

IGBT – FS2 Solar/UPS, 650 V, 75 A

NGTB75N65FL2WG

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Field Stop (FS) Trench construction, and provides superior performance in demanding switching applications, offering both low on state voltage and minimal switching loss.

Features

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

Typical Applications

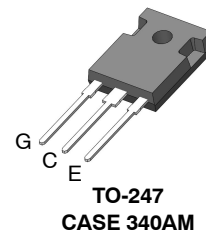
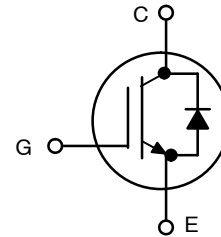
- Solar Inverters
- Uninterruptible Power Supplies (UPS)
- Welding

ABSOLUTE MAXIMUM RATINGS

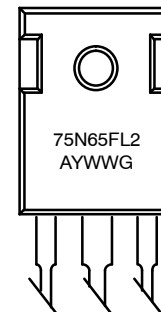
Symbol	Rating	Value	Unit
V_{CES}	Collector-emitter Voltage	650	V
I_C	Collector Current @ $T_C = 25\text{ }^{\circ}\text{C}$ @ $T_C = 100\text{ }^{\circ}\text{C}$	100 75	A
I_F	Diode Forward Current @ $T_C = 25\text{ }^{\circ}\text{C}$ @ $T_C = 100\text{ }^{\circ}\text{C}$	100 75	A
I_{FM}	Diode Pulsed Current T_{PULSE} Limited by T_J Max	200	A
I_{CM}	Pulsed Collector Current, T_{pulse} Limited by T_{Jmax}	200	A
t_{SC}	Short-circuit Withstand Time $V_{GE} = 15\text{ V}$, $V_{CE} = 400\text{ V}$, $T_J \leq +150\text{ }^{\circ}\text{C}$	5	μs
V_{GE}	Gate-emitter Voltage	± 20	V
	Transient Gate-emitter Voltage ($T_{PULSE} = 5\text{ }\mu\text{s}$, $D < 0.10$)	± 30	V
P_D	Power Dissipation @ $T_C = 25\text{ }^{\circ}\text{C}$ @ $T_C = 100\text{ }^{\circ}\text{C}$	595 265	W
T_J	Operating Junction Temperature Range	-55 to $+175$	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	-55 to $+175$	$^{\circ}\text{C}$
T_{SLD}	Lead temperature for soldering, 1/8" from case for 5 seconds	260	$^{\circ}\text{C}$

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.

75 A, 650 V
 $V_{CEsat} = 1.70\text{ V}$
 $E_{off} = 1.0\text{ mJ}$



MARKING DIAGRAM



75N65FL2 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping
NGTB75N65FL2WG	TO-247 (Pb-Free)	30 Units / Rail

NGTB75N65FL2WG

THERMAL CHARACTERISTICS

Symbol	Rating	Value	Unit
$R_{\theta JC}$	Thermal resistance junction-to-case, for IGBT	0.28	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$	Thermal resistance junction-to-case, for Diode	0.62	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal resistance junction-to-ambient	40	$^{\circ}\text{C}/\text{W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
--------	-----------	-----------------	-----	-----	-----	------

STATIC CHARACTERISTIC

$V_{(BR)CES}$	Collector-emitter breakdown voltage, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, I_C = 500\ \mu\text{A}$	650			V
V_{CEsat}	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_J = 175^{\circ}\text{C}$	1.50	1.75 2.30	2.00	V
$V_{GE(th)}$	Gate-emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 350\ \mu\text{A}$	4.5	5.5	6.5	V
I_{CES}	Collector-emitter cut-off current, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, V_{CE} = 650\text{ V}$ $V_{GE} = 0\text{ V}, V_{CE} = 650\text{ V}, T_J = 175^{\circ}\text{C}$		4.0	0.1	mA
I_{GES}	Gate leakage current, collector-emitter short-circuited	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$			200	nA

DYNAMIC CHARACTERISTIC

C_{ies}	Input capacitance	$V_{CE} = 20\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$		7500		pF
C_{oes}	Output capacitance			300		
C_{res}	Reverse transfer capacitance			190		
Q_g	Gate charge total	$V_{CE} = 480\text{ V}, I_C = 50\text{ A}, V_{GE} = 15\text{ V}$		310		nC
Q_{ge}	Gate to emitter charge			60		
Q_{gc}	Gate to collector charge			150		

SWITCHING CHARACTERISTIC, INDUCTIVE LOAD

$t_{d(on)}$	Turn-on delay time	$T_J = 25^{\circ}\text{C}$ $V_{CC} = 400\text{ V}, I_C = 75\text{ A}$ $R_g = 10\ \Omega$ $V_{GE} = 0\text{ V}/15\text{ V}$		110		ns	
t_r	Rise time			48			
$t_{d(off)}$	Turn-off delay time			270			
t_f	Fall time			70			
E_{on}	Turn-on switching loss			2.2			mJ
E_{off}	Turn-off switching loss			1.1			
E_{ts}	Total switching loss		3.3				
$t_{d(on)}$	Turn-on delay time	$T_J = 150^{\circ}\text{C}$ $V_{CC} = 400\text{ V}, I_C = 75\text{ A}$ $R_g = 10\ \Omega$ $V_{GE} = 0\text{ V}/15\text{ V}$		100		ns	
t_r	Rise time			50			
$t_{d(off)}$	Turn-off delay time			280			
t_f	Fall time			100			
E_{on}	Turn-on switching loss			2.8			mJ
E_{off}	Turn-off switching loss			1.6			
E_{ts}	Total switching loss		4.4				

DIODE CHARACTERISTIC

V_F	Forward voltage	$V_{GE} = 0\text{ V}, I_F = 75\text{ A}$ $V_{GE} = 0\text{ V}, I_F = 75\text{ A}, T_J = 175^{\circ}\text{C}$	1.50	2.20 2.40	2.90	V
t_{rr}	Reverse recovery time	$T_J = 25^{\circ}\text{C}$ $I_F = 75\text{ A}, V_R = 400\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$		80		ns
Q_{rr}	Reverse recovery charge			0.40		μC
I_{rrm}	Reverse recovery current			8		A
t_{rr}	Reverse recovery time	$T_J = 175^{\circ}\text{C}$ $I_F = 75\text{ A}, V_R = 400\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$		143		ns
Q_{rr}	Reverse recovery charge			1.45		μC
I_{rrm}	Reverse recovery current			16		A

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.

NGTB75N65FL2WG

TYPICAL CHARACTERISTICS

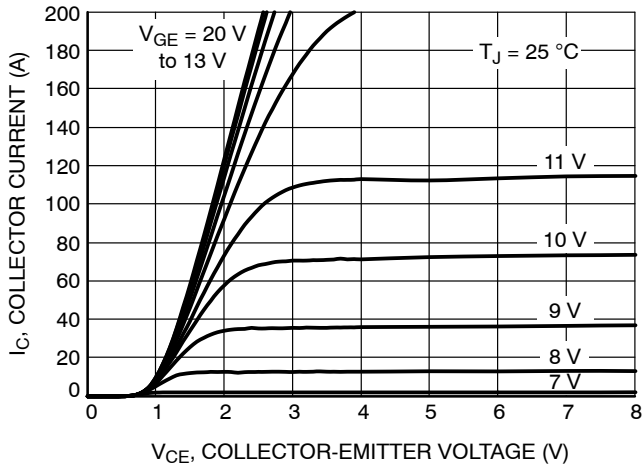


Figure 1. Output Characteristics

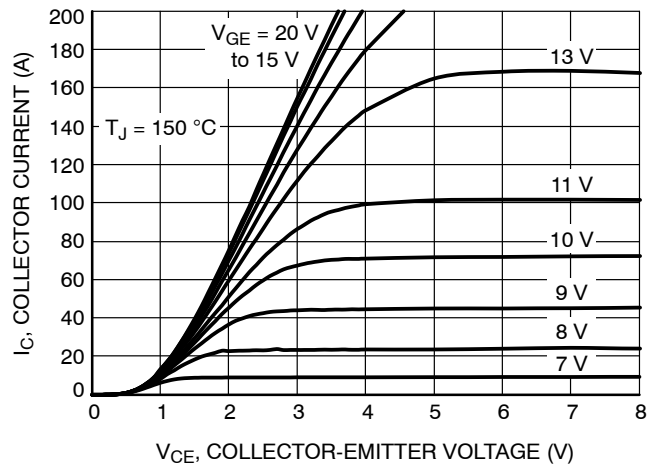


Figure 2. Output Characteristics

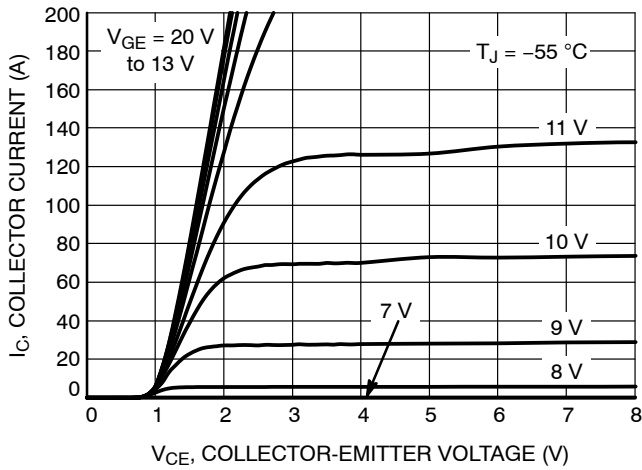


Figure 3. Output Characteristics

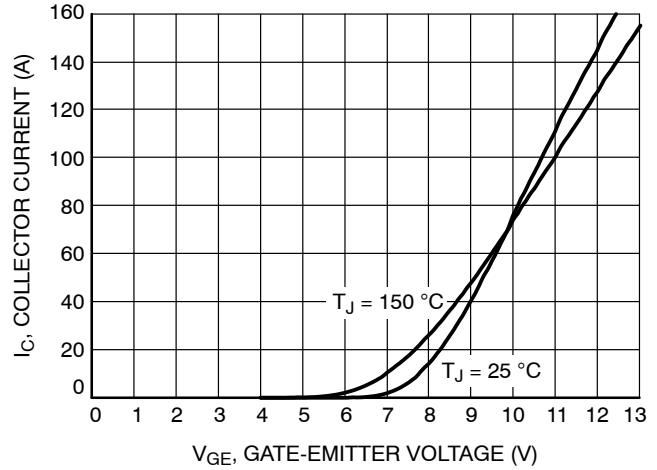


Figure 4. Typical Transfer Characteristics

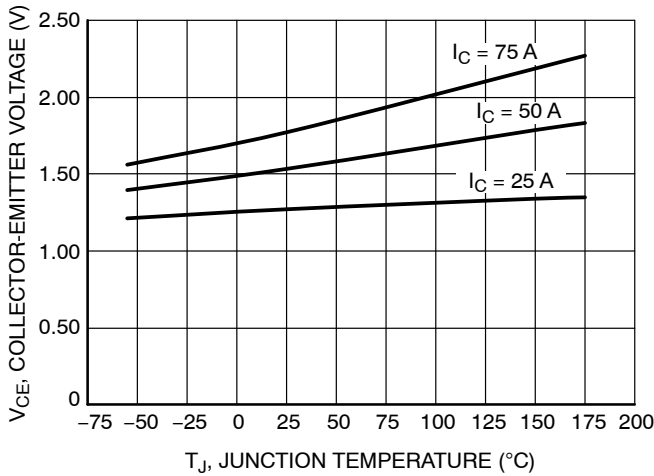


Figure 5. $V_{CE(sat)}$ vs. T_J

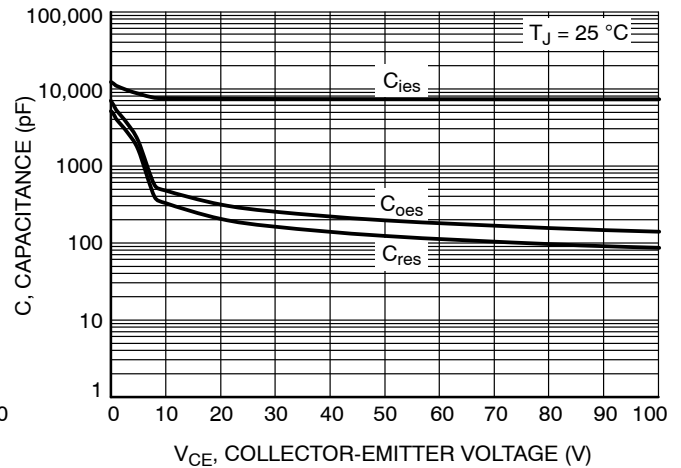


Figure 6. Typical Capacitance

NGTB75N65FL2WG

TYPICAL CHARACTERISTICS (continued)

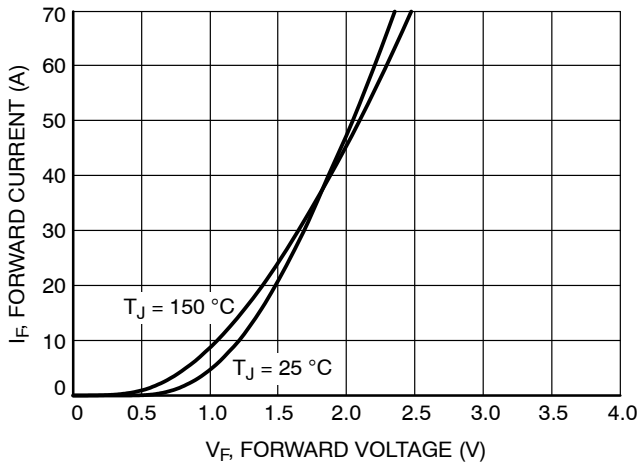


Figure 7. Diode Forward Characteristics

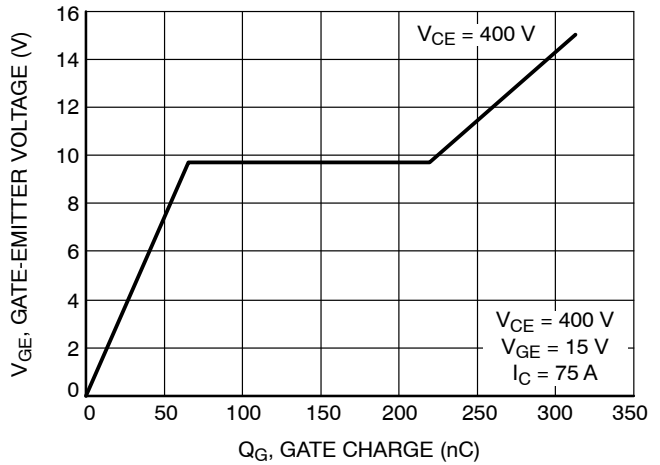


Figure 8. Typical Gate Charge

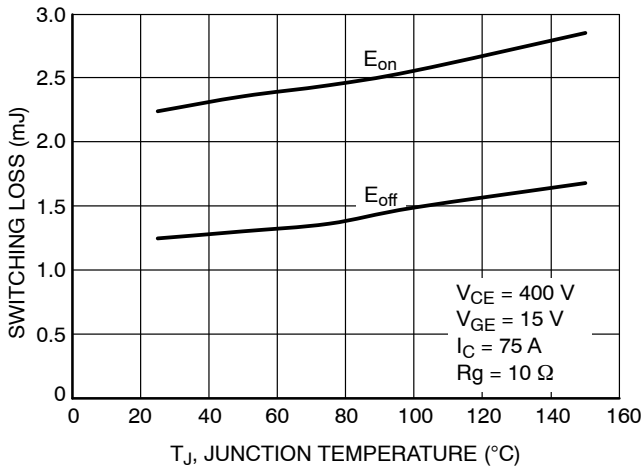


Figure 9. Switching Loss vs. Temperature

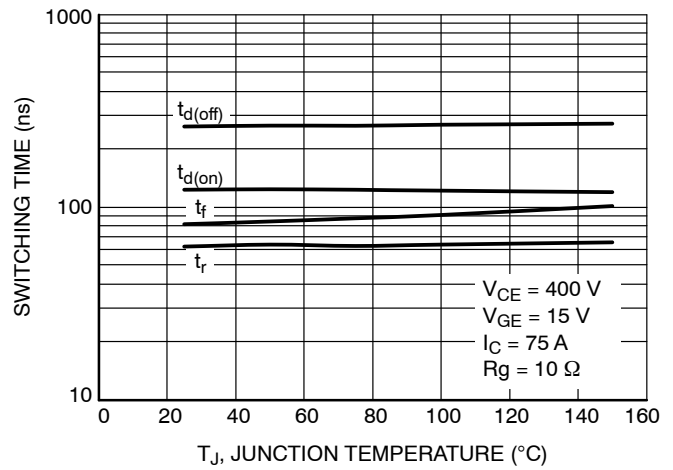


Figure 10. Switching Time vs. Temperature

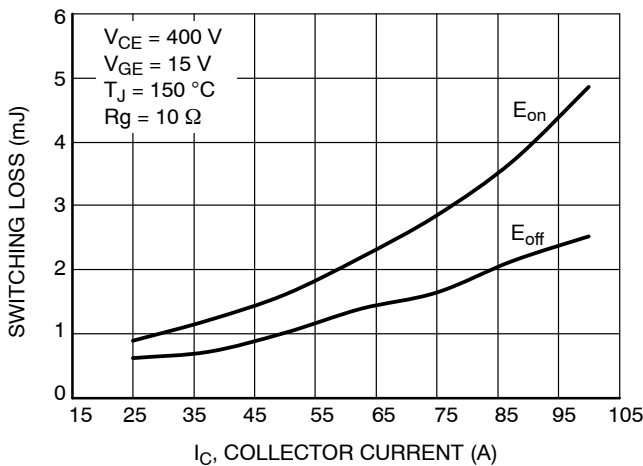


Figure 11. Switching Loss vs. I_C

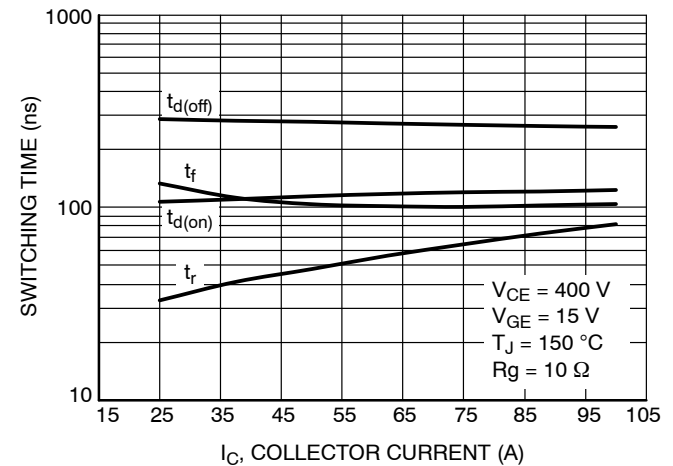


Figure 12. Switching Time vs. I_C

NGTB75N65FL2WG

TYPICAL CHARACTERISTICS (continued)

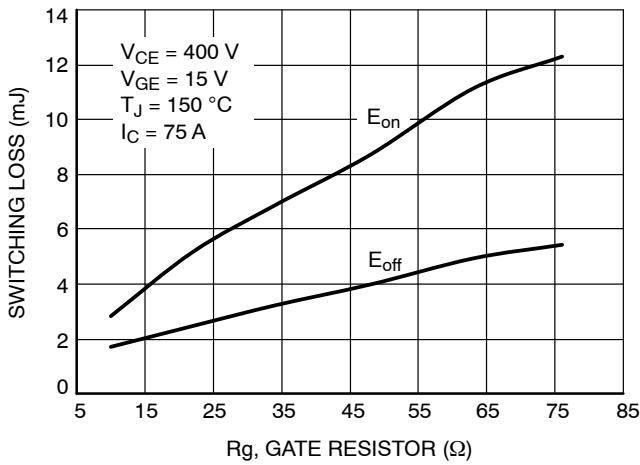


Figure 13. Switching Loss vs. Rg

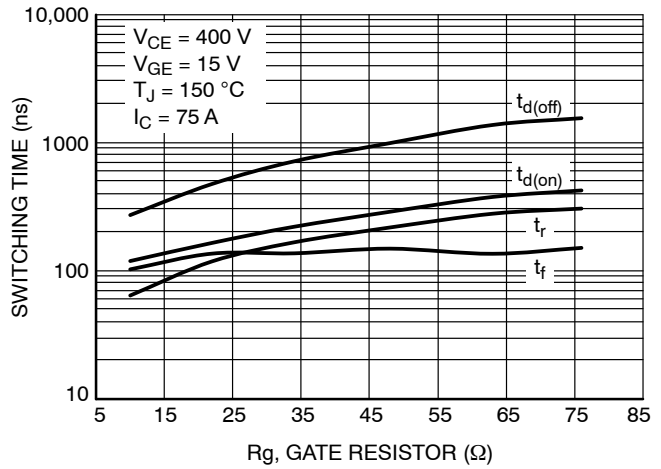


Figure 14. Switching Time vs. Rg

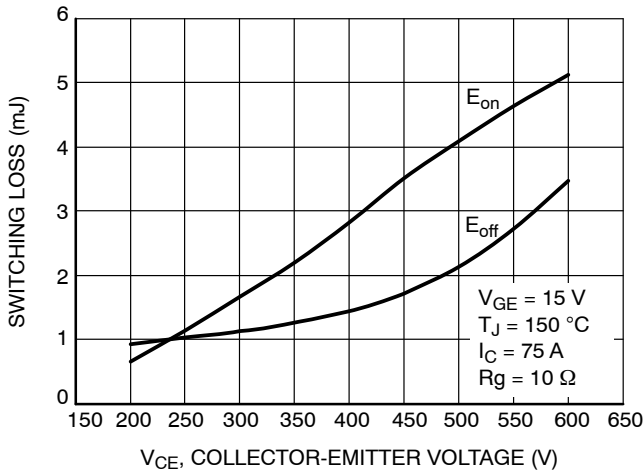


Figure 15. Switching Loss vs. V_{CE}

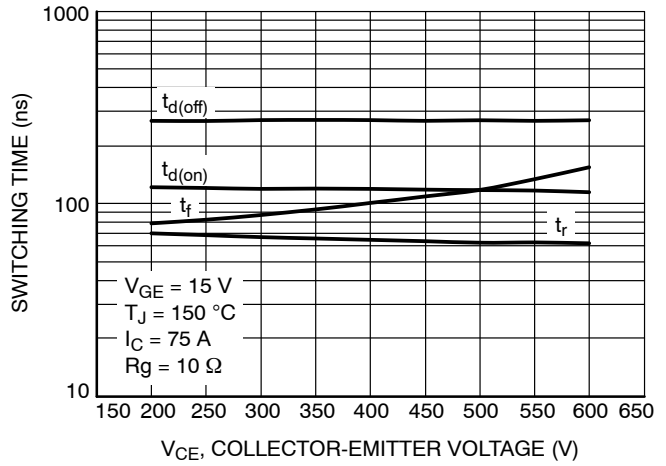


Figure 16. Switching Time vs. V_{CE}

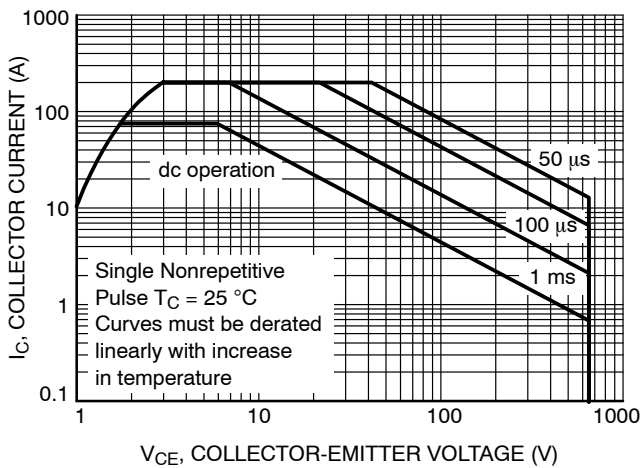


Figure 17. Safe Operating Area

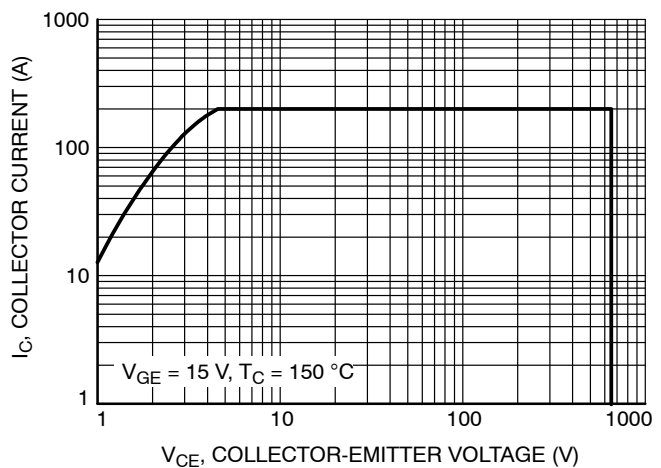


Figure 18. Reverse Bias Safe Operating Area

NGTB75N65FL2WG

TYPICAL CHARACTERISTICS (continued)

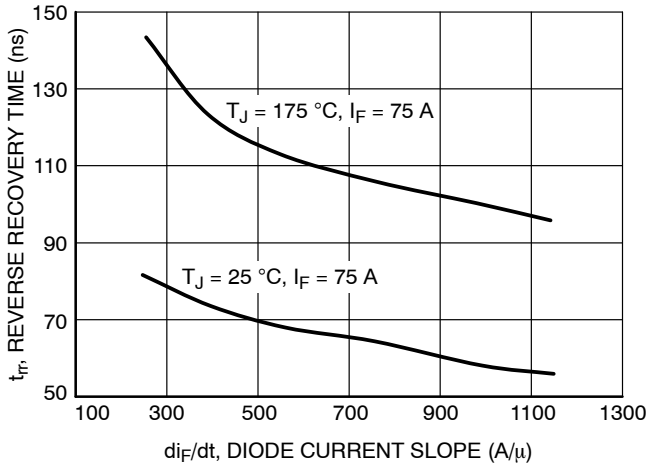


Figure 19. t_{rr} vs. di_F/dt ($V_R = 400\text{ V}$)

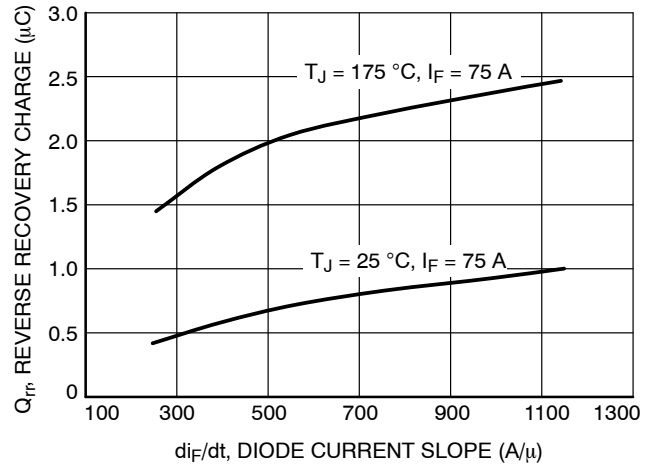


Figure 20. Q_{rr} vs. di_F/dt ($V_R = 400\text{ V}$)

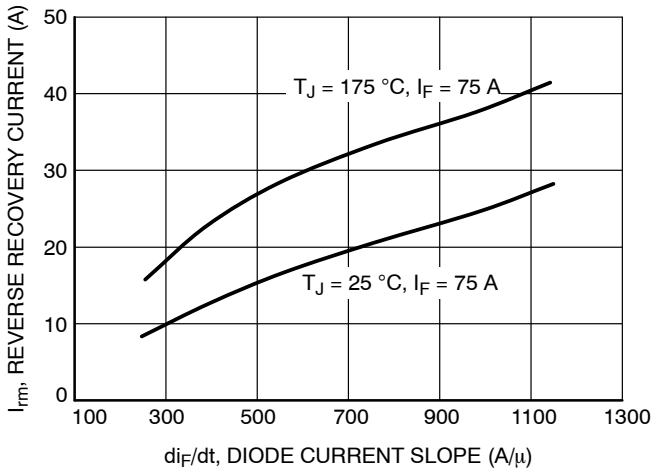


Figure 21. I_{rm} vs. di_F/dt ($V_R = 400\text{ V}$)

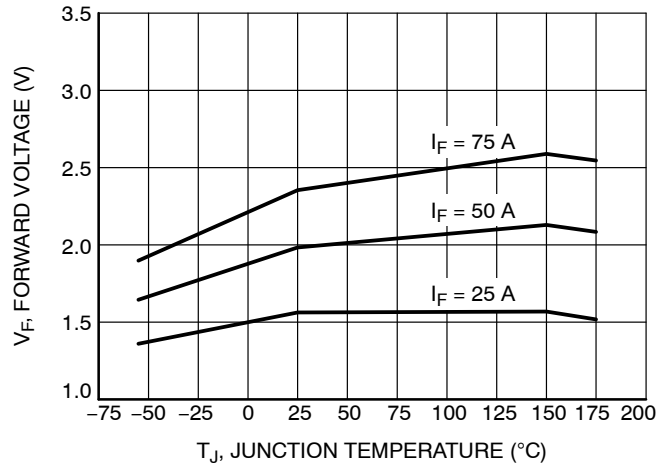


Figure 22. V_F vs. T_J

NGTB75N65FL2WG

TYPICAL CHARACTERISTICS (continued)

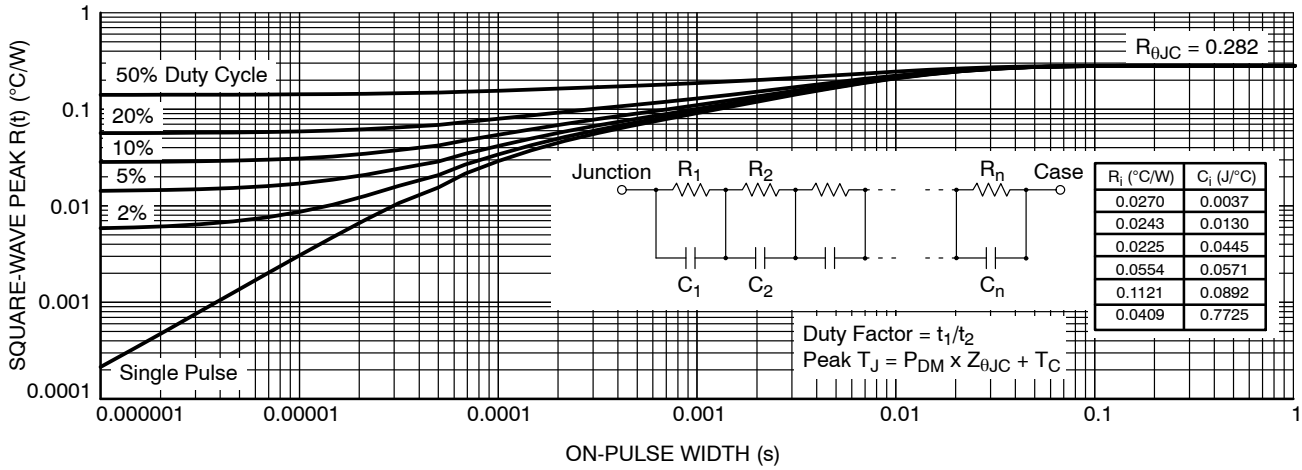


Figure 23. IGBT Transient Thermal Impedance

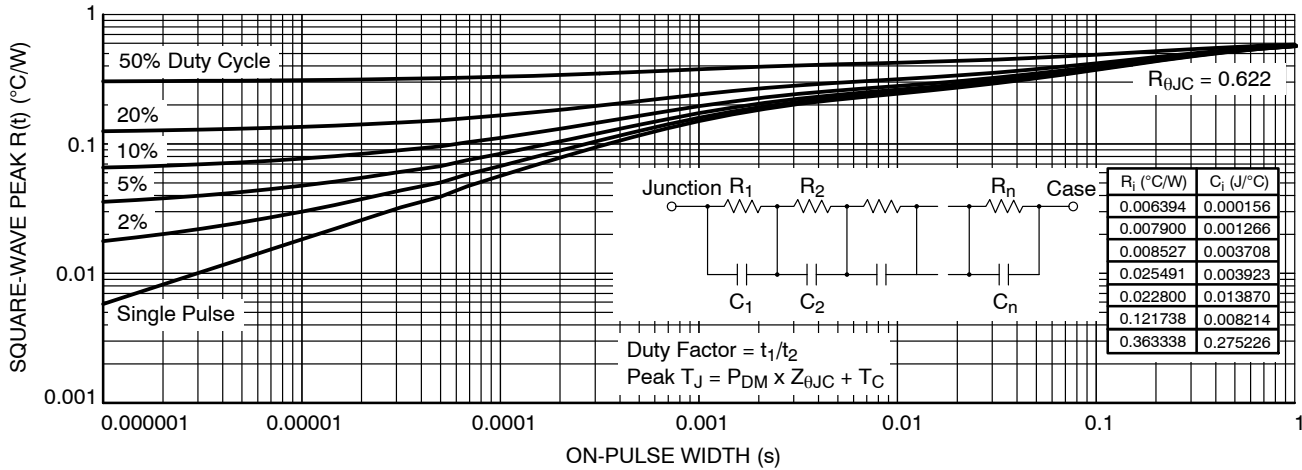


Figure 24. Diode Transient Thermal Impedance

NGTB75N65FL2WG

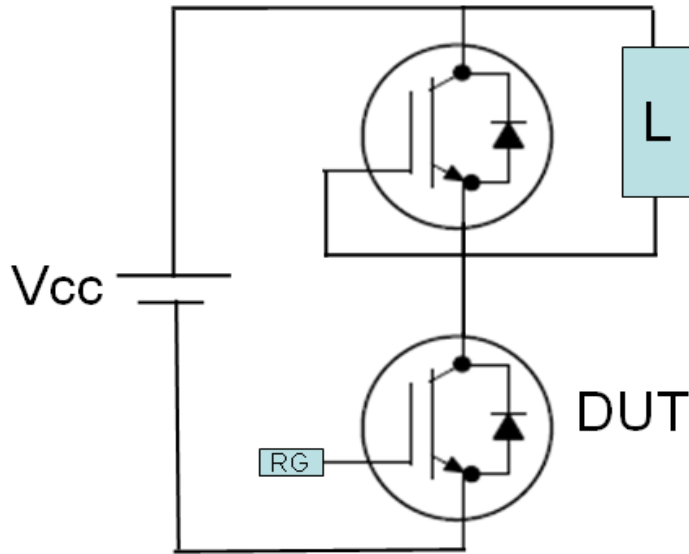
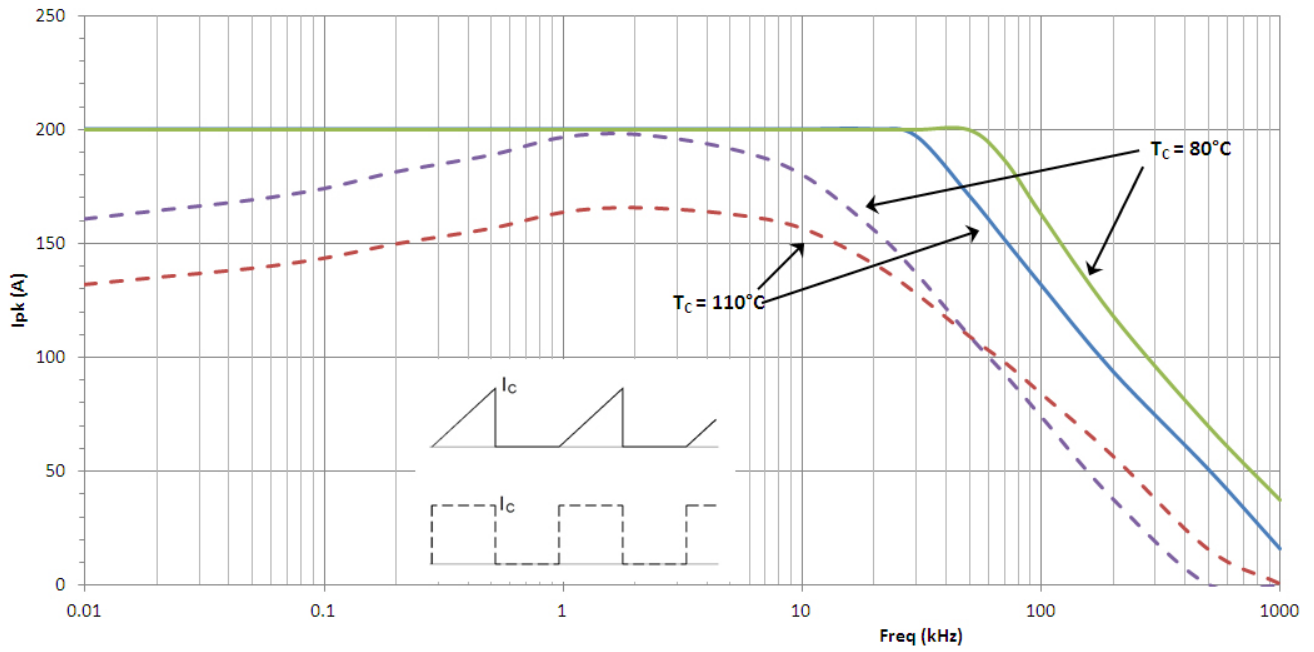


Figure 25. Test Circuit for Switching Characteristics

NGTB75N65FL2WG

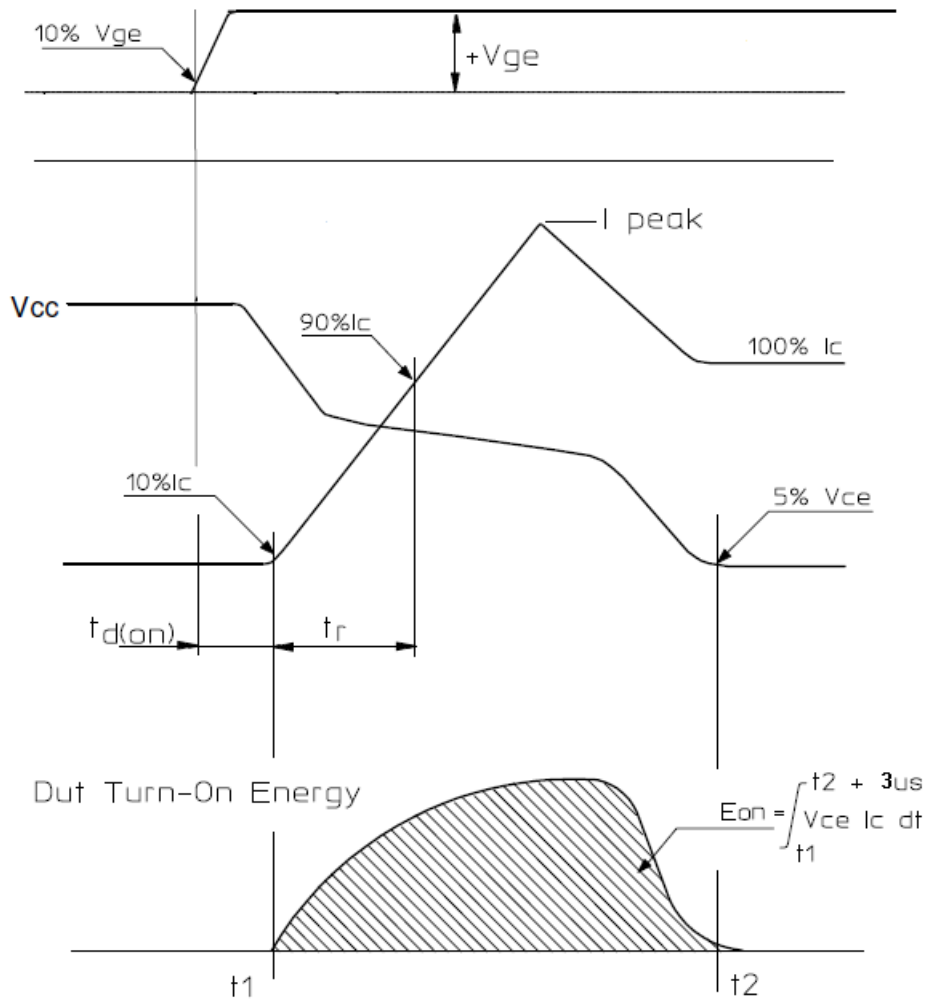


Figure 26. Definition of Turn On Waveform

NGTB75N65FL2WG

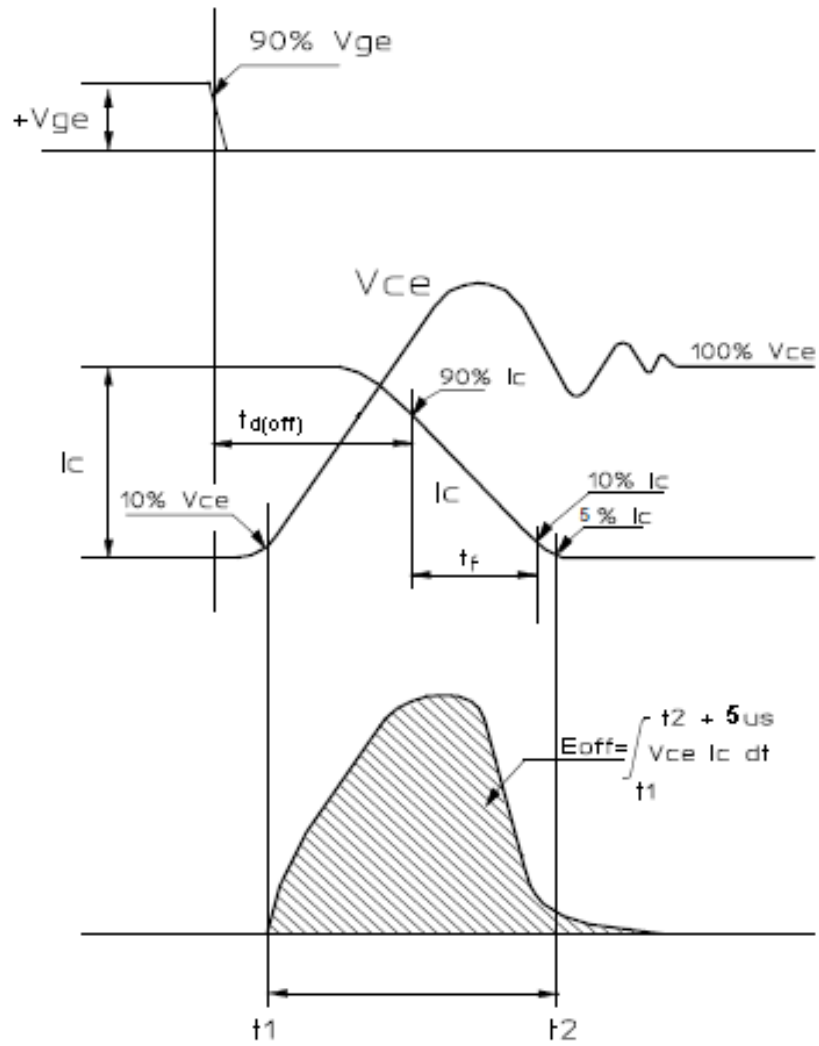


Figure 27. Definition of Turn Off Waveform

NGTB75N65FL2WG

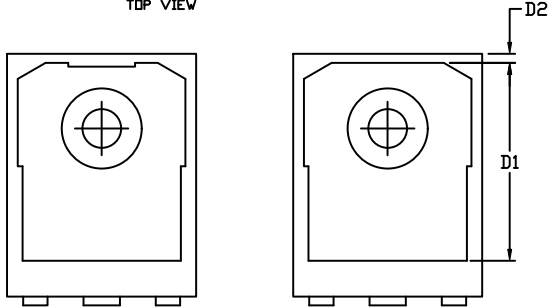
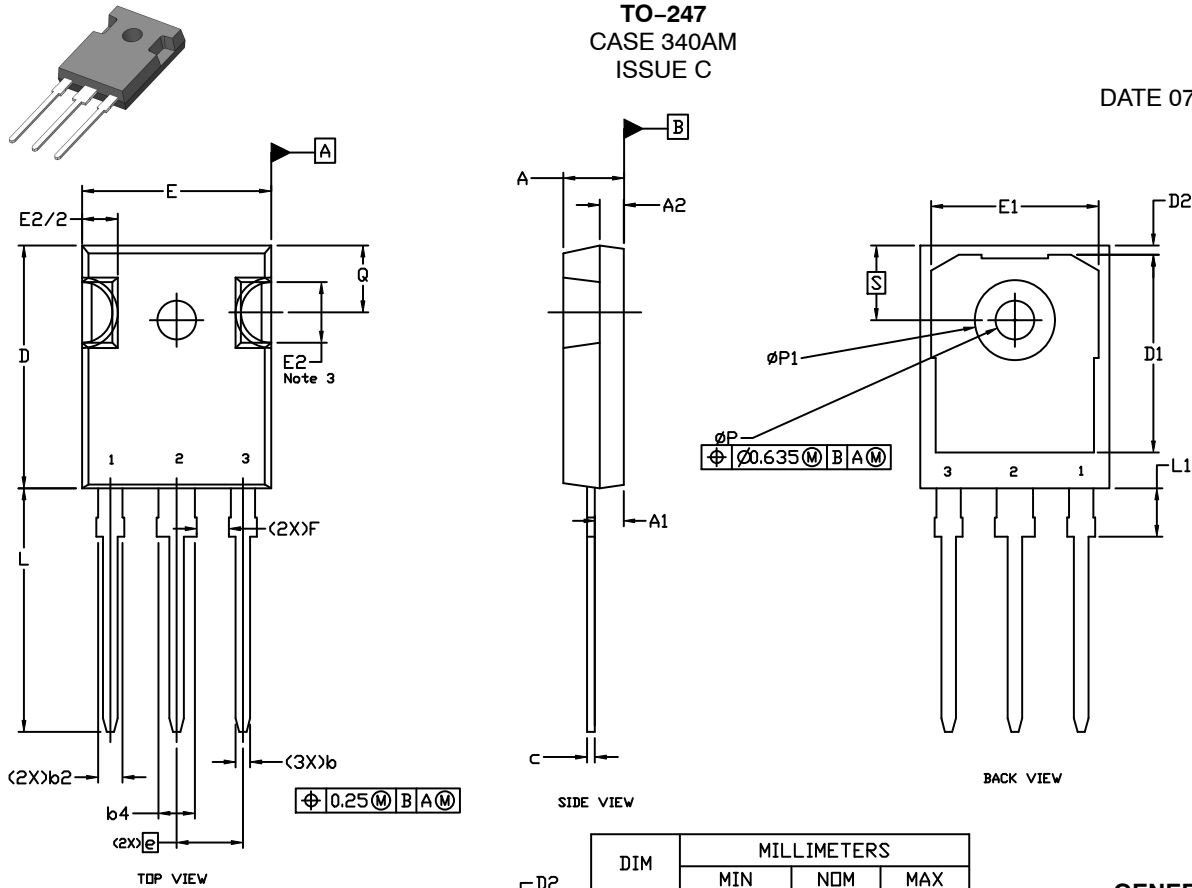
REVISION HISTORY

Revision	Description of Changes	Date
7	Update the data sheet to move value from Max to Typ under ICES symbol.	3/23/2026

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

DATE 07 SEP 2021

TO-247
CASE 340AM
ISSUE C

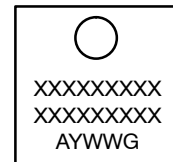
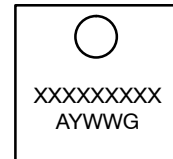


NOTES:

1. DIMENSIONING AND TOLERANCE AS PER ASME Y14.5M, 2009.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. SLOT REQUIRED, NOTCH MAY BE ROUNDED.
4. OPTIONAL BACK SIDE HEATSINK SHAPE.
5. DIMENSIONS ARE EXCLUSIVE OF BURRS AND MOLD FLASH. DIMENSIONS D AND E ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
6. DIMENSIONS A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
7. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.70	5.00	5.30
A1	2.20	2.40	2.60
A2	1.80	2.00	2.20
b	1.07	1.20	1.33
b2	1.65	2.12	2.35
b4	2.60	3.12	3.40
c	0.45	0.60	0.75
D	20.80	21.00	21.34
D1	16.30	---	---
D2	0.75	---	---
E	15.50	16.00	16.25
E1	13.80	---	---
E2	4.32	4.90	5.49
e	5.45 BSC		
F	2.655	---	---
L	19.80	20.00	20.80
L1	3.81	4.20	4.35
P	3.55	3.60	3.65
P1	6.60	---	---
Q	5.40	6.00	6.20
S	6.15 BSC		

GENERIC MARKING DIAGRAMS*



XXXX = Specific Device Code
 A = Assembly Location
 Y = Year
 WW = Work Week
 G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

DOCUMENT NUMBER:	98AON77284F	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	TO-247	PAGE 1 OF 1

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the 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. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **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**'s 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.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales