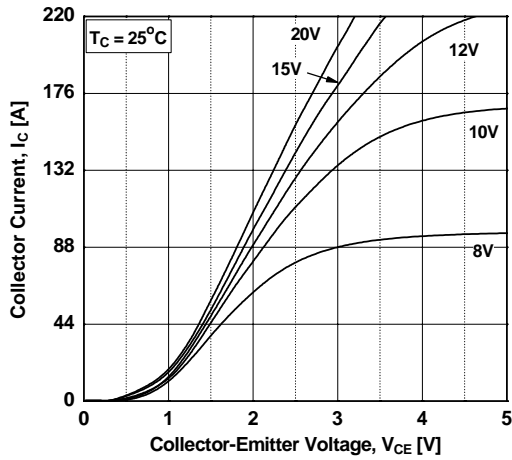
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$V_{V_{CES}}$	Collector to Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	330	--	--	V
$\frac{\Delta V_{V_{CES}}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0V, I_C = 250\mu A$	--	0.3	--	V/°C
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{V_{CES}}, V_{GE} = 0V$	--	--	250	$\mu A$
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0V$	--	--	$\pm 400$	nA
<b>On Characteristics</b>						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 250\mu A, V_{CE} = V_{GE}$	2.3	3.3	4.3	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 20A, V_{GE} = 15V$	--	1.1	--	V
		$I_C = 40A, V_{GE} = 15V,$	--	1.4	--	V
		$I_C = 70A, V_{GE} = 15V, T_C = 25^\circ C$	--	1.7	--	V
		$I_C = 70A, V_{GE} = 15V, T_C = 125^\circ C$	--	1.8	--	V
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE} = 30V, V_{GE} = 0V, f = 1MHz$	--	1380	--	pF
$C_{oes}$	Output Capacitance		--	140	--	pF
$C_{res}$	Reverse Transfer Capacitance		--	60	--	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 200V, I_C = 20A, R_G = 5\Omega, V_{GE} = 15V, Resistive Load, T_C = 25^\circ C$	--	13	--	ns
$t_r$	Rise Time		--	26	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	46	--	ns
$t_f$	Fall Time		--	198	--	ns
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 200V, I_C = 20A, R_G = 5\Omega, V_{GE} = 15V, Resistive Load, T_C = 125^\circ C$	--	13	--	ns
$t_r$	Rise Time		--	28	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	48	--	ns
$t_f$	Fall Time		--	268	--	ns
$Q_g$	Total Gate Charge	$V_{CE} = 200V, I_C = 20A, V_{GE} = 15V$	--	49	--	nC
$Q_{ge}$	Gate to Emitter Charge		--	6.8	--	nC
$Q_{gc}$	Gate to Collector Charge		--	17.5	--	nC

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

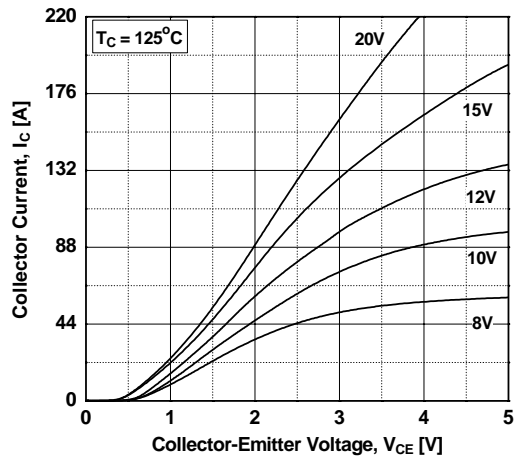
Symbol	Parameter	Test Conditions	Min.	Typ.	Max	Units	
$V_{FM}$	Diode Forward Voltage	$I_F = 10\text{A}$	$T_C = 25^\circ\text{C}$	--	1.1	1.5	V
			$T_C = 125^\circ\text{C}$	--	0.95	--	
$t_{rr}$	Diode Reverse Recovery Time	$I_F = 10\text{A}, di/dt = 200\text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	--	23	--	ns
			$T_C = 125^\circ\text{C}$	--	36	--	
$I_{rr}$	Diode Peak Reverse Recovery Current	$I_F = 10\text{A}, di/dt = 200\text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	--	2.8	--	A
			$T_C = 125^\circ\text{C}$	--	5.1	--	
$Q_{rr}$	Diode Reverse Recovery Charge	$I_F = 10\text{A}, di/dt = 200\text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	--	32	--	nC
			$T_C = 125^\circ\text{C}$	--	91	--	

## Typical Performance Characteristics

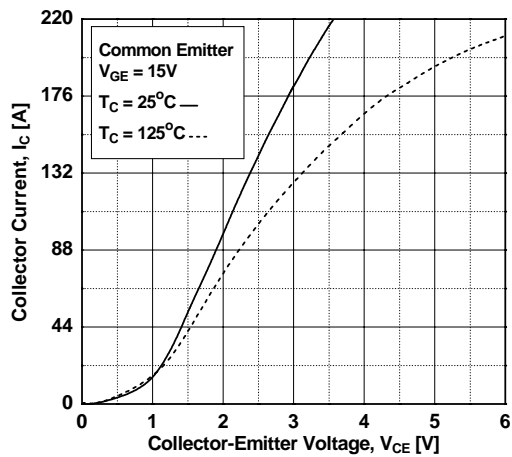
**Figure 1. Typical Output Characteristics**



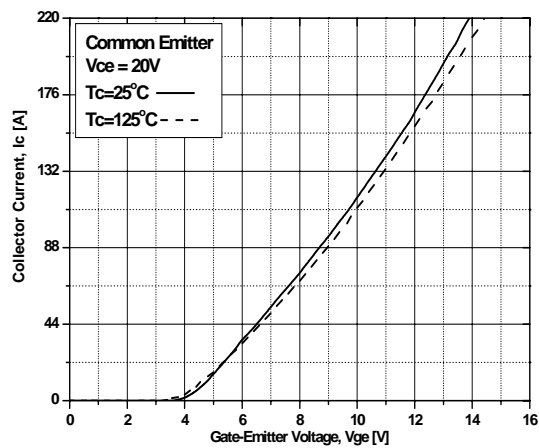
**Figure 2. Typical Output Characteristics**



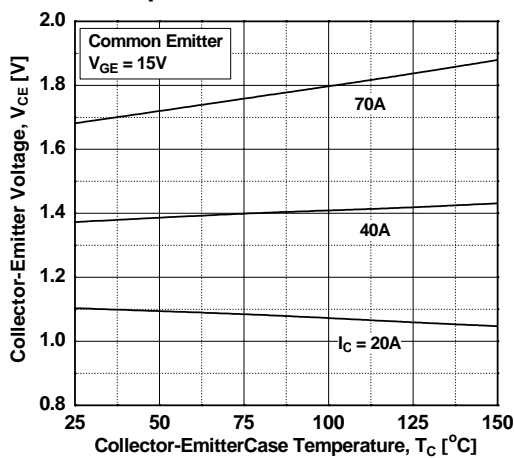
**Figure 3. Typical Saturation Voltage Characteristics**



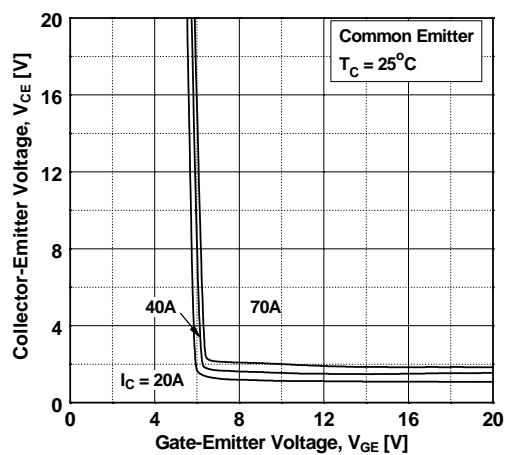
**Figure 4. Transfer Characteristics**



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



**Figure 6. Saturation Voltage vs. Vge**



## Typical Performance Characteristics

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

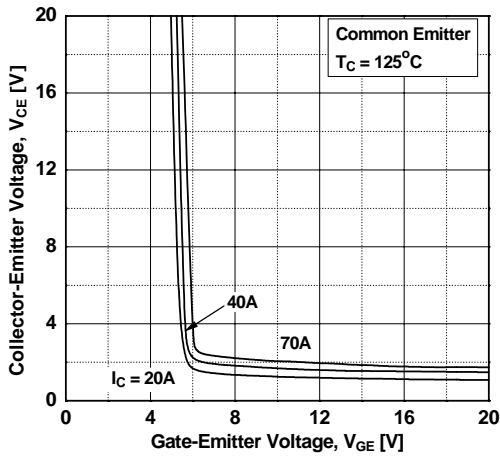


Figure 8. Capacitance Characteristics

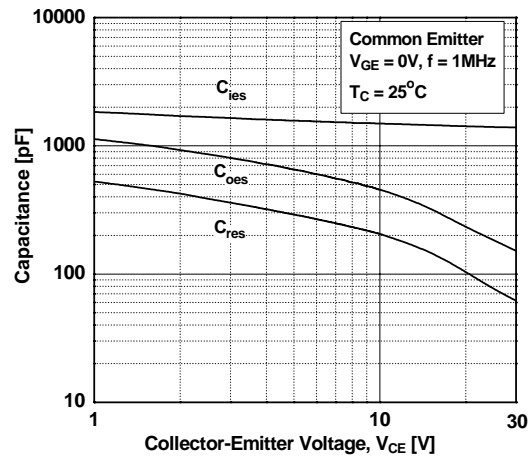


Figure 9. Gate charge Characteristics

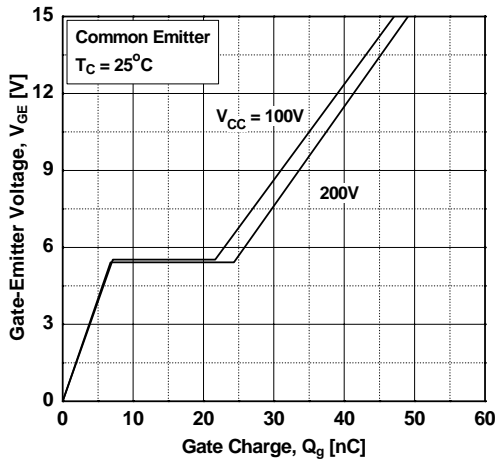


Figure 10. SOA Characteristics

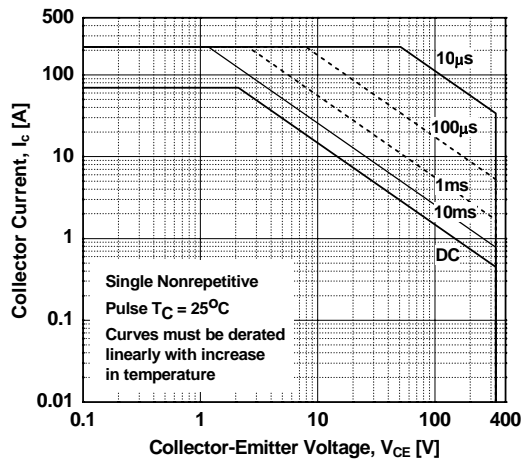


Figure 11. Turn-on Characteristics vs. Gate Resistance

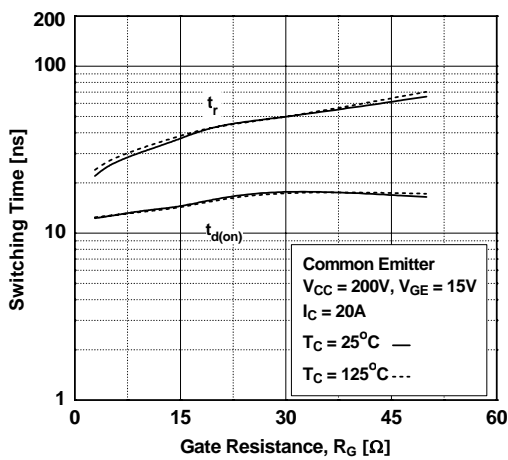
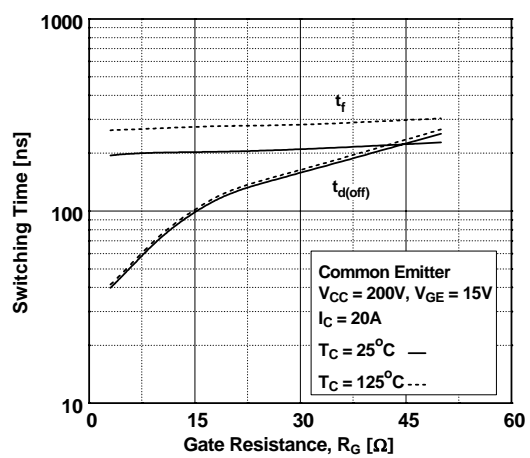
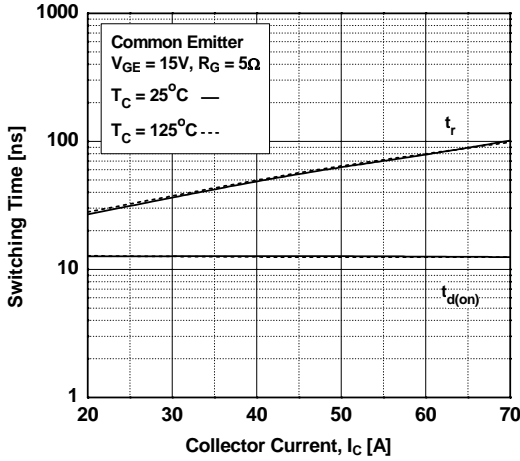


Figure 12. Turn-off Characteristics vs. Gate Resistance

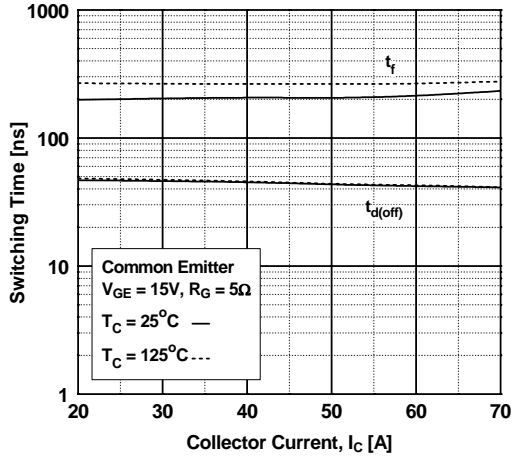


### Typical Performance Characteristics

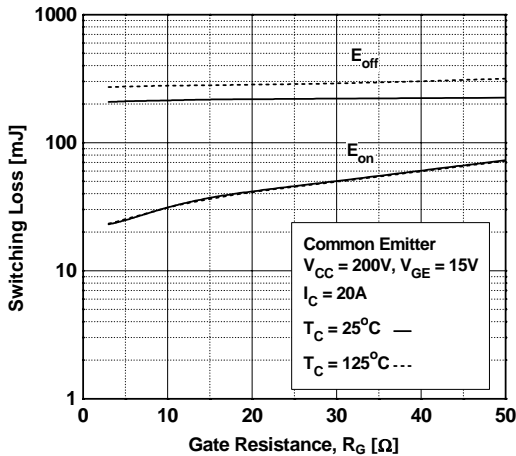
**Figure 13. Turn-on Characteristics vs. Collector Current**



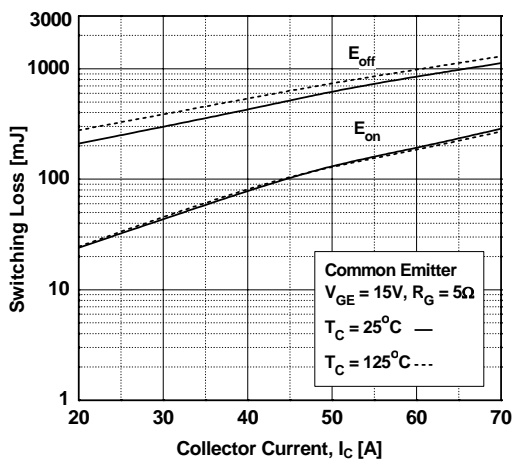
**Figure 14. Turn-off Characteristics vs. Collector Current**



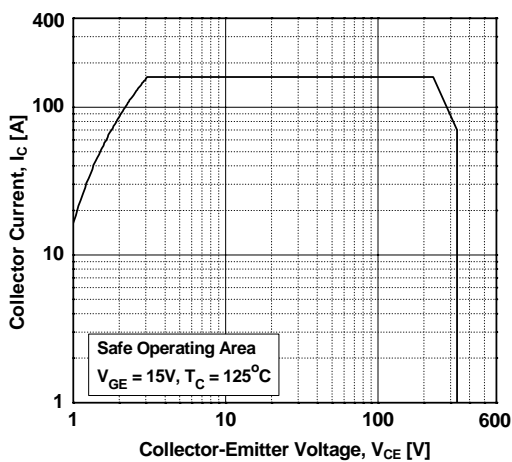
**Figure 15. Switching Loss vs. Gate Resistance**



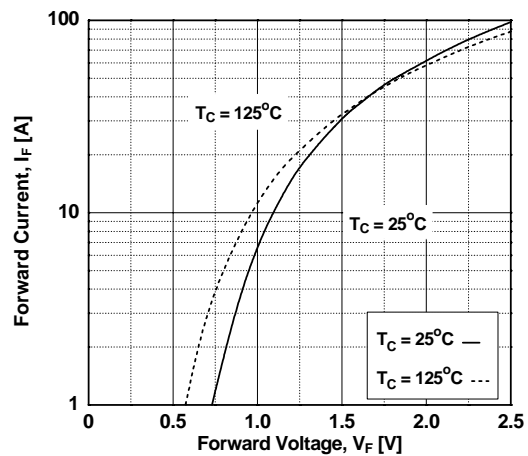
**Figure 16. Switching Loss vs. Collector Current**



**Figure 17. Turn off Switching SOA Characteristics**

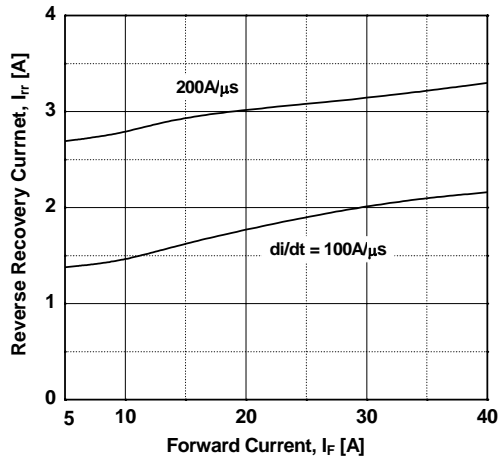


**Figure 18. Forward Characteristics**

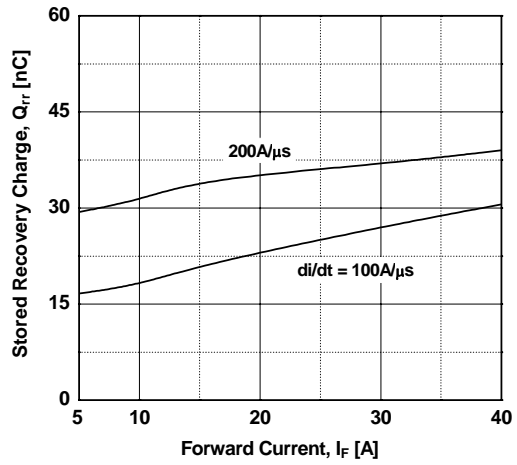


### Typical Performance Characteristics

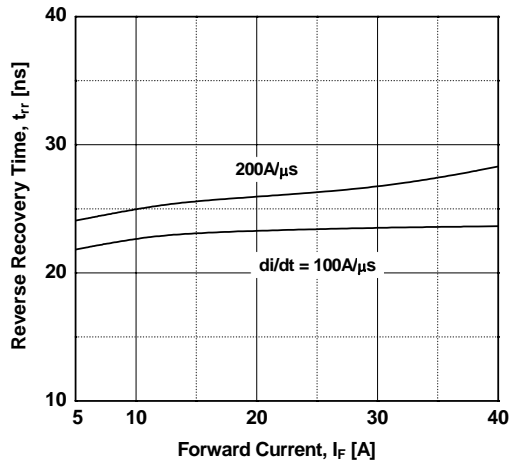
**Figure 19. Reverse Recovery Current**



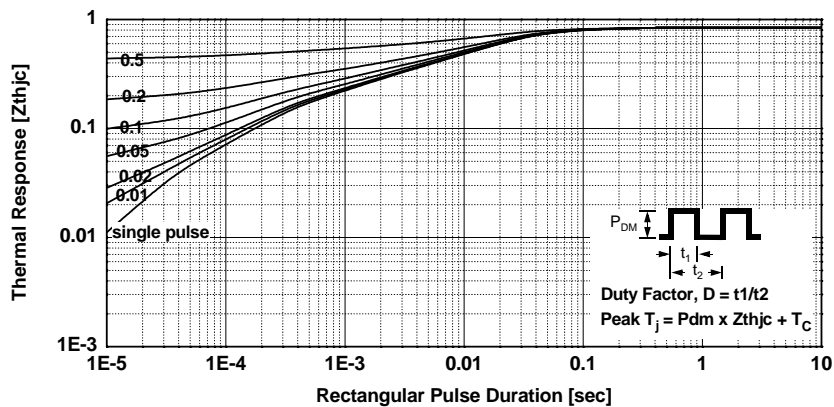
**Figure 20. Stored Charge**



**Figure 21. Reverse Recovery Time**



**Figure 22. Transient Thermal Impedance of IGBT**














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Rev. 137