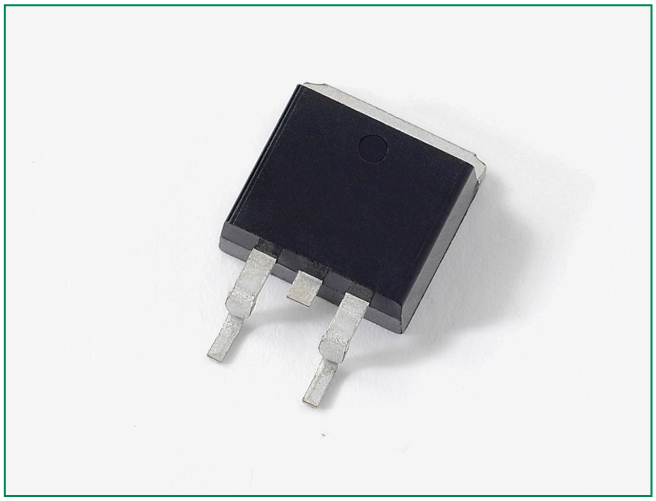
NGB8207ABN - 20 A, 365 V, N-Channel Ignition IGBT,



20 Amps, 365 Volts
V_{CE}(on) ≤ 1.5 V @
I_C = 10A, V_{GE} ≥ 4.5 V

Maximum Ratings and Thermal Characteristics
(T_J = 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	I_G	1.0	mA
Transient Gate Current (t ≤ 2 ms, f ≤ 100 Hz)	I_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.

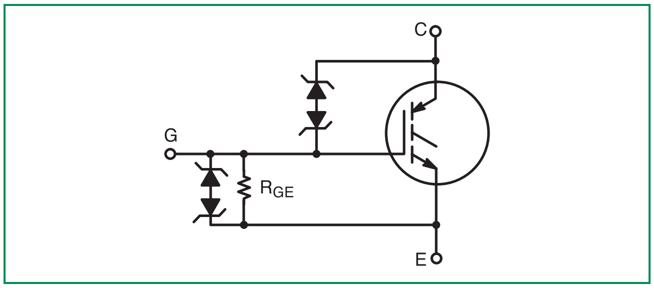
Features

- 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

Datasheet | Resources | Samples

Revised: 02/15/18

Unclamped Collector–To–Emitter Avalanche Characteristics (–55° ≤ T_J ≤ 175°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 kΩ Starting T_J = 25°C	E_{AS}	500	mJ
V_{CC} = 50 V, V_{GE} = 10 V, P_k I_L = 10 A, L = 6.1 mH, Rg = 1 kΩ Starting T_J = 125°C		306	
Reverse Avalanche Energy			
V_{CC} = 100 V, V_{GE} = 20 V, P_k I_L = 25.8 A, L = 6.0 mH, Starting T_J = 25°C	$E_{AS(R)}$	2000	mJ

Thermal Characteristics

	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.9	°C/W
Thermal Resistance, Junction to Ambient (Note 2)	$R_{\theta JA}$	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	Typ	Max	Unit
Collector−Emitter Clamp Voltage	BV_{CES}	I_C = 2.0 mA	T_J = −40°C to 175°C	325	350	375	V
		I_C = 10 mA	T_J = −40°C to 175°C	340	365	390	
Zero Gate Voltage Collector Current	I_{CES}	V_{GE} = 0 V, V_{CE} = 24V	T_J = 25°C	–	0.1	2.0	µA
		V_{CE} = 250V V_{GE} = 0 V	T_J = 25°C	–	1.0	5	
			T_J = 175°C	70	85	150	
			T_J = -40°C	–	0.25	2.5	
Reverse Collector−Emitter Clamp Voltage	$B_{VCES\ (R)}$	I_C = −75 mA	T_J = 25°C	30	33	39	V
			T_J = 175°C	30	36	42	
			T_J = −40°C	29	32	35	
Reverse Collector−Emitter Leakage Current	$I_{CES(R)}$	V_{CE} = −24 V	T_J = 25°C	0.10	0.25	0.85	mA
			T_J = 175°C	20	25	40	
			T_J = −40°C	–	0.03	0.3	
Gate−Emitter Clamp Voltage	BV_{GES}	I_G = ± 5.0 mA	T_J = −40°C to 175°C	12	13	14.5	V
Gate−Emitter Leakage Current	I_{GES}	V_{GE} = ± 10.0 V	T_J = −40°C to 175°C	500	700	1000	µA
Gate Resistor	R_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	Typ	Max	Unit
Gate Threshold Voltage	$V_{GE\ (th)}$	I_C = 1.0 mA, $V_{GE} = V_{CE}$	T_J = 25°C	1.2	1.5	2.0	V
			T_J = 175°C	0.6	0.8	1.2	
			T_J = −40°C	1.4	1.7	2.0	
Threshold Temperature Coefficient (Negative)	–	–	–	12	12	12	mV/°C
Collector−to−Emitter On−Voltage	$V_{GE\ (on)}$	I_C = 6.0 mA, V_{GE} = 4.0 V	T_J = 25°C	1.0	1.3	1.6	V
			T_J = 175°C	0.8	1.1	1.4	
			T_J = −40°C	1.15	1.4	1.75	
		I_C = 10 mA, V_{GE} = 4.5 V	T_J = 25°C	–	0.62	1.0	

*Maximum Value of Characteristic across Temperature Range.

3. Pulse Test: Pulse Width ≤ 300 µS, Duty Cycle ≤ 2%.

Electrical Characteristics - ON (Note 4)

Characteristic	Symbol	Test Conditions	Temperature	Min	Typ	Max	Unit
Collector–to–Emitter On–Voltage	$V_{CE\ (on)}$	I_C = 8.0 A, V_{GE} = 4.0 V	T_J = 25°C	1.1	1.5	1.7	V
			T_J = 175°C	1.0	1.3	1.6	
			T_J = −40°C	1.2	1.5	1.85	
		I_C = 10 A, V_{GE} = 3.7 V	T_J = 25°C	1.2	1.6	1.9	
			T_J = 175°C	1.1	1.45	1.8	
			T_J = −40°C	1.3	1.7	2.0	
		I_C = 10 A, V_{GE} = 4.0 V	T_J = 25°C	1.1	1.5	1.85	
			T_J = 175°C	1.1	1.4	1.75	
			T_J = −40°C	1.35	1.7	2.1	
		I_C = 10 A, V_{GE} = 4.5 V	T_J = 25°C	1.2	1.5	1.8	
			T_J = 175°C	1.1	1.4	1.7	
			T_J = −40°C	1.2	1.6	2.0	
		I_C = 15 A, V_{GE} = 4.0 V	T_J = 25°C	1.45	1.85	2.15	
			T_J = 175°C	1.6	1.9	2.4	
			T_J = −40°C	1.5	1.9	2.25	
		I_C = 20 A, V_{GE} = 4.0V	T_J = 25°C	1.6	2.1	2.6	
			T_J = 175°C	2.0	2.4	3.1	
			T_J = −40°C	1.6	2.1	2.5	
Forward Transconductance	gfs	V_{CE} = 5.0 V, I_C = 6.0 A	T_J = 25°C	–	15.8	–	Mhos

Dynamic Characteristics

Characteristic	Symbol	Test Conditions	Temperature	Min	Typ	Max	Unit
Input Capacitance	C_{ISS}	V_{CE} = 25 V f = 10 kHz	T_J = 25°C	750	810	900	pF
Output Capacitance	C_{OSS}			75	90	105	
Transfer Capacitance	C_{RSS}			4	7	12	

Switching Characteristics

Characteristic	Symbol	Test Conditions	Temperature	Min	Typ	Max	Unit
Turn–On Delay Time (Resistive) Low Voltage	$t_{d\ (on)}$	V_{CE} = 14 V R_L = 1.0 Ω V_{GE} = 5.0 V R_G = 1000 Ω	T_J = 25°C	0.5	0.55	0.7	μSec
Rise Time (Resistive) Low Voltage	t_f		T_J = 25°C	2.0	2.32	2.7	
Turn–Off Delay Time (Resistive) Low Voltage	$t_{d\ (off)}$		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	$t_{d\ (on)}$	V_{CE} = 300 V R_L = 46 Ω V_{GE} = 5.0 V R_G = 1000 Ω	T_J = 25°C	0.5	0.65	0.75	
Rise Time (Resistive) High Voltage	t_r		T_J = 25°C	0.7	1.8	2.0	
Turn–Off Delay Time (Resistive) High Voltage	$t_{d\ (off)}$		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 ≤ 300 μS, Duty Cycle ≤ 2%.
*Maximum Value of Characteristic across Temperature Range.

Ratings and Characteristic Curves

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

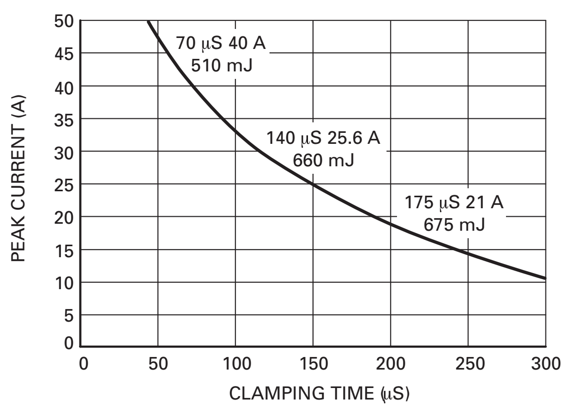


Figure 2. Typical Self Clamped Inductive Switching Performance (SCIS) @ 150°C

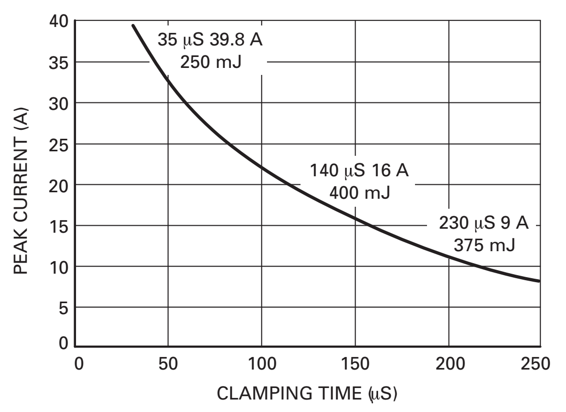


Figure 3. Collector–to–Emitter Voltage vs. Collector Current

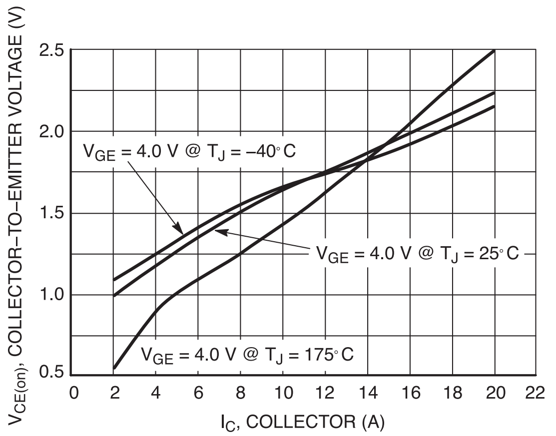


Figure 4. Collector–to–Emitter Voltage vs. Junction Temp

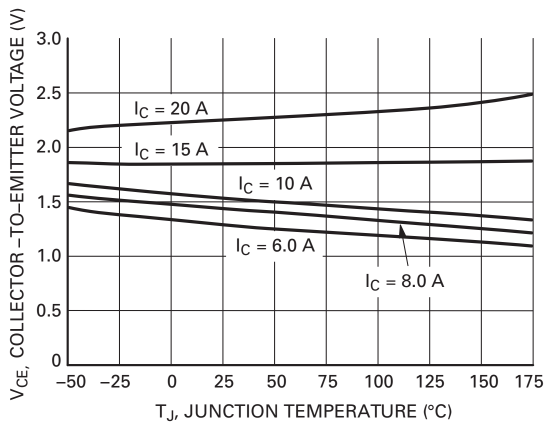


Figure 5. On–Region Characteristics @ T_J = 25°C

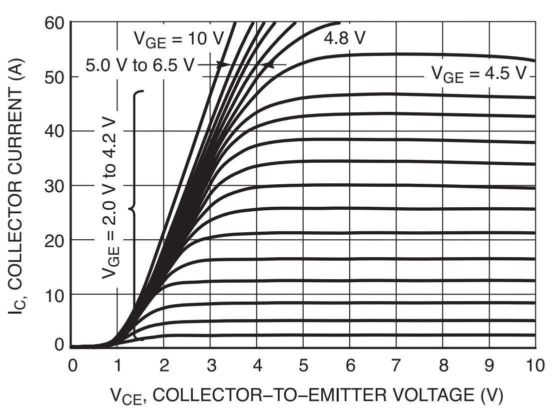


Figure 5. On–Region Characteristics @ T_J = -40°C

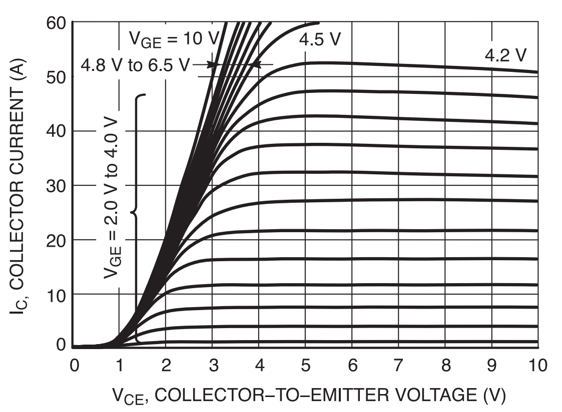


Figure 7. On–Region Characteristics @ T_J = 175°C

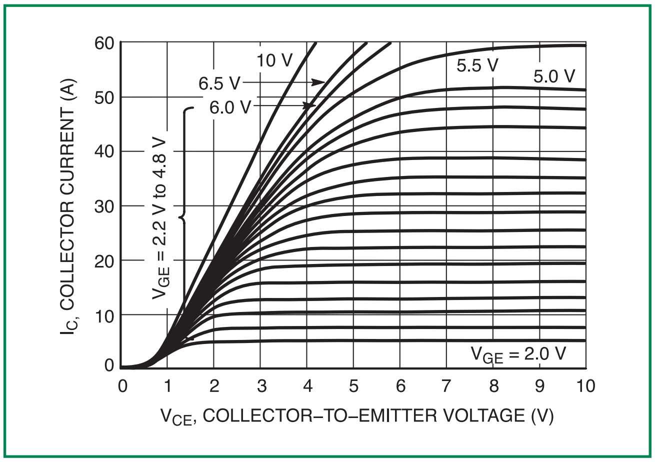


Figure 8. Transfer Characteristics

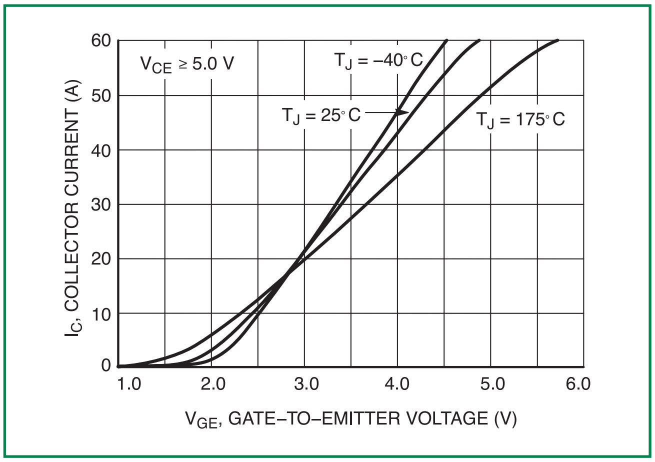


Figure 9. Collector–to–Emitter Leakage Current vs. Temp

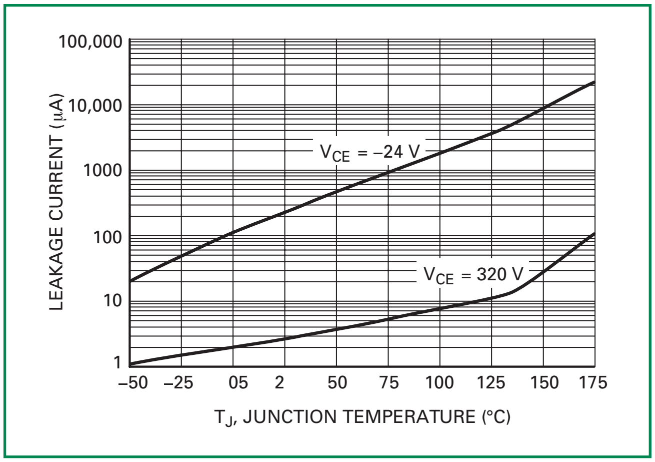


Figure 10. Gate Threshold Voltage vs. Temperature

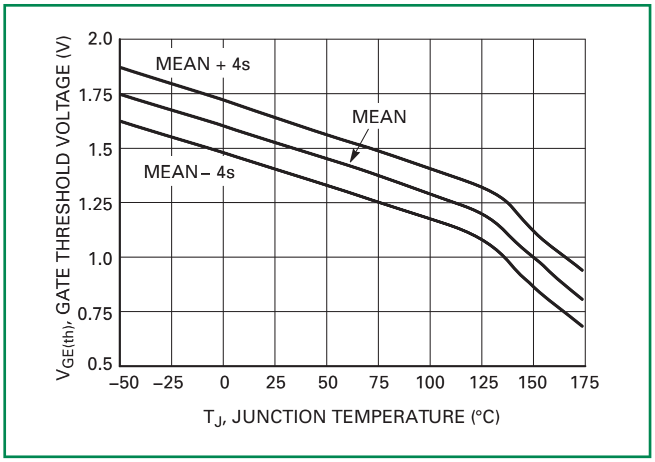


Figure 11. Capacitance Variation

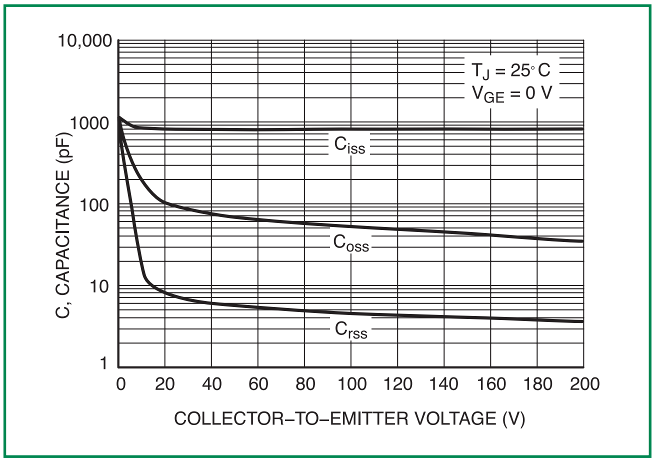


Figure 12. Resistive Switching Time Variation vs. Temperature

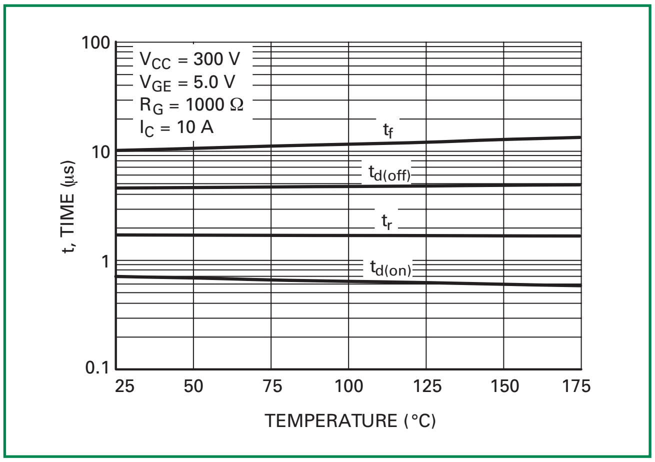


Figure 13. Inductive Switching Time Variation vs. Temperature

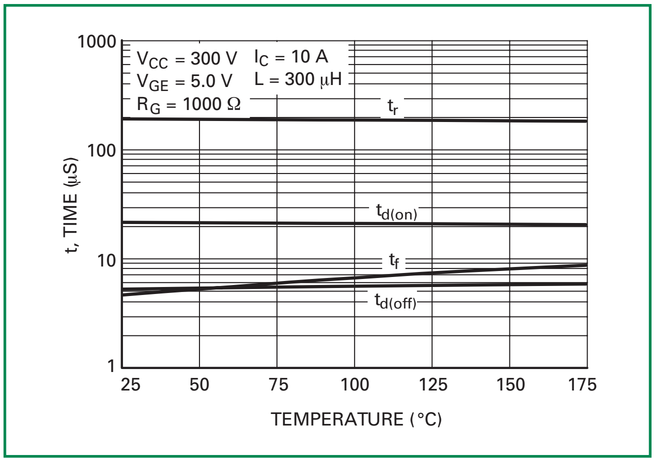


Figure 14. Forward Biased Safe Operating Area

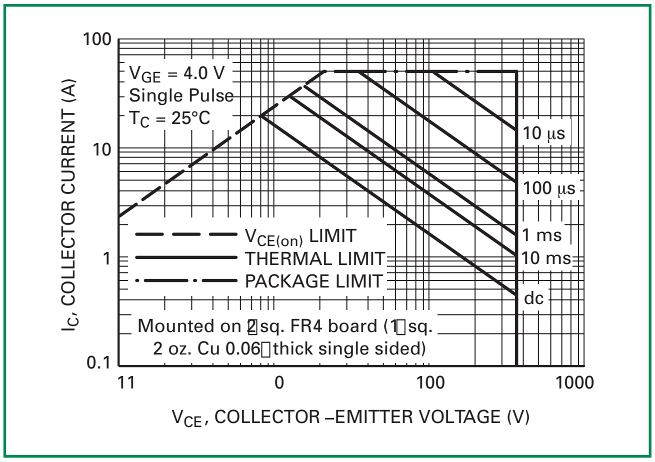
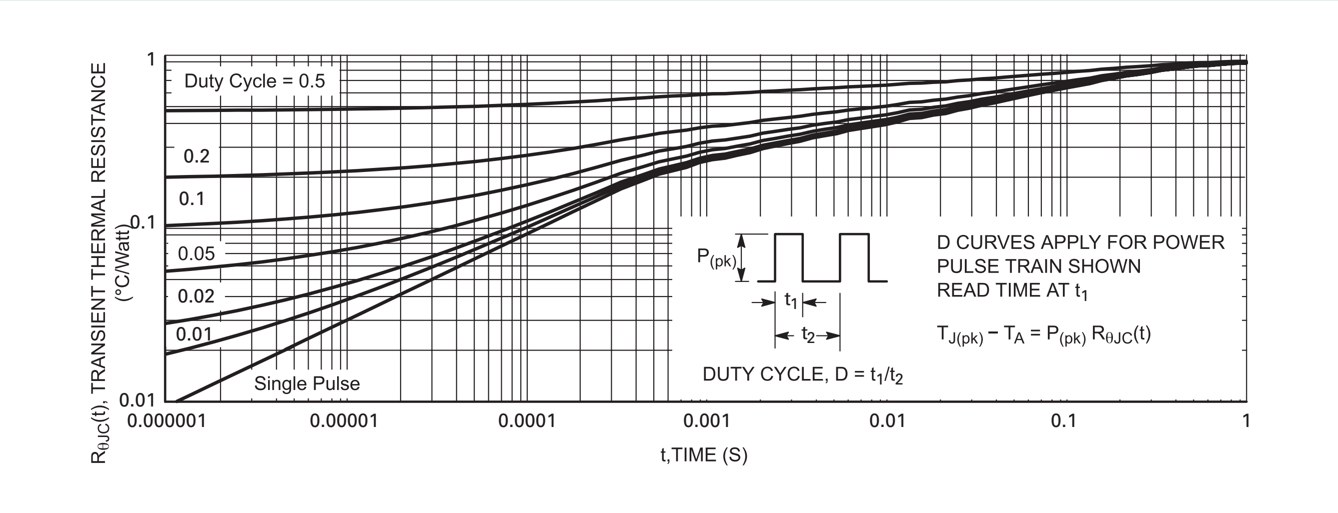
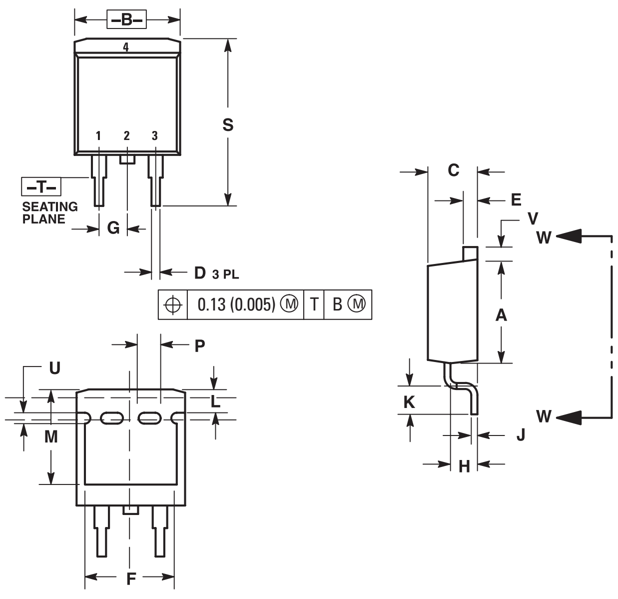


Figure 15. Best Case Transient Thermal Resistance (Non–normalized Junction–to–Case Mounted on Cold Plate)



Dimensions

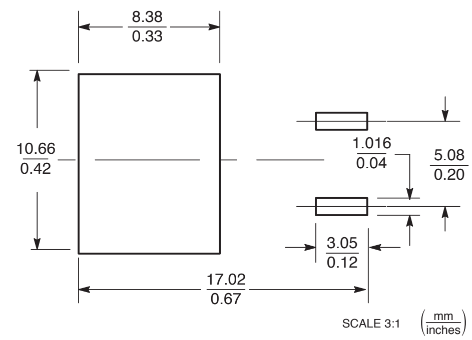


VIEW W–W

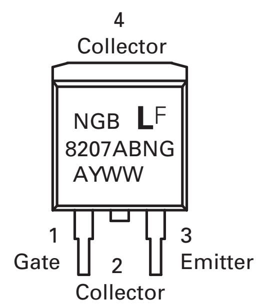
Dim	Inches		Millimeters	
	Min	Max	Min	Max
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
F	0.310	0.350	7.87	8.89
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197 REF		5.00 REF	
P	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

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

ORDERING INFORMATION

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