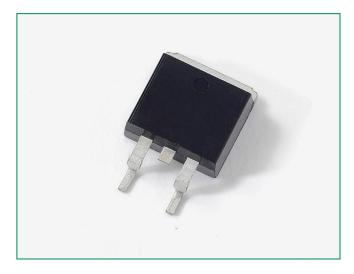


NGB8207ABN - 20 A, 365 V, N-Channel Ignition IGBT,





20 Amps, 365 Volts $V_{CE}(on) \le 1.5 V @$ $I_{C} = 10A, V_{GE} \ge 4.5 V$

Maximum Ratings and Thermal Characteristics (T₁ = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CES}	365	V
Gate-Emitter Voltage	V _{GE}	±15	V
Collector Current-Continuous @T _c = 25°C - Pulsed	I _c	20 50	A _{DC} A _{AC}
Continuous Gate Current	l _G	1.0	mA
Transient Gate Current (t \leq 2 ms, f \leq 100 Hz)	l _G	20	mA
ESD (Charged-Device Model)	ESD	2.0	kV
ESD (Human Body Model) R = 1500 Ω , C = 100 pF	ESD	8.0	kV
ESD (Machine Model) R = 0 Ω, C = 200 pF	ESD	500	V
Total Power Dissipation @ T _c = 25°C Derate above 25°C	P _D	165 1.1	Watts W/°C
Operating and Storage Temperature Range	T _J , T _{stg}	-55 to +175	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Description

This Logic Level Insulated Gate Bipolar Transistor (IGBT) features monolithic circuitry integrating ESD and Over–Voltage clamped protection for use in inductive coil drivers applications. Primary uses include Ignition, Direct Fuel Injection, or wherever high voltage and high current switching is required.

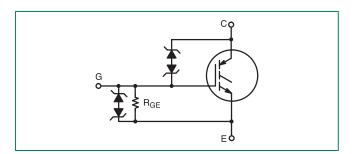
Features

- Ideal for Coil-on-Plug and Driver-on-Coil Applications
- Gate-Emitter ESD Protection
- Temperature Compensated Gate-Collector Voltage Clamp Limits Stress Applied to Load
- Integrated ESD Diode Protection
- Low Threshold Voltage for Interfacing Power Loads to Logic or Microprocessor Devices
- Low Saturation Voltage
- High Pulsed Current Capability
- Minimum Avalanche Energy 500 mJ
- Gate Resistor (R_G) = 70 Ω
- These are Pb-Free Devices

Applications

• Ignition Systems

Functional Diagram



Additional Information







Samples



Unclamped Collector–To–Emitter Avalanche Characteristics ($-55^{\circ} \le T_{_{\rm J}} \le 175^{\circ}$ C)

	Symbol	Value	Unit			
Single Pulse Collector-to-Emitter Avalanche Energy						
V_{CC} = 50 V, V_{GE} = 10 V, P_k IL = 16.5 A, L = 3.7 mH, Rg = 1 k Ω Starting T_J = 25°C	F	500				
$V_{CC} = 50 \text{ V}, V_{GE} = 10 \text{ V}, P_k I_L = 10 \text{ A}, L = 6.1 \text{ mH}, Rg = 1 \text{ k}\Omega \text{ Starting} T_J = 125 ^{\circ}\text{C}$	E _{AS}	306	mJ			
Reverse Avalanche Energy						
$V_{CC} = 100 \text{ V, } V_{GE} = 20 \text{ V, } P_k I_L = 25.8 \text{ A, } L = 6.0 \text{ mH, } Starting T_J = 25^{\circ}C$	E _{AS(R)}	2000	mJ			

Thermal Characteristics

	Symbol	Value	Unit
Thermal Resistance, Junction to Case	R _{eJC}	0.9	°C/W
Thermal Resistance, Junction to Ambient (Note 2)	R _{eJA}	50	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	T _L	275	°C

^{2.} When surface mounted to an FR4 board using the minimum recommended pad size.



Electrical Characteristics - OFF

Characteristic	Symbol	Test Conditions	Temperature	Min	Тур	Max	Unit	
Collector-Emitter	DV/	$I_{c} = 2.0 \text{ mA}$	$T_J = -40$ °C to 175°C	325	350	375	V	
Clamp Voltage	BV _{CES}	I _c = 10 mA	$T_J = -40$ °C to 175°C	340	365	390	V	
		$V_{GE} = 0 \text{ V},$ $V_{CE} = 24 \text{V}$	T _J = 25°C	-	0.1	2.0		
Zero Gate Voltage	I _{CES}		T _J = 25°C	_	1.0	5	μA	
Collector Current	CES	$V_{CE} = 250V$ $V_{GE} = 0 V$	T _J = 175°C	70	85	150	·	
		GE 5	T _J = -40°C	-	0.25	2.5		
			T _J = 25°C	30	33	39		
Reverse Collector–Emitter Clamp Voltage	B _{VCES (R)}	$I_{c} = -75 \text{ mA}$	T _J = 175°C	30	36	42	V	
, , , , , , , , , , , , , , , , , , ,				T _J = -40°C	29	32	35	
			T _J = 25°C	0.10	0.25	0.85		
Reverse Collector-Emitter Leakage Current	I _{CES(R)}	V _{CE} = −24 V	T _J = 175°C	20	25	40	mA	
			T _J = -40°C	-	0.03	0.3		
Gate-Emitter Clamp Voltage	BV _{GES}	$I_{\rm G} = \pm 5.0 \text{mA}$	T _J = -40°C to 175°C	12	13	14.5	V	
Gate-Emitter Leakage Current	l _{GES}	V _{GE} = ± 10.0 V	T _J = -40°C to 175°C	500	700	1000	μА	
Gate Resistor	$R_{\rm G}$	-	T _J = -40°C to 175°C	-	70	-	Ω	
Gate Emitter Resistor	R _{GE}		T _J = -40°C to 175°C	14.25	16	25	kΩ	

Electrical Characteristics - ON (Note 3)

Characteristic	Symbol	Test Conditions	Temperature	Min	Тур	Max	Unit	
		1.00	T _J = 25°C	1.2	1.5	2.0		
Gate Threshold Voltage	V _{GE (th)}	$V_{GE (th)}$ $I_{c} = 1.0 \text{ mA},$	$I_C = 1.0 \text{ mA},$ $V_{GE} = V_{CE}$	T _J = 175°C	0.6	0.8	1.2	V
		V _{GE} = V _{CE}	T _J = -40°C	1.4	1.7	2.0		
Threshold Temperature Coefficient (Negative)	-	-	-	12	12	12	mV/°C	
			1 - 6 0 m 4	T _J = 25°C	1.0	1.3	1.6	
Collector-to-Emitter		$I_{c} = 6.0 \text{ mA},$ $V_{GF} = 4.0 \text{ V}$	T _J = 175°C	0.8	1.1	1.4		
On-Voltage	V _{GE (on)}	$V_{GE (on)}$ $V_{GE} = 4.0 \text{ V}$	T _J = -40°C	1.15	1.4	1.75	V	
On-voltage		$I_{c} = 10 \text{ mA},$ $V_{GE} = 4.5 \text{ V}$	T _J = 25°C	-	0.62	1.0		

^{*}Maximum Value of Characteristic across Temperature Range.

^{3.} Pulse Test: Pulse Width $\leq 300~\mu\text{S},~\text{Duty Cycle} \leq 2\,\%.$



Electrical Characteristics - ON (Note 4)

Characteristic	Symbol	Test Conditions	Temperature	Min	Тур	Max	Unit								
			T _J = 25°C	1.1	1.5	1.7									
	$I_{c} = 8.0 \text{ A},$ $V_{GE} = 4.0 \text{ V}$	T _J = 175°C	1.0	1.3	1.6										
		V GE → 4.0 V	T _J = -40°C	1.2	1.5	1.85									
			T _J = 25°C	1.2	1.6	1.9									
		$I_{c} = 10 \text{ A},$ $V_{ge} = 3.7 \text{ V}$	T _J = 175°C	1.1	1.45	1.8									
		V _{GE} = 0.7 V	T _J = -40°C	1.3	1.7	2.0									
			T _J = 25°C	1.1	1.5	1.85									
	$I_{c} = 10 \text{ A},$ $V_{GE} = 4.0 \text{ V}$ $I_{c} = 10 \text{ A},$ $V_{GE} = 4.5 \text{ V}$ $I_{c} = 15 \text{ A},$ $V_{GE} = 4.0 \text{ V}$	$V_{CE \text{ (on)}}$ $I_{c} = 10 \text{ A,}$ $V_{GE} = 4.5 \text{ V}$	$V_{\text{GE}} = 4.0$	$V_{GE} = V_{GE}$	_	T _J = 175°C	1.1	1.4	1.75						
Collector-to-Emitter					V _{GE} = 4.0 V	T _J = -40°C	1.35	1.7	2.1	.,					
On-Voltage					V _{CE (on)}	l I		T _J = 25°C	1.2	1.5	1.8	V			
										$I_{c} = 10 \text{ A},$ $V_{c} = 4.5 \text{ V}$ $T_{c} = 175^{\circ}\text{C}$	T _J = 175°C	1.1	1.4	1.7	
														V GE → 4.5 V	T _J = -40°C
			T _J = 25°C	1.45	1.85	2.15									
		$I_{c} = 15 \text{ A},$ $V_{GE} = 4.0 \text{ V}$	T _J = 175°C	1.6	1.9	2.4									
		V _{GE} - 4.0 V	T _J = -40°C	1.5	1.9	2.25									
			T _J = 25°C	1.6	2.1	2.6									
		$I_{C} = 20 \text{ A},$ $V_{GE} = 4.0 \text{V}$	T _J = 175°C	2.0	2.4	3.1									
		V GE - 4.0 V	T _J = -40°C	1.6	2.1	2.5									
Forward Transconductance	gfs	$V_{CE} = 5.0 \text{ V},$ $I_{C} = 6.0 \text{ A}$	T _J = 25°C	-	15.8	-	Mhos								



vnami		

Characteristic	Symbol	Test Conditions	Temperature	Min	Тур	Max	Unit
Input Capacitance	C _{ISS}			750	810	900	
Output Capacitance	C _{oss}	$V_{CE} = 25 V$ f = 10 kHz	T _J = 25°C	75	90	105	pF
Transfer Capacitance	C _{RSS}	1 – 10 KHZ		4	7	12	

Switching Characteristics

Characteristic	Symbol	Test Conditions	Temperature	Min	Тур	Max	Unit
Turn-On Delay Time (Resistive) Low Voltage	t _{d (on)}		T _J = 25°C	0.5	0.55	0.7	
Rise Time (Resistive) Low Voltage	t _f	$V_{CE} = 14 V$ $R_{L} = 1.0 \Omega$	T _J = 25°C	2.0	2.32	2.7	
Turn-Off Delay Time (Resistive) Low Voltage	t _{d (off)}	$V_{GE} = 5.0 V$ $R_{G} = 1000 \Omega$	T _J = 25°C	2.0	2.5	3.0	
Fall Time (Resistive) Low Voltage	t _f		T _J = 25°C	8.0	10	13	
Turn-On Delay Time (Resistive) High Voltage	t _{d (on)}		T _J = 25°C	0.5	0.65	0.75	μSec
Rise Time (Resistive) High Voltage	t _r	$V_{CE} = 300 \text{ V}$ $R_L = 46 \Omega$	T _J = 25°C	0.7	1.8	2.0	
Turn-Off Delay Time (Resistive) High Voltage	t _{d (off)}	$V_{GE} = 5.0 V$ $R_{G} = 1000 \Omega$	T _J = 25°C	4.0	4.7	6.0	
Fall Time (Resistive) High Voltage	t _f		T _J = 25°C	6.0	10	15	

^{4.} Pulse Test: Pulse Width $\leq 300~\mu\text{S},~\text{Duty Cycle} \leq 2\,\%.$

 $^{{\}bf *Maximum\ Value\ of\ Characteristic\ across\ Temperature\ Range}.$



Ratings and Characteristic Curves

Figure 1. Typical Self Clamped Inductive Switching Performance (SCIS) @ 25°C

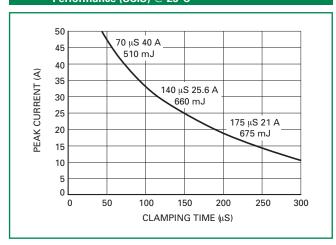


Figure 2. Typical Self Clamped Inductive Switching Performance (SCIS) @ 150°C

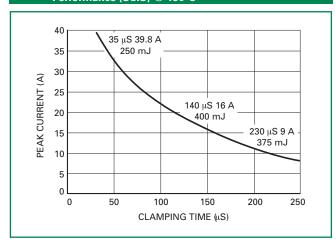


Figure 3. Collector-to-Emitter Voltage vs. Collector Current

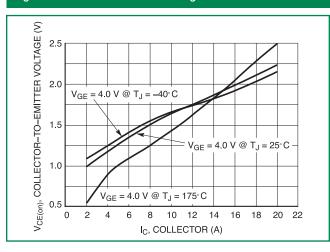


Figure 4. Collector-to-Emitter Voltage vs. Junction Temp

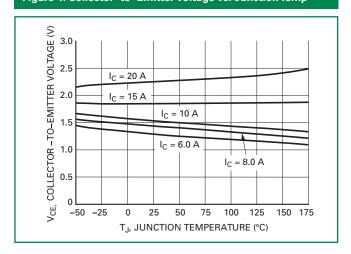


Figure 5. On-Region Characteristics @ T₁ = 25°C

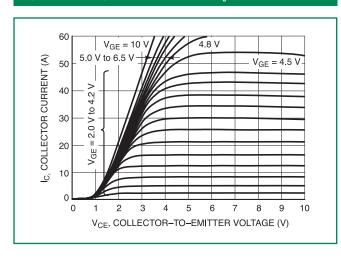


Figure 5. On-Region Characteristics @ T, = -40°C

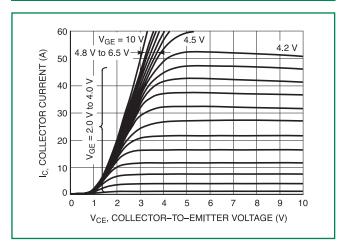




Figure 7. On–Region Characteristics @ T₁ = 175°C

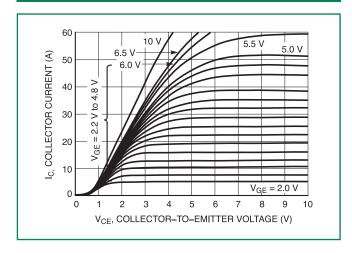


Figure 8. Transfer Characteristics

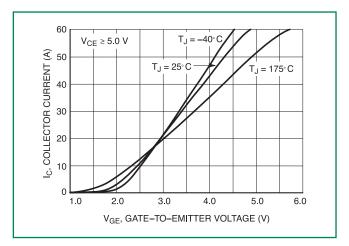


Figure 9. Collector-to-Emitter Leakage Current vs. Temp

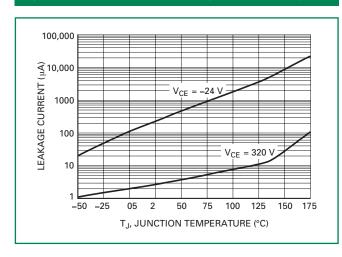


Figure 10. Gate Threshold Voltage vs. Temperature

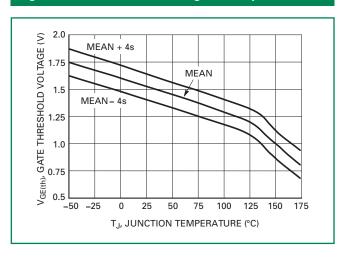


Figure 11. Capacitance Variation

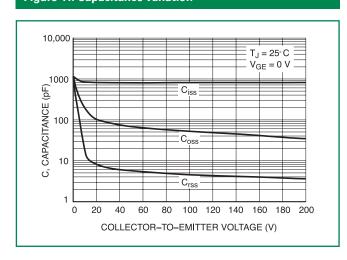


Figure 12. Resistive Switching Time Variation vs. Temperature

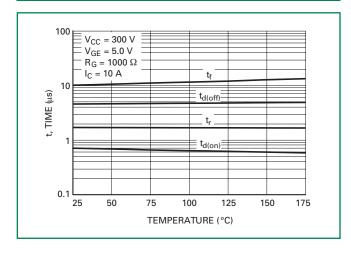




Figure 13. Inductive Switching Time Variation vs. Temperature

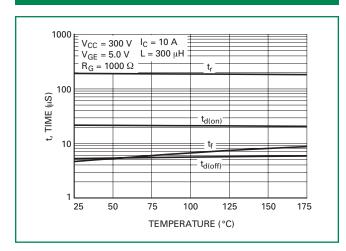


Figure 14. Forward Biased Safe Operating Area

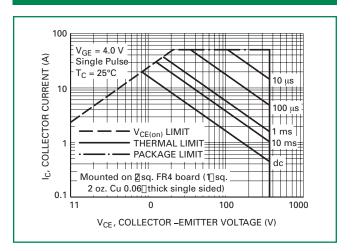
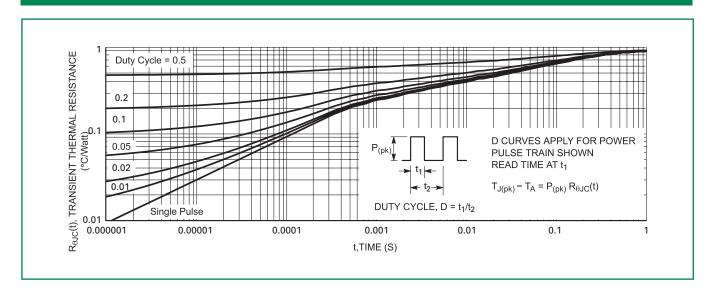
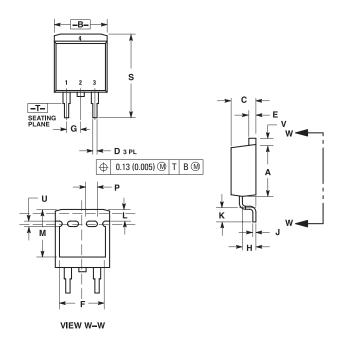


Figure 15. Best Case Transient Thermal Resistance (Non-normalized Junction-to-Case Mounted on Cold Plate)





Dimensions

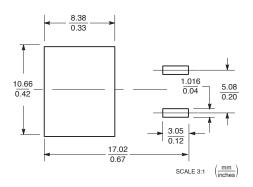


5 .	Inches		Millim	neters	
Dim	Min	Max	Min	Max	
А	0.340	0.380	8.64	9.65	
В	0.380	0.405	9.65	10.29	
С	0.160	0.190	4.06	4.83	
D	0.020	0.035	0.51	0.89	
Е	0.045	0.055	1.14	1.40	
F	0.310	0.350	7.87	8.89	
G	0.100	BSC	2.54 BSC		
Н	0.080	0.110	2.03	2.79	
J	0.018	0.025	0.46	0.64	
K	0.090	0.110	2.29	2.79	
L	0.052	0.072	1.32	1.83	
М	0.280	0.320	7.11	8.13	
N	0.197 REF		5.00 REF		
Р	0.079 REF		2.00 REF		
R	0.039 REF		0.99 REF		
S	0.575	0.625	14.60	15.88	
V	0.045	0.055	1.14	1.40	

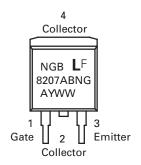
NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- 2. CONTROLLING DIMENSION: INCH.
- 3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

Soldering Footrpint



Part Marking System



NGB8207ABN = Device Code

 $\begin{array}{ll} A = & Assembly \ Location \\ Y = & Year \\ WW & = Work \ Week \\ G = & Pb-Free \ Package \end{array}$

ORDERING INFORMATION

Device	Package	Shipping†
NGB8207BNT4G	D ² PAK (Pb-Free)	800 / Tape & Reel

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 RJH60F3DPQ-A0#T0

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 NGTB75N65FL2WAG
 NGTG15N120FL2WG
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 NTE3320
 FGD3440G2-F085
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 APT35GP120JDQ2
 IKFW40N65ES5XKSA1
 IMBG120R220M1HXTMA1

 IGW30N60H3FKSA1
 STGWA8M120DF3
 IGB30N60H3ATMA1
 IGW100N60H3FKSA1
 IGW75N60H3FKSA1
 HGTG40N60B3

 IRGS4715DPBF
 FGH60N60SMD_F085
 FGH75T65UPD
 STGWA15H120F2
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 IKW25N120T2FKSA1
 IHW20N65R5XKSA1
 IDW40E65D2FKSA1
 STGWT60H65FB
 STGWT60H65DFB
 STGWT40V60DF

 STGWT20V60DF
 STGB10NB37LZT4
 FGH40T70SHD-F155
 FGD3245G2_F085
 NGTB40N65IHL2WG
 HGTG30N60C3D

 HGTG30N60A4D
 HGTG30N60A4D
 HGTG30N60A4D
 HGTG30N60A4D