

# NGTG35N65FL2WG

## IGBT - Field Stop II

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Field Stop II Trench construction, and provides superior performance in demanding switching applications, offering both low on state voltage and minimal switching loss. The IGBT is well suited for UPS and solar applications.

### Features

- Extremely Efficient Trench with Field Stop Technology
- $T_{Jmax} = 175^{\circ}C$
- Optimized for High Speed Switching
- 5  $\mu s$  Short-Circuit Capability
- These are Pb-Free Devices

### Typical Applications

- Solar Inverters
- Uninterruptible Power Supplies (UPS)
- Welding

### ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-emitter voltage	$V_{CES}$	650	V
Collector current @ $T_c = 25^{\circ}C$ @ $T_c = 100^{\circ}C$	$I_c$	70 35	A
Pulsed collector current, $T_{pulse}$ limited by $T_{Jmax}$	$I_{CM}$	120	A
Short-circuit withstand time $V_{GE} = 15 V$ , $V_{CE} = 400 V$ , $T_J \leq +150^{\circ}C$	$t_{SC}$	5	$\mu s$
Gate-emitter voltage	$V_{GE}$	$\pm 20$	V
Transient gate-emitter voltage ( $T_{PULSE} = 5 \mu s$ , $D < 0.10$ )		$\pm 30$	V
Power Dissipation @ $T_c = 25^{\circ}C$ @ $T_c = 100^{\circ}C$	$P_D$	300 150	W
Operating junction temperature range	$T_J$	-55 to +175	$^{\circ}C$
Storage temperature range	$T_{stg}$	-55 to +175	$^{\circ}C$
Lead temperature for soldering, 1/8" from case for 5 seconds	$T_{SLD}$	260	$^{\circ}C$

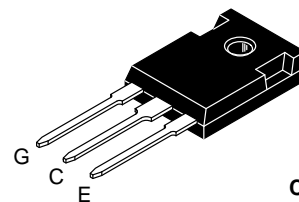
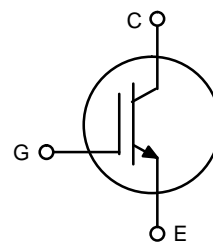
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



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**35 A, 650 V**  
 **$V_{CEsat} = 1.70 V$**   
 **$E_{OFF} = 0.28 mJ$**



TO-247  
CASE 340L  
STYLE 4

### MARKING DIAGRAM



- A = Assembly Location
- Y = Year
- WW = Work Week
- G = Pb-Free Package

### ORDERING INFORMATION

Device	Package	Shipping
NGTG35N65FL2WG	TO-247 (Pb-Free)	30 Units / Rail

# NGTG35N65FL2WG

## THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction-to-case, for IGBT	$R_{\theta JC}$	0.50	°C/W
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	°C/W

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
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### STATIC CHARACTERISTIC

Collector-emitter breakdown voltage, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, I_C = 500\ \mu\text{A}$	$V_{(BR)CES}$	650	-	-	V
Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 35\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 35\text{ A}, T_J = 175^\circ\text{C}$	$V_{CEsat}$	1.50 -	1.70 2.20	2.00 -	V
Gate-emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 350\ \mu\text{A}$	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter cut-off current, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, V_{CE} = 650\text{ V}$ $V_{GE} = 0\text{ V}, V_{CE} = 650\text{ V}, T_J = 175^\circ\text{C}$	$I_{CES}$	- -	- -	0.5 4.0	mA
Gate leakage current, collector-emitter short-circuited	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	$I_{GES}$	-	-	200	nA

### DYNAMIC CHARACTERISTIC

Input capacitance	$V_{CE} = 20\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{ies}$	-	3115	-	pF
Output capacitance		$C_{oes}$	-	149	-	
Reverse transfer capacitance		$C_{res}$	-	88	-	
Gate charge total	$V_{CE} = 480\text{ V}, I_C = 35\text{ A}, V_{GE} = 15\text{ V}$	$Q_g$	-	125	-	nC
Gate to emitter charge		$Q_{ge}$	-	30	-	
Gate to collector charge		$Q_{gc}$	-	63	-	

### SWITCHING CHARACTERISTIC, INDUCTIVE LOAD

Turn-on delay time	$T_J = 25^\circ\text{C}$ $V_{CC} = 400\text{ V}, I_C = 35\text{ A}$ $R_g = 10\ \Omega$ $V_{GE} = 0\text{ V}/15\text{ V}^*$	$t_{d(on)}$	-	72	-	ns	
Rise time		$t_r$	-	40	-		
Turn-off delay time		$t_{d(off)}$	-	132	-		
Fall time			$t_f$	-	75	-	mJ
Turn-on switching loss		$E_{on}$	-	0.84	-		
Turn-off switching loss		$E_{off}$	-	0.28	-		
Total switching loss			$E_{ts}$	-	1.12	-	
Turn-on delay time	$T_J = 150^\circ\text{C}$ $V_{CC} = 400\text{ V}, I_C = 35\text{ A}$ $R_g = 10\ \Omega$ $V_{GE} = 0\text{ V}/15\text{ V}^*$	$t_{d(on)}$	-	70	-	ns	
Rise time		$t_r$	-	38	-		
Turn-off delay time		$t_{d(off)}$	-	135	-		
Fall time			$t_f$	-	96	-	mJ
Turn-on switching loss		$E_{on}$	-	1.05	-		
Turn-off switching loss		$E_{off}$	-	0.50	-		
Total switching loss			$E_{ts}$	-	1.55	-	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

\*Includes diode reverse recovery loss using NGTG35N65FL2WG.

# NGTG35N65FL2WG

## TYPICAL CHARACTERISTICS

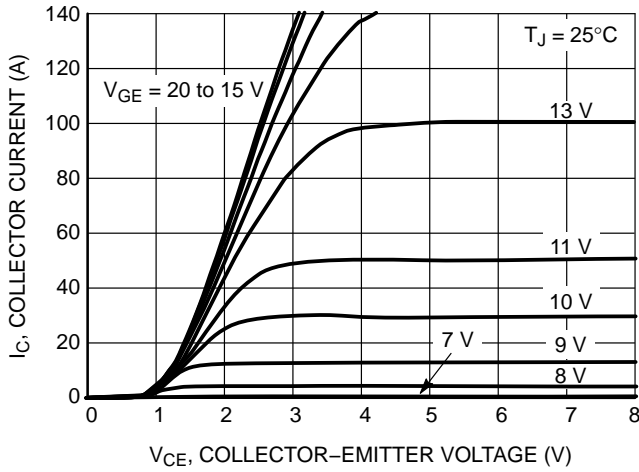


Figure 1. Output Characteristics

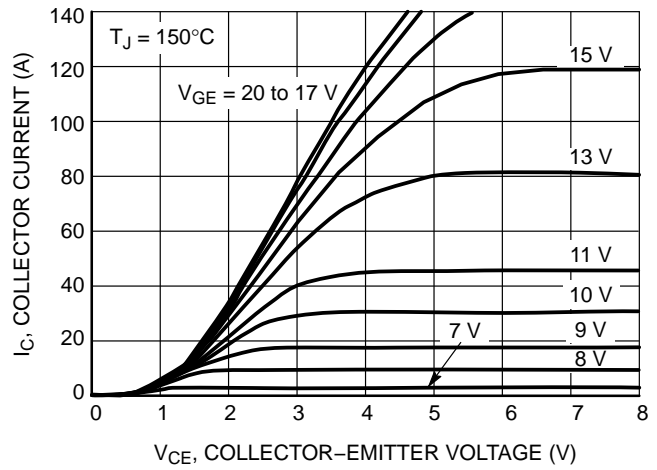


Figure 2. Output Characteristics

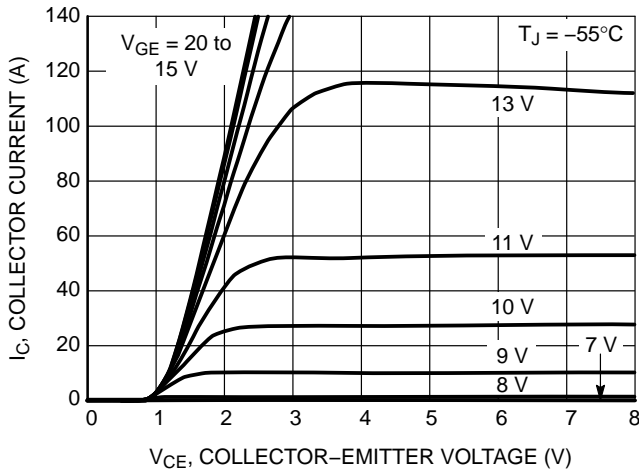


Figure 3. Output Characteristics

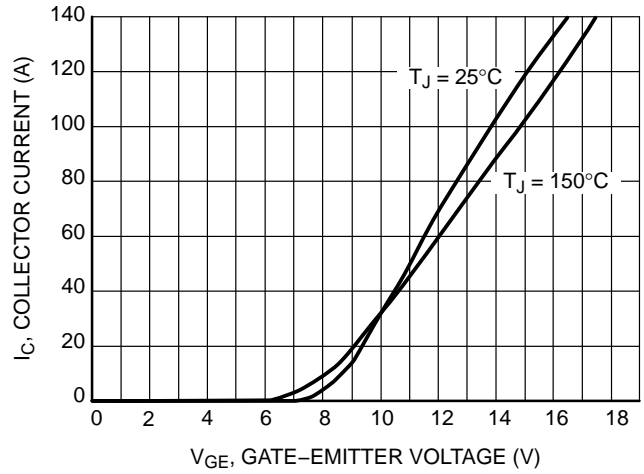


Figure 4. Typical Transfer Characteristics

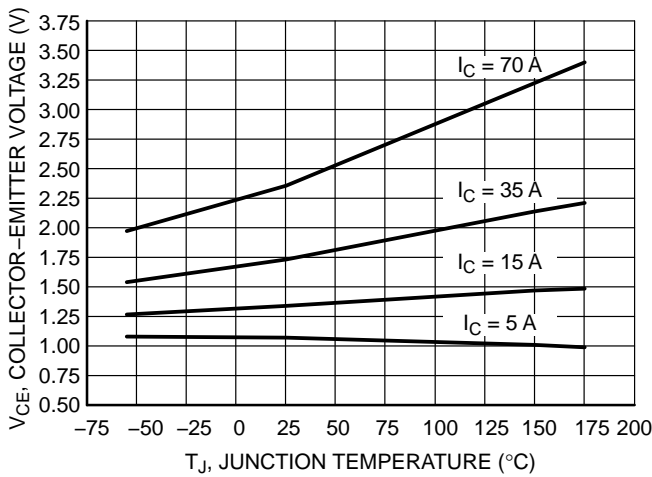


Figure 5.  $V_{CE(sat)}$  vs.  $T_J$

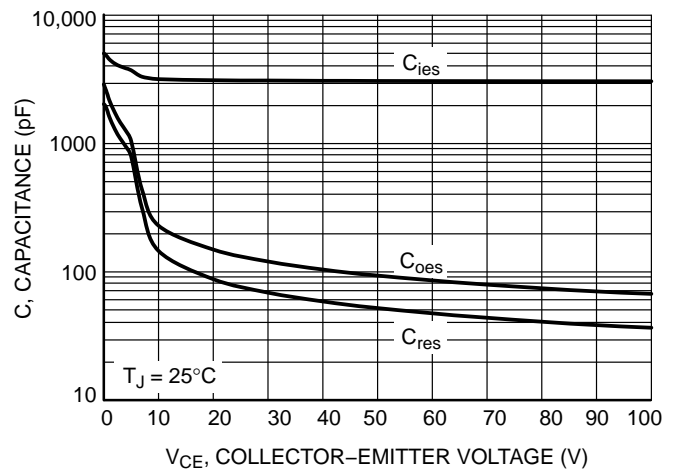


Figure 6. Typical Capacitance

# NGTG35N65FL2WG

## TYPICAL CHARACTERISTICS

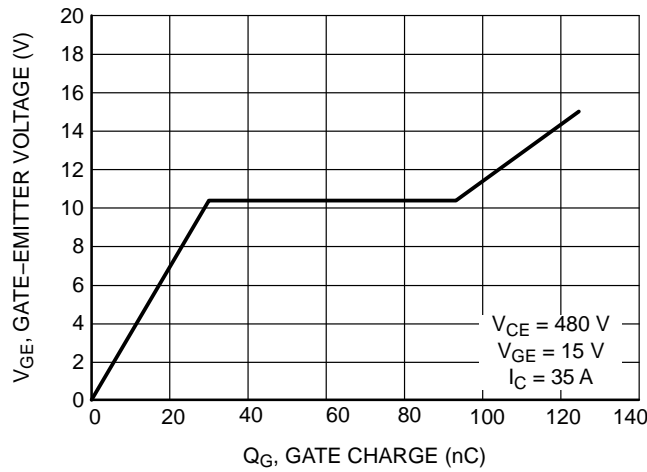


Figure 7. Typical Gate Charge

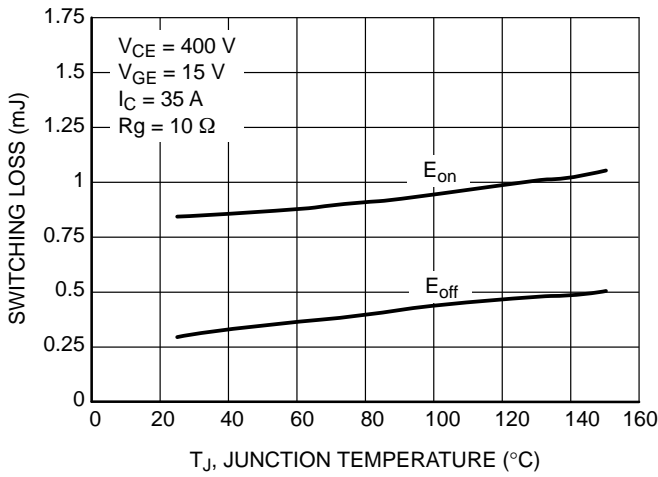


Figure 8. Switching Loss vs. Temperature

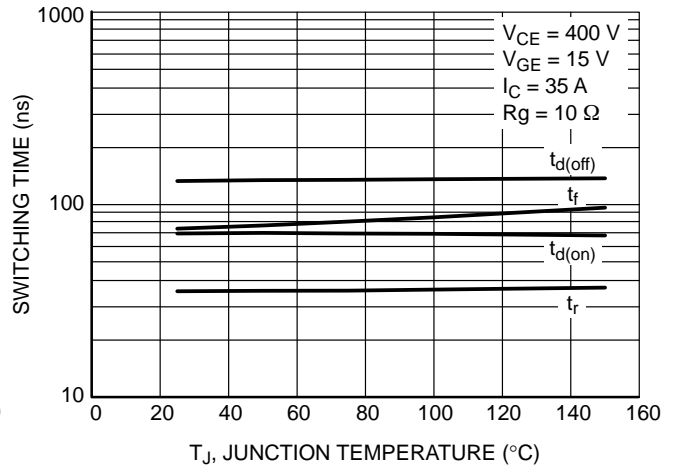


Figure 9. Switching Time vs. Temperature

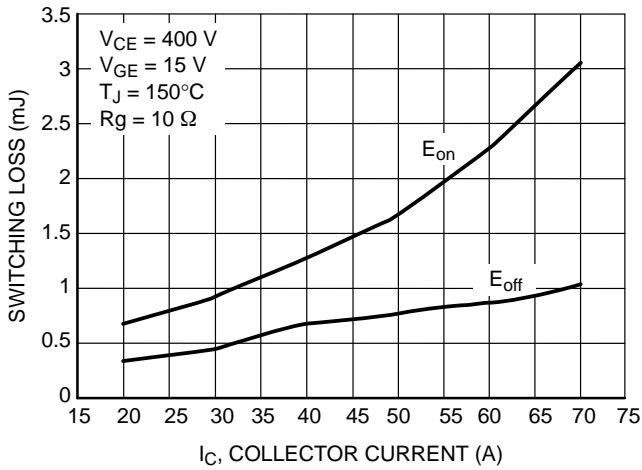


Figure 10. Switching Loss vs.  $I_C$

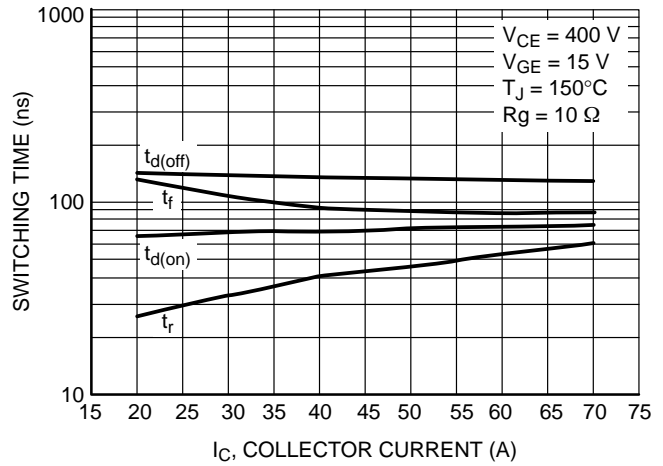


Figure 11. Switching Time vs.  $I_C$

# NGTG35N65FL2WG

## TYPICAL CHARACTERISTICS

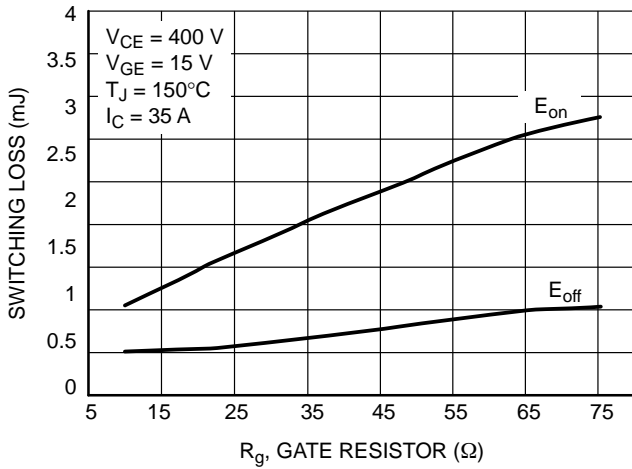


Figure 12. Switching Loss vs.  $R_g$

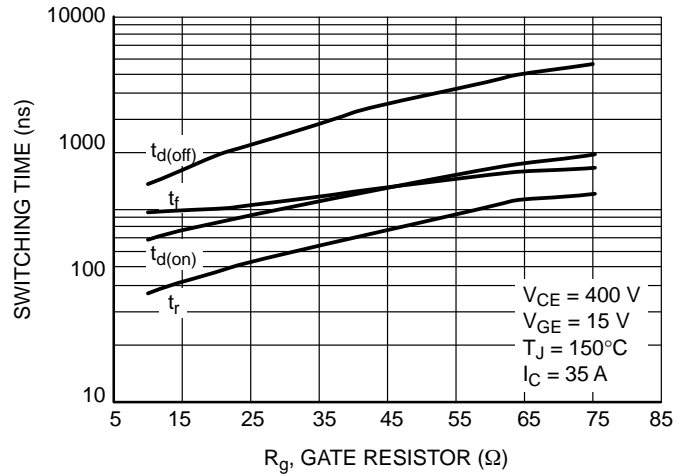


Figure 13. Switching Time vs.  $R_g$

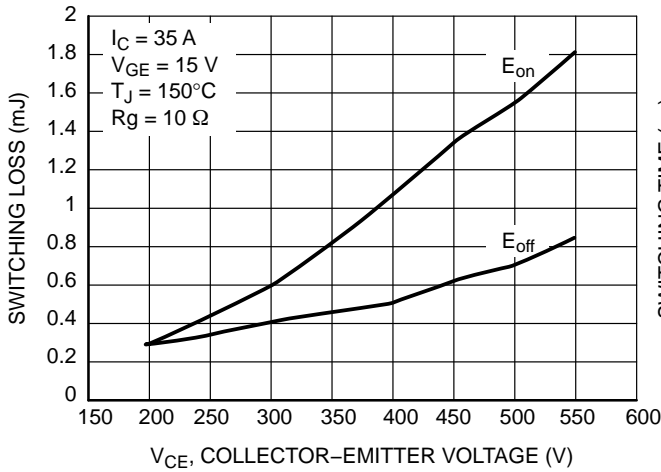


Figure 14. Switching Loss vs.  $V_{CE}$

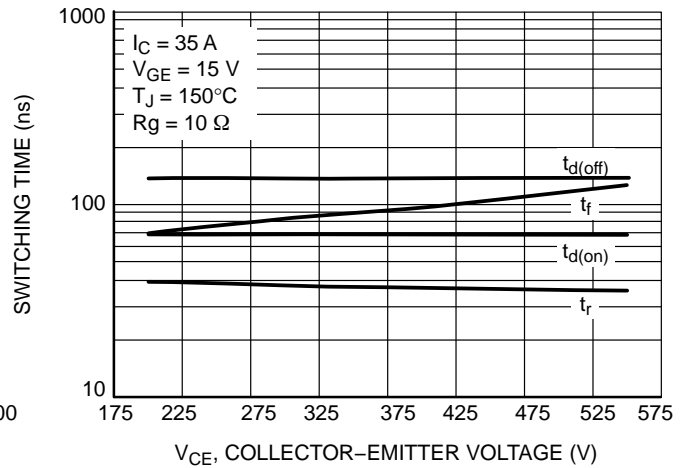


Figure 15. Switching Time vs.  $V_{CE}$

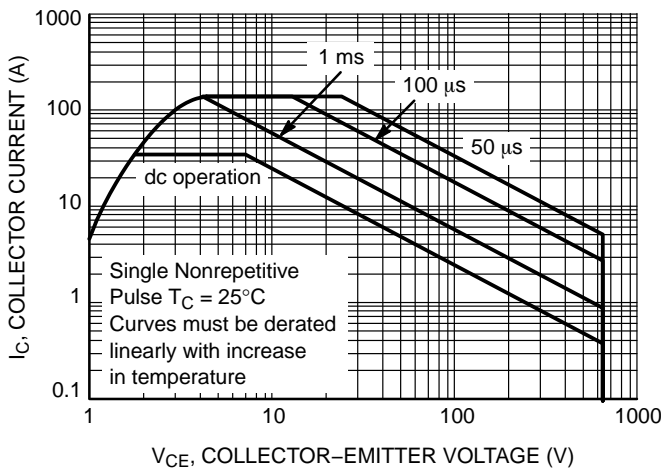


Figure 16. Safe Operating Area

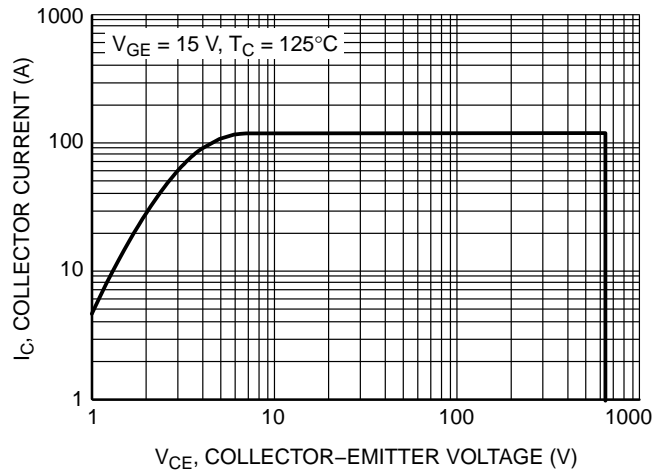


Figure 17. Reverse Bias Safe Operating Area

# NGTG35N65FL2WG

## TYPICAL CHARACTERISTICS

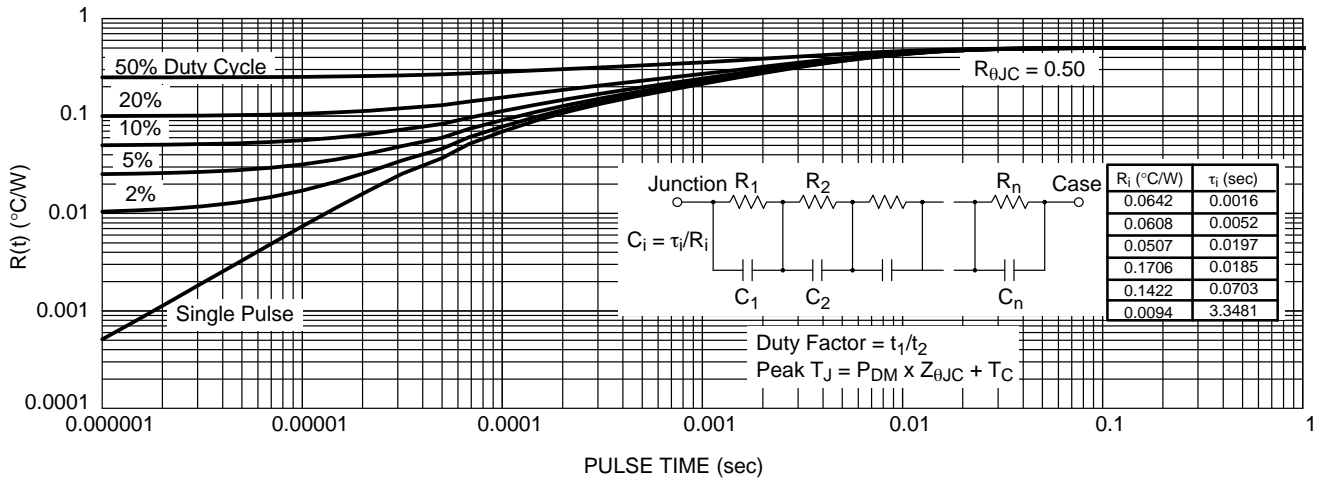
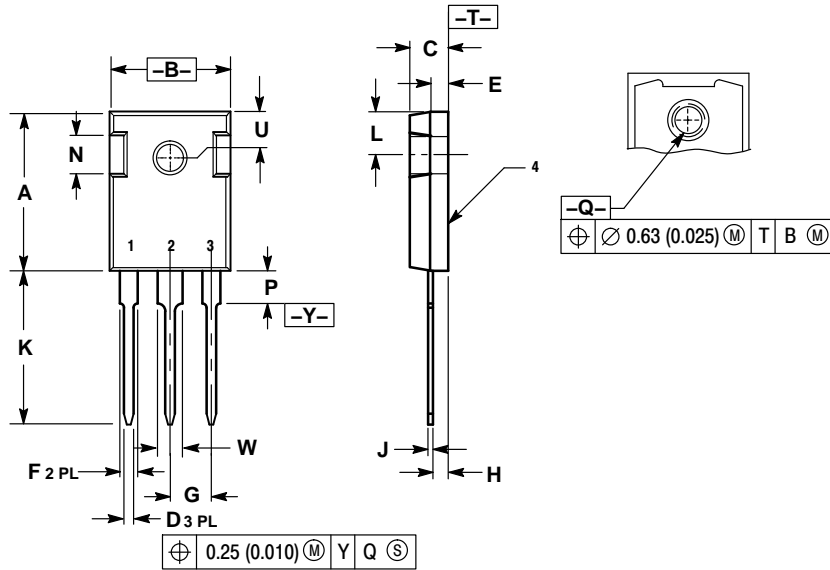


Figure 18. IGBT Transient Thermal Impedance

# NGTG35N65FL2WG

## PACKAGE DIMENSIONS

TO-247  
CASE 340L-02  
ISSUE F



- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	20.32	21.08	0.800	0.830
B	15.75	16.26	0.620	0.640
C	4.70	5.30	0.185	0.209
D	1.00	1.40	0.040	0.055
E	1.90	2.60	0.075	0.102
F	1.65	2.13	0.065	0.084
G	5.45 BSC		0.215 BSC	
H	1.50	2.49	0.059	0.098
J	0.40	0.80	0.016	0.031
K	19.81	20.83	0.780	0.820
L	5.40	6.20	0.212	0.244
N	4.32	5.49	0.170	0.216
P	---	4.50	---	0.177
Q	3.55	3.65	0.140	0.144
U	6.15 BSC		0.242 BSC	
W	2.87	3.12	0.113	0.123

- STYLE 4:  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

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