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# NGTB20N120IHWG

## IGBT - Induction Cooking

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Field Stop (FS) Trench construction, provides and superior performance in demanding switching applications, and offers low on-state voltage with minimal switching loss. The IGBT is well suited for resonant or soft switching applications.

### Features

- Extremely Efficient Trench with Fieldstop Technology
- Low Switching Loss Reduces System Power Dissipation
- Optimized for Low Losses in IH Cooker Application
- This is a Pb-Free Device

### Typical Applications

- Inductive Heating
- Consumer Appliances
- Soft Switching

### ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-emitter voltage @ $T_J = 25^\circ\text{C}$	$V_{CES}$	1200	V
Collector current @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	$I_C$	40 20	A
Pulsed collector current, $T_{\text{pulse}}$ limited by $T_{J\text{max}}$ , 10 $\mu\text{s}$ Pulse, $V_{GE} = 15\text{ V}$	$I_{CM}$	80	A
Diode forward current @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	$I_F$	40 20	A
Diode pulsed current, $T_{\text{pulse}}$ limited by $T_{J\text{max}}$ , 10 $\mu\text{s}$ Pulse, $V_{GE} = 0\text{ V}$	$I_{FM}$	80	A
Gate-emitter voltage Transient Gate-emitter voltage ( $T_{\text{pulse}} = 5\ \mu\text{s}$ , $D < 0.10$ )	$V_{GE}$	$\pm 20$ $\pm 25$	V
Power Dissipation @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	$P_D$	341 170	W
Operating junction temperature range	$T_J$	-40 to +175	$^\circ\text{C}$
Storage temperature range	$T_{\text{stg}}$	-55 to +175	$^\circ\text{C}$
Lead temperature for soldering, 1/8" from case for 5 seconds	$T_{\text{SLD}}$	260	$^\circ\text{C}$

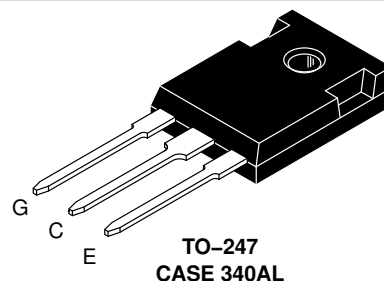
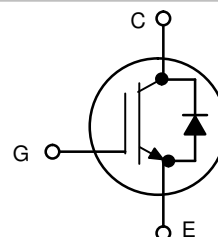
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



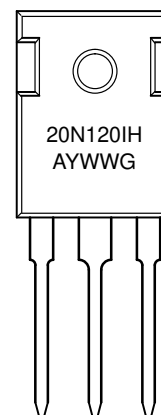
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**20 A, 1200 V**  
 **$V_{CEsat} = 2.20\text{ V}$**   
 **$E_{off} = 0.48\text{ mJ}$**



### MARKING DIAGRAM



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

### ORDERING INFORMATION

Device	Package	Shipping
NGTB20N120IHWG	TO-247 (Pb-Free)	30 Units / Rail

# NGTB20N120IHWG

## THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction-to-case	$R_{\theta JC}$	0.44	$^{\circ}\text{C}/\text{W}$
Thermal resistance junction-to-ambient	$R_{\theta JA}$	40	$^{\circ}\text{C}/\text{W}$

## 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	$V_{GE} = 0\text{ V}, I_C = 500\ \mu\text{A}$	$V_{(BR)CES}$	1200	–	–	V
Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 20\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 20\text{ A}, T_J = 175^{\circ}\text{C}$	$V_{CEsat}$	–	2.20 2.30	2.65 –	V
Gate-emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 250\ \mu\text{A}$	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter cut-off current, gate-emitter short-circuited	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}$ $V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_J = 150^{\circ}\text{C}$	$I_{CES}$	–	–	0.1 2.8	mA
Gate leakage current, collector-emitter short-circuited	$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	$I_{GES}$	–	–	100	nA

### DYNAMIC CHARACTERISTIC

Input capacitance	$V_{CE} = 20\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{ies}$	–	3590	–	pF
Output capacitance		$C_{oes}$	–	90	–	
Reverse transfer capacitance		$C_{res}$	–	70	–	
Gate charge total	$V_{CE} = 600\text{ V}, I_C = 20\text{ A}, V_{GE} = 15\text{ V}$	$Q_g$	–	150	–	nC
Gate to emitter charge		$Q_{ge}$	–	31	–	
Gate to collector charge		$Q_{gc}$	–	67	–	

### SWITCHING CHARACTERISTIC, INDUCTIVE LOAD

Turn-off delay time	$T_J = 25^{\circ}\text{C}$ $V_{CC} = 600\text{ V}, I_C = 20\text{ A}$ $R_g = 10\ \Omega$ $V_{GE} = 0\text{ V}/15\text{ V}$	$t_{d(off)}$	–	170	–	ns
Fall time		$t_f$	–	155	–	
Turn-off switching loss		$E_{off}$	–	0.48	–	
Turn-off delay time	$T_J = 150^{\circ}\text{C}$ $V_{CC} = 600\text{ V}, I_C = 20\text{ A}$ $R_g = 10\ \Omega$ $V_{GE} = 0\text{ V}/15\text{ V}$	$t_{d(off)}$	–	185	–	ns
Fall time		$t_f$	–	210	–	
Turn-off switching loss		$E_{off}$	–	0.92	–	

### DIODE CHARACTERISTIC

Forward voltage	$V_{GE} = 0\text{ V}, I_F = 20\text{ A}$ $V_{GE} = 0\text{ V}, I_F = 20\text{ A}, T_J = 175^{\circ}\text{C}$	$V_F$	–	2.2 3.8	2.75	V
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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.

# NGTB20N120IHWG

## TYPICAL CHARACTERISTICS

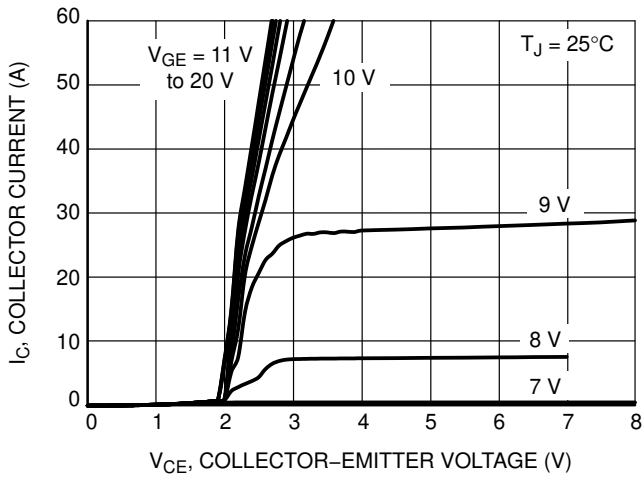


Figure 1. Output Characteristics

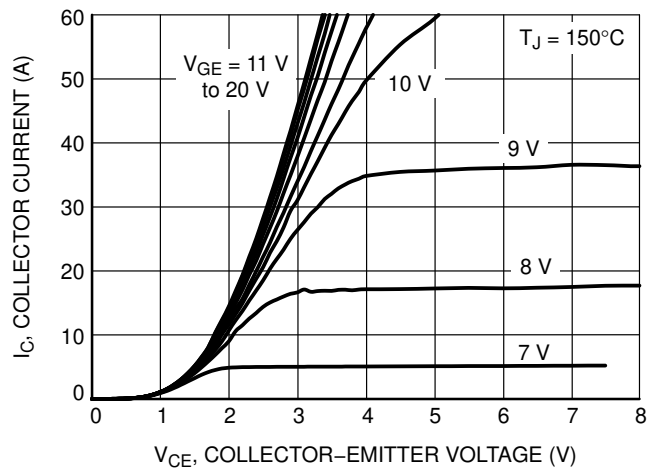


Figure 2. Output Characteristics

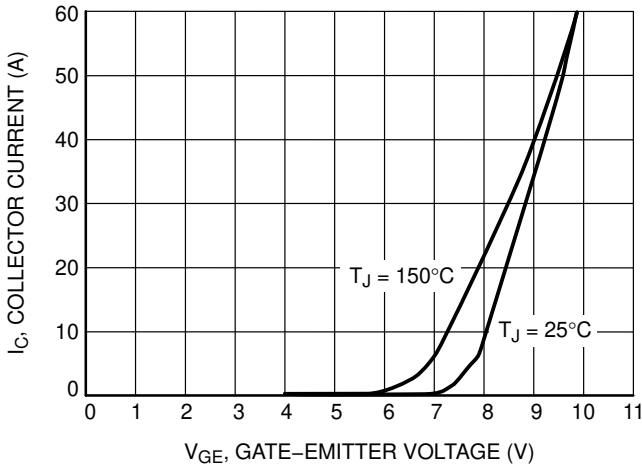


Figure 3. Typical Transfer Characteristics

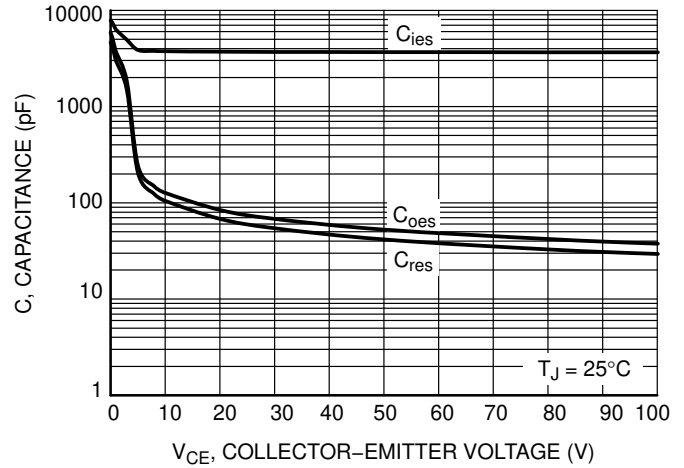


Figure 4. Typical Capacitance

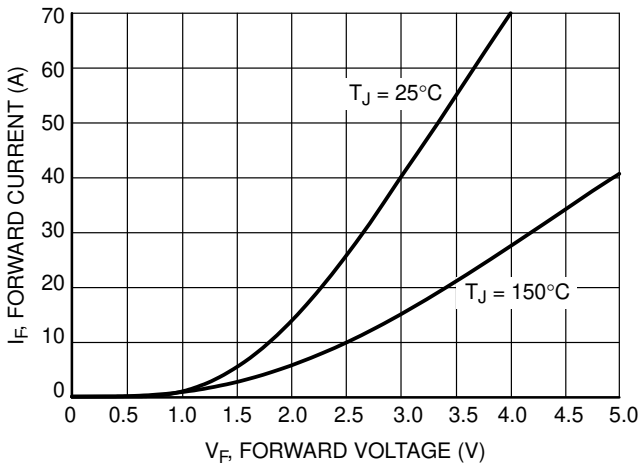


Figure 5. Diode Forward Characteristics

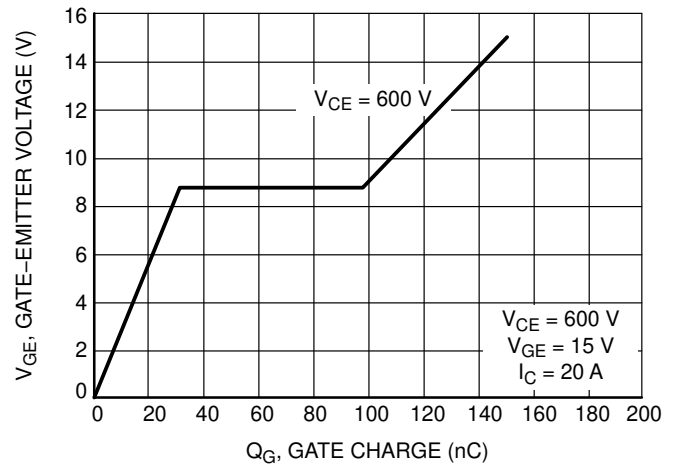


Figure 6. Typical Gate Charge

# NGTB20N120IHVG

## TYPICAL CHARACTERISTICS

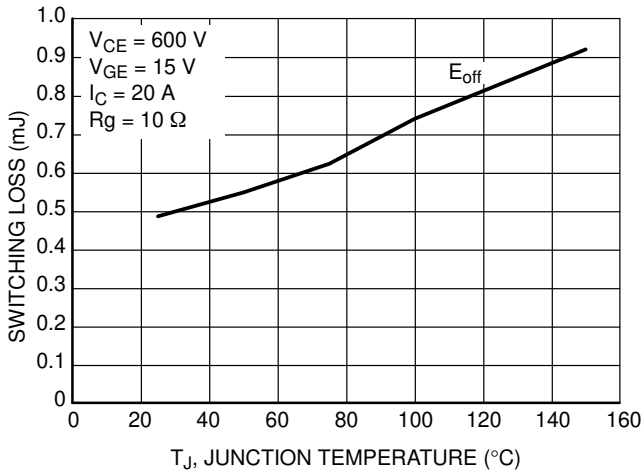


Figure 7. Switching Loss vs. Temperature

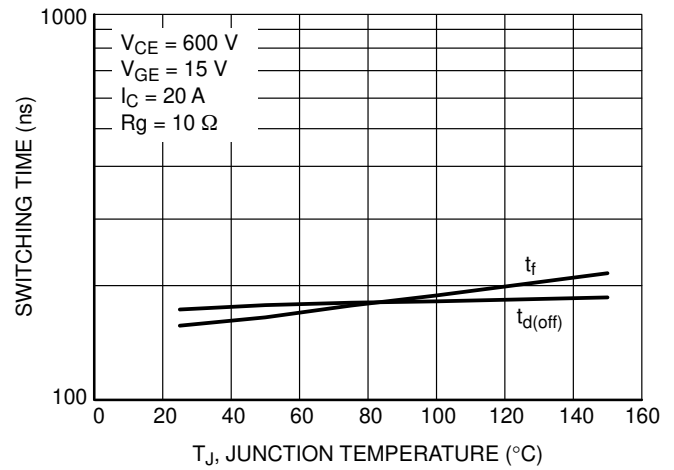


Figure 8. Switching Time vs. Temperature

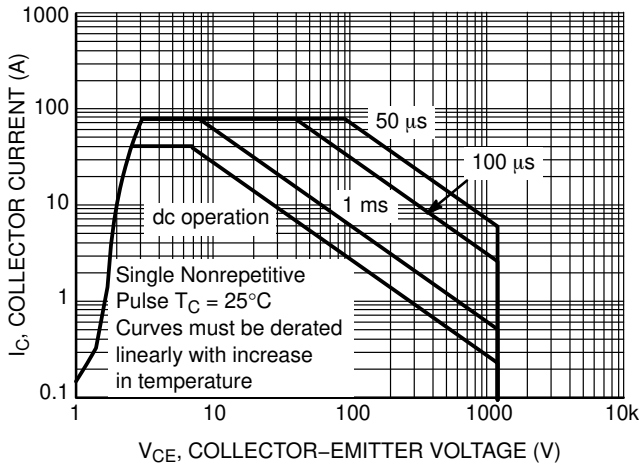


Figure 9. Safe Operating Area

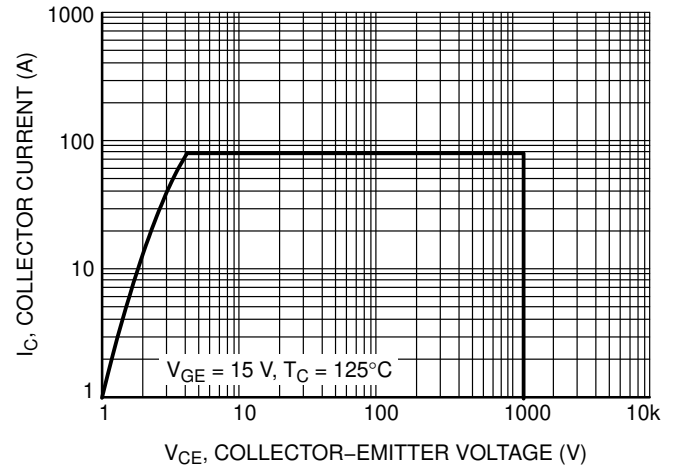


Figure 10. Reverse Bias Safe Operating Area

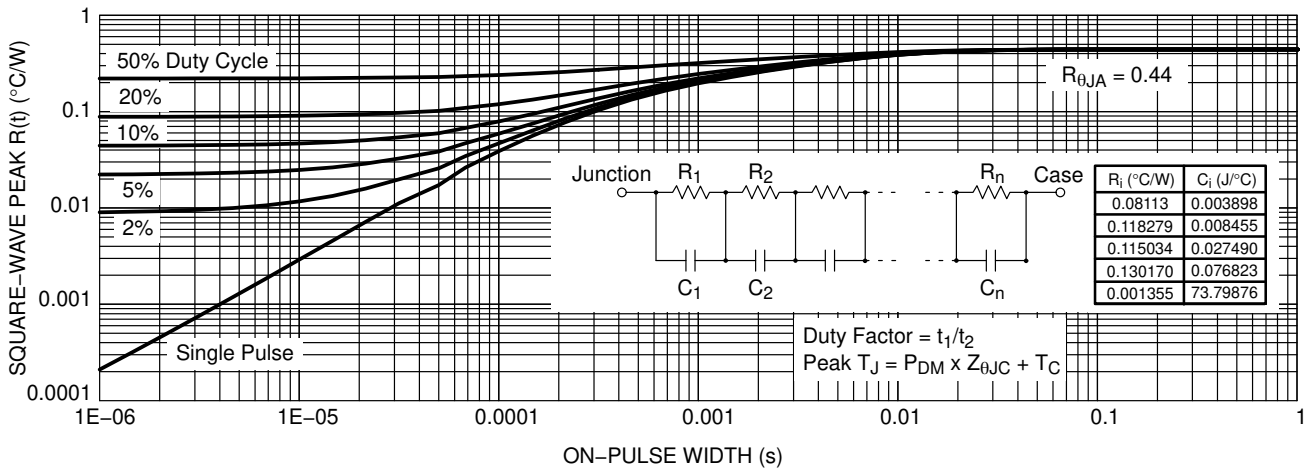


Figure 11. IGBT Transient Thermal Impedance

# NGTB20N120IHWG

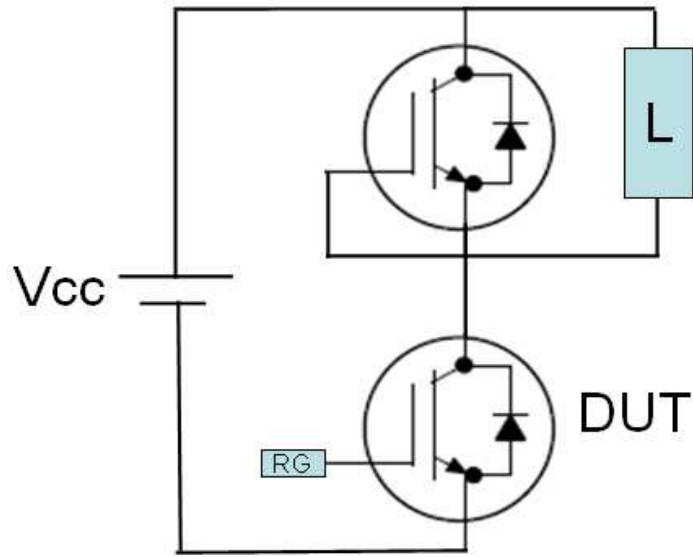


Figure 12. Test Circuit for Switching Characteristics

# NGTB20N120IHWG

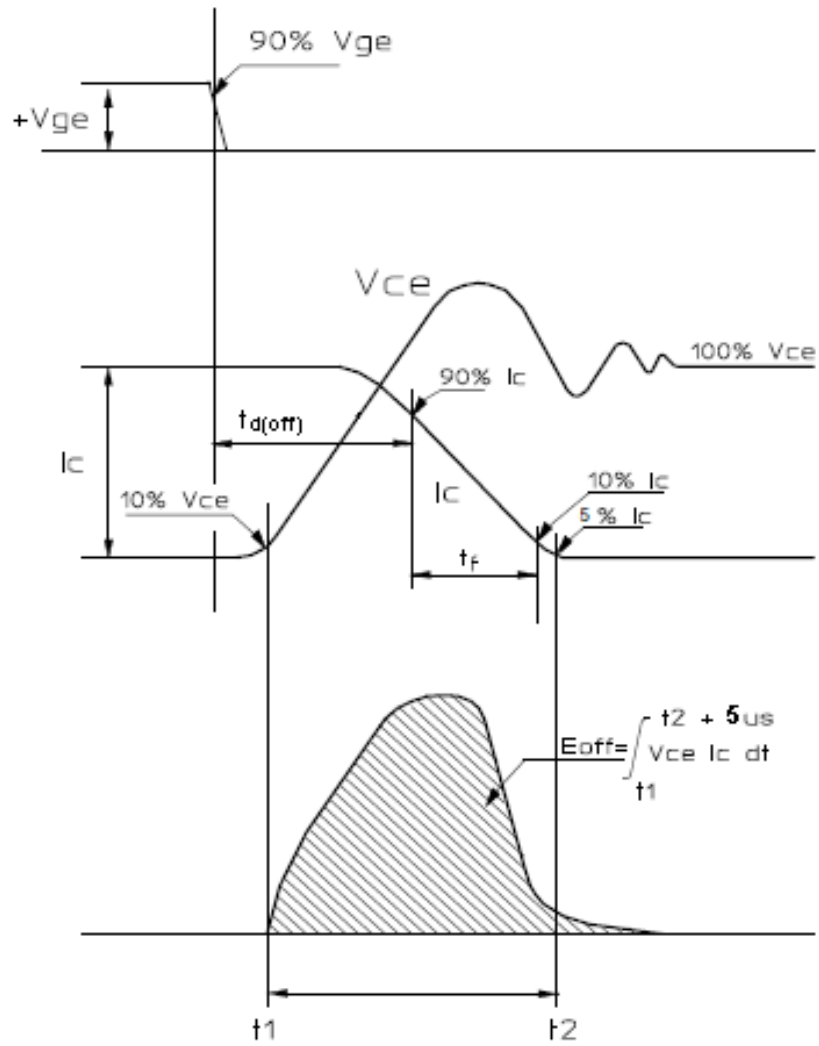
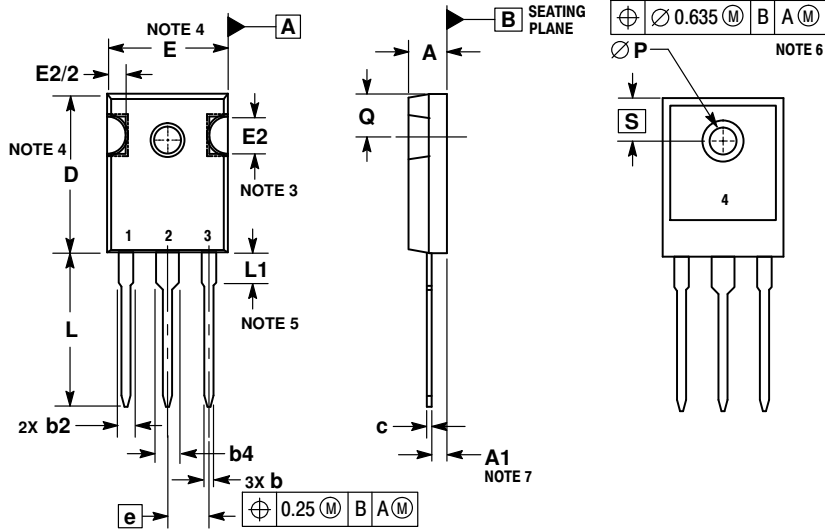


Figure 13. Definition of Turn Off Waveform

# NGTB20N120IHWG

## PACKAGE DIMENSIONS


### TO-247 CASE 340AL ISSUE A



#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. SLOT REQUIRED, NOTCH MAY BE ROUNDED.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
5. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.
6.  $\varnothing P$  SHALL HAVE A MAXIMUM DRAFT ANGLE OF 1.5° TO THE TOP OF THE PART WITH A MAXIMUM DIAMETER OF 3.91.
7. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.

DIM	MILLIMETERS	
	MIN	MAX
A	4.70	5.30
A1	2.20	2.60
b	1.00	1.40
b2	1.65	2.35
b4	2.60	3.40
c	0.40	0.80
D	20.30	21.40
E	15.50	16.25
E2	4.32	5.49
e	5.45 BSC	
L	19.80	20.80
L1	3.50	4.50
P	3.55	3.65
Q	5.40	6.20
S	6.15 BSC	

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