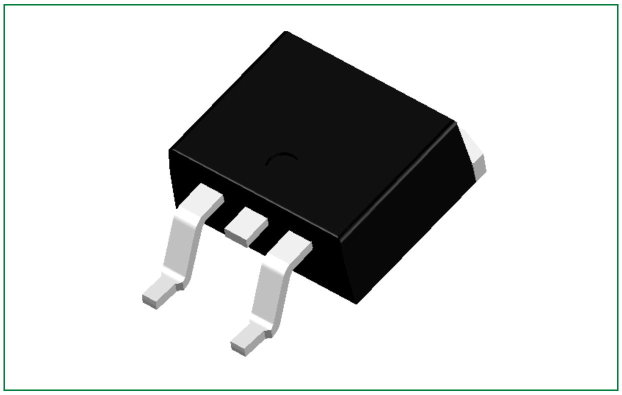
LGB8207TH
365 V, 20 A N-Channel Ignition IGBT



Product Summary

Characteristic	Value	Unit
V_{CES}	365	V
I_C	20	A

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.

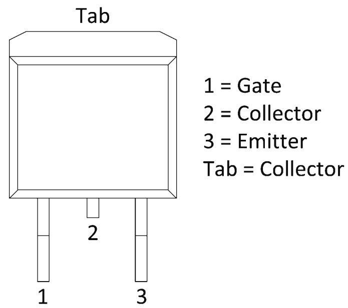
Agency Approvals

Environmental Approvals
Pb

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 Interfaces 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
- AEC-Q101 Qualified
- These are Pb−Free Devices

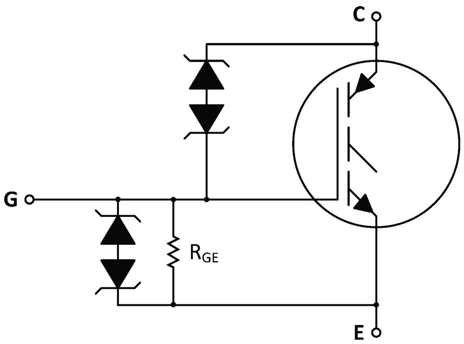
Pinout Diagram



Applications

- Ignition Systems

Functional Diagram



1. Maximum Ratings (T_J = 25 °C unless otherwise specified)

Characteristic	Conditions	Symbol	Value	Unit
Collector-Emitter Voltage	-	V_{CES}	365	V
Gate-Emitter Voltage	-	V_{GE}	±15	V
Collector Current – Continuous	T_C = 25 °C	I_C	20	A_{DC}
Collector Current – Pulsed			50	A_{AC}
Continuous Gate Current	-	I_G	1.0	mA
Transient Gate Current	t < 2 ms, f ≤ 100 Hz		20	mA
ESD – Charged-Device Model	-	ESD	2.0	kV
ESD – Human Body Model	R = 1500 Ω, C = 100 pF		8.0	kV
ESD – Machine Model	R = 0 Ω,C = 200 pF		500	V
Total Power Dissipation	T_C = 25 °C	P_D	165	W
	Derating for >25 °C		1.1	W/°C
Operating and Storage Temperature Range	-	T_J, T_{stg}	-55 to +175	°C

2. Unclamped Collector-to-Emitter Avalanche Characteristics

Characteristic	Symbol	Value	Unit
Single Pulse Collector-to-Emitter Avalanche Energy			
V_{CC} = 50 V, V_{GE} = 5.0 V, P_kI_L = 16.5 A, L = 3.7 mH, R_G = 1 kΩ, Starting T_J = 25 °C	E_{AS}	500	mJ
V_{CC} = 50 V, V_{GE} = 5.0 V, P_kI_L = 10 A, L = 6.1 mH, R_G = 1 kΩ, Starting T_J = 125 °C		306	
Reverse Avalanche Energy			
V_{CC} = 100 V, V_{GE} = 20 V, P_kI_L = 25.8 A, L = 6.0 mH, Starting T_J = 25 °C	$E_{AS(R)}$	2000	mJ

Note: -55 °C ≤ T_J ≤ 150 °C

3. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.9	°C/W
Thermal Resistance, Junction to Ambient (D2PAK)[1]	$R_{\theta JA}$	50	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 5 seconds	T_L	275	°C

Footnote 1: When surface mounted to an FR4 board using the minimum recommended pad size

4. Electrical Characteristics – Off

Characteristic	Symbol	Conditions	Temperature	Value			Unit
				Min	Typ	Max	
Collector-Emitter Clamp Voltage	BV_{CES}	I_C = 2.0 mA	T_J = -40 °C to 150 °C	325	350	375	V
		I_C = 10 mA		340	365	390	
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 24 V, V_{GE} = 0 V	T_J = 25 °C	-	0.1	2.0	µA
		V_{CE} = 250 V, 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 Leakage Current	I_{ECS}	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	
Reverse Collector-Emitter Clamp Voltage	$BV_{CES(R)}$	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	
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-Emitter Resistor	R_{GE}	-	T_J = -40 °C to 175 °C	14.25	16	25	kΩ
Gate Resistor	R_G	-	T_J = -40 °C to 175 °C	-	70	-	Ω

5. Electrical Characteristics – On

Characteristic	Symbol	Conditions	Temperature	Value Min	Value Typ	Value 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-Emitter On-Voltage[2]	$V_{CE(on)}$	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 = 10.0 mA, V_{GE} = 4.5 V	T_J = 25 °C	-	0.62	1.0	
		I_C = 8.0 A, V_{GE} = 4.0 V	T_J = 25 °C	1.1	1.5	1.7	
			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} = 4.0 V	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[2]	gfs	V_{CE} = 5.0 V, I_C = 6.0 A	T_J = 25 °C	-	15.8	-	Mhos

Footnote 2: Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%

6. Dynamic Characteristics

Characteristic	Symbol	Conditions	Temperature	Value			Unit
				Min	Typ	Max	
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	

7. Switching Characteristics

Characteristic	Symbol	Conditions	Temperature	Value			Unit
				Min	Typ	Max	
Low Voltage							
Turn-on Delay Time (Resistive)	$t_{d(on)}$	V_{CE} = 14 V, V_{GE} = 5.0 V, R_G = 1.0 kΩ, R_L = 1.0 Ω	T_J = 25 °C	0.5	0.55	0.7	µs
Rise Time (Resistive)	t_r			2.0	2.32	2.7	
Turn-off Delay Time (Resistive)	$t_{d(off)}$			2.0	2.5	3.0	
Fall Time (Resistive)	t_f			8.0	10	13	
High Voltage							
Turn-on Delay Time (Resistive)	$t_{d(on)}$	V_{CE} = 300 V, V_{GE} = 5.0 V, R_G = 1.0 kΩ, R_L = 46 Ω	T_J = 25 °C	0.5	0.65	0.75	µs
Rise Time (Resistive)	t_r			0.7	1.8	2.0	
Turn-off Delay Time (Resistive)	$t_{d(off)}$			4.0	4.7	6.0	
Fall Time (Resistive)	t_f			6.0	10	15	

8. Figure Data

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

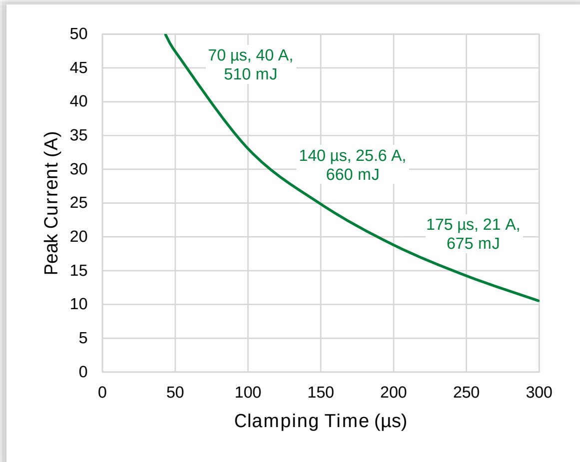


Figure 2. Typical Self Clamped Inductive Switching Performance (SCIS) @ 150 °C

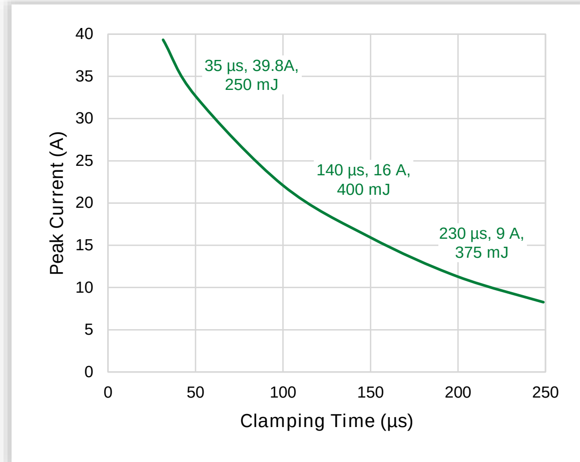


Figure 3. Collector-Emitter Voltage vs. Collector Current

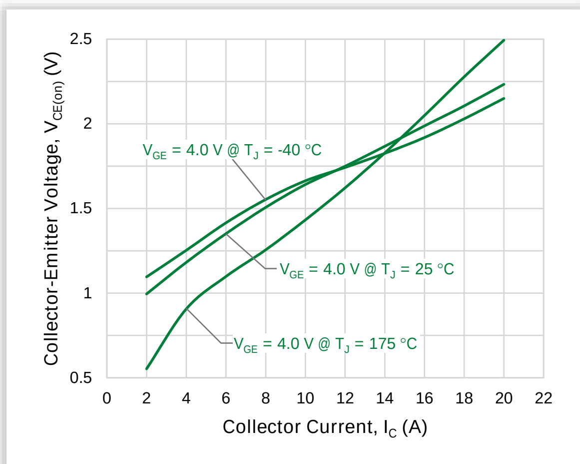


Figure 4. Collector-Emitter Voltage vs. Junction Temperature

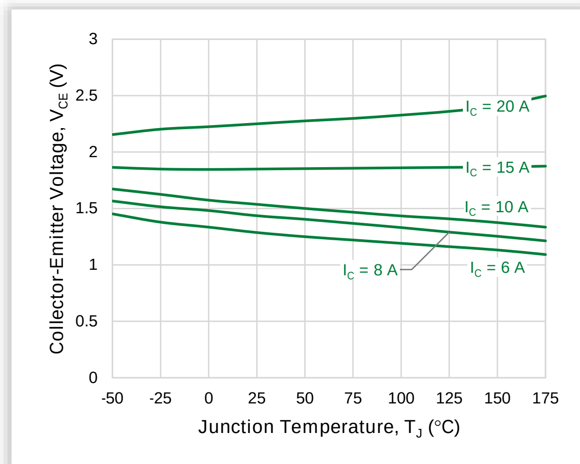


Figure 5. Output Characteristics (T_J = 25 °C)

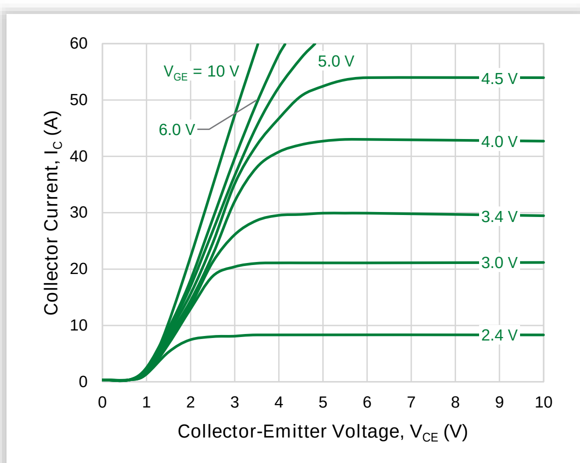


Figure 6. Output Characteristics (T_J = -40 °C)

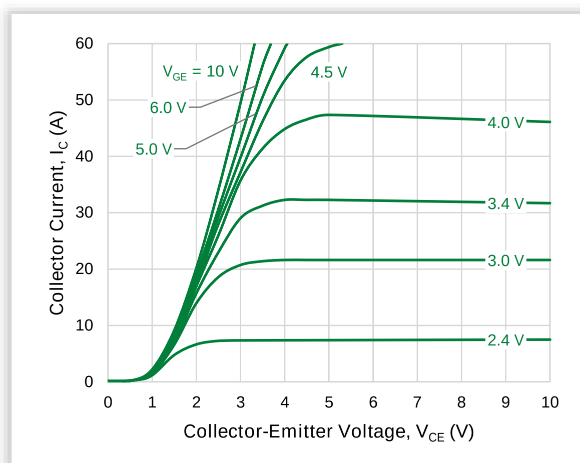


Figure 7. Output Characteristics (T_J = 150 °C)

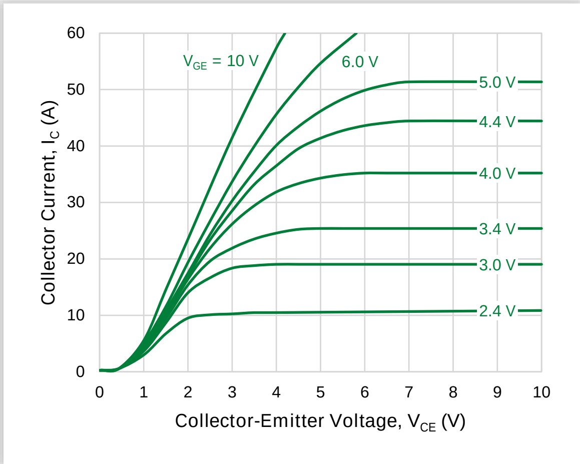


Figure 8. Transfer Characteristics

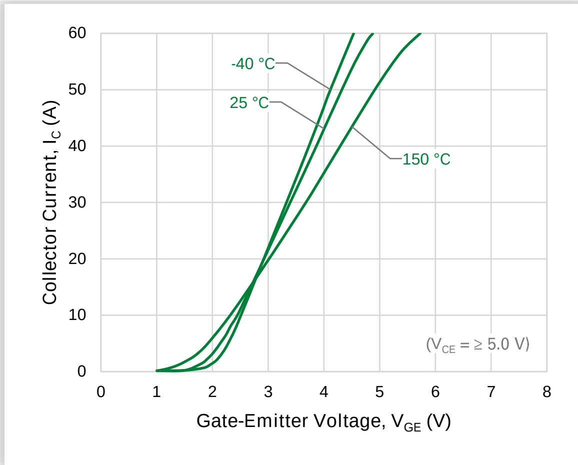


Figure 9. Collector-Emitter Leakage Current vs. Temperature

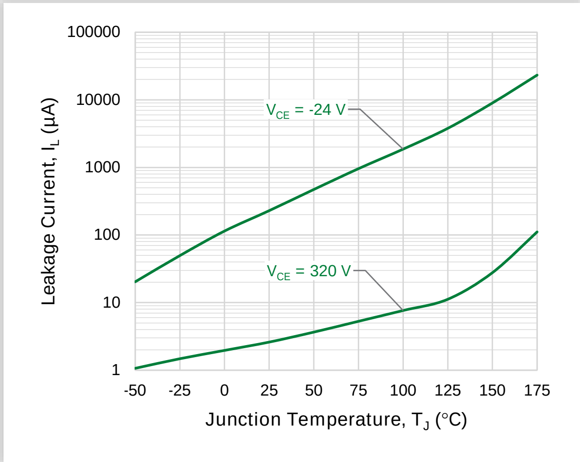


Figure 10. Gate Threshold Voltage vs. Temperature

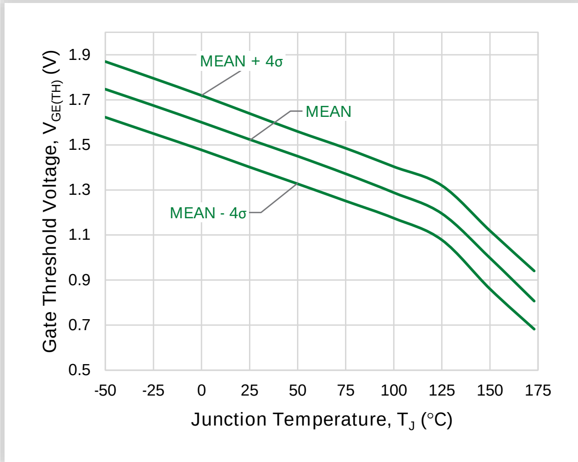


Figure 11. Capacitance Variance

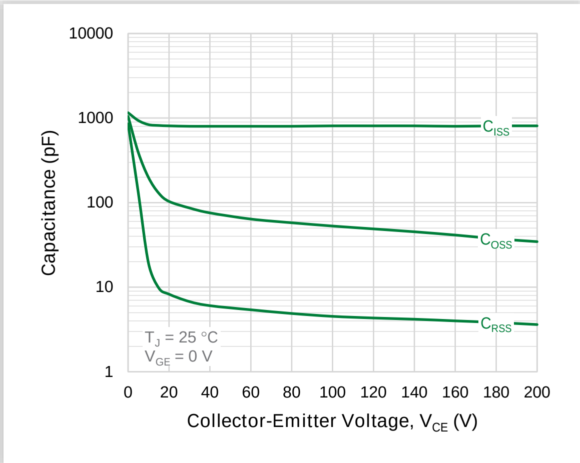


Figure 12. Resistive Switching Time Variation vs. Temperature

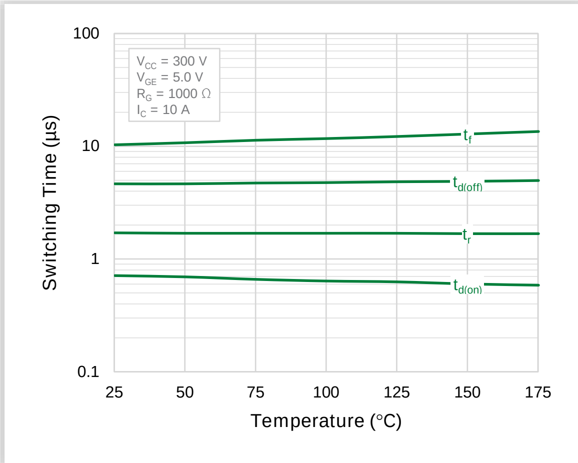


Figure 13. Inductive Switching Time Variation vs. Temperature

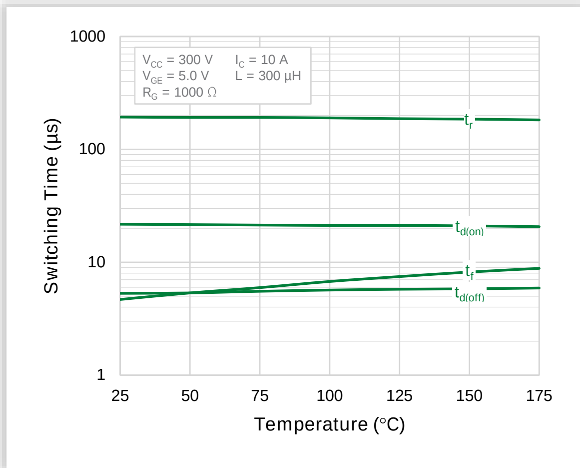


Figure 14. Forward Biased Safe Operating Area

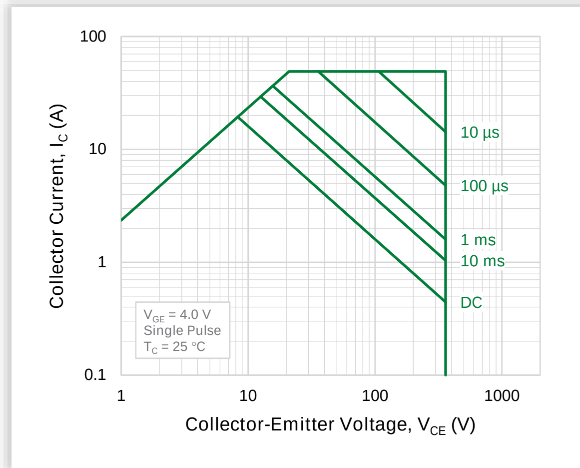
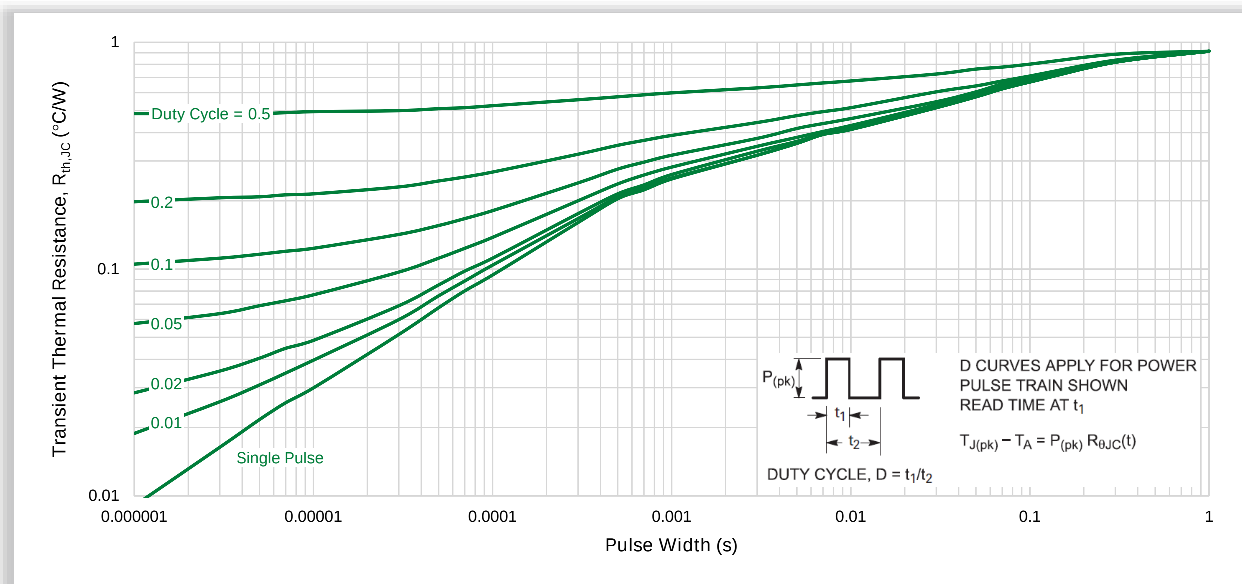
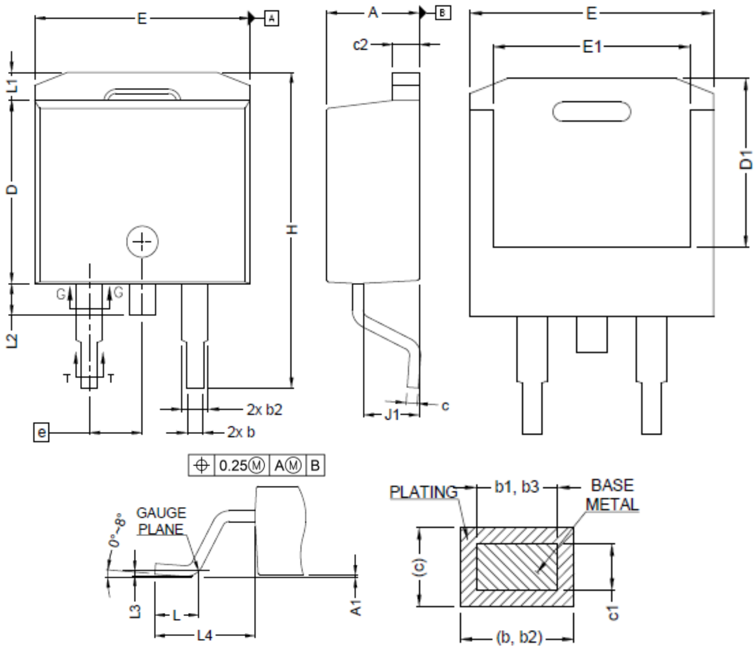


Figure 15. Best Case Transient Thermal Resistance

(Non-normalized Junction-Case mounted on cold plate)



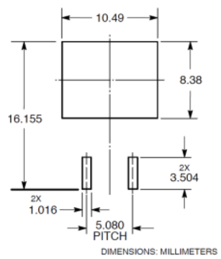
9. Package Dimensions



(Section G-G & TT)

Symbol	Millimeters		
	Min	Nom	Max
A	4.360	-	4.560
A1	0.000	-	0.250
b	0.700	-	0.900
b1	0.510	-	0.890
b2	1.200	-	1.460
b3	1.170	-	1.370
c	0.380	-	0.694
c1	0.380	-	0.534
c2	1.190	-	1.340
D	8.600	-	9.000
D1	6.900	-	7.500
E	10.150	-	10.550
E1	8.100	-	8.700
e	2.540 BSC		
H	15.000	-	15.600
L	1.900	-	2.500
L1	-	-	1.650
L2	-	-	1.780
L3	0.250		
L4	4.780	-	5.280
J1	2.560	-	2.960

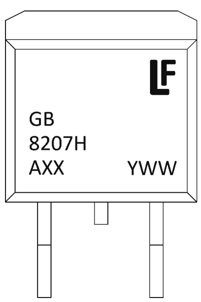
Recommended Solder Pad Layout:



Notes:

1. Dimensioning & tolerancing confirm to ASME Y14.5M-1994.
2. All dimensions are in millimeters. Angles are in degrees.
3. Heatsink side flash is max 0.8 mm.
4. Radius on terminal is optional

10. Part Numbering and Marking



GB8207	= Device Code
A	= Assembly Location
XX	= Lot Number
Y	= Year
WW	= Work Week
H	= Ballast Structure Design

11. Packing Options

Part Number	Package	Packing Mode	M.O.Q.
LGB8207TH	D2PAK (Pb-Free)	Tape & Reel	800

For additional information please visit www.Littelfuse.com/powersemi