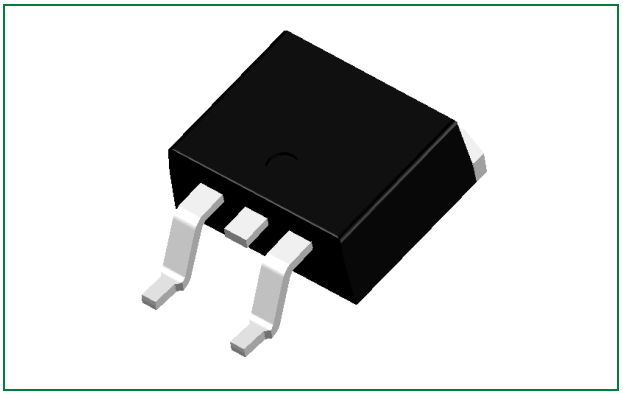
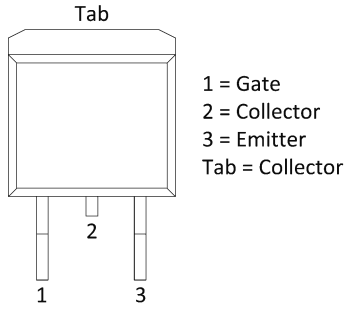
LGB8207TH
365 V, 20 A N-Channel Ignition IGBT



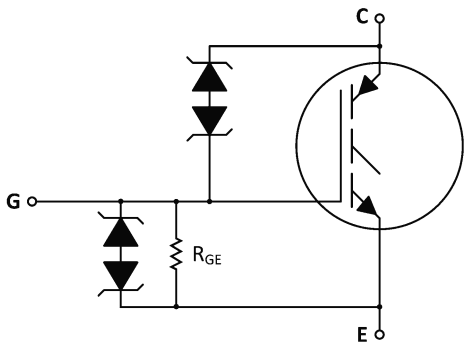
Agency Approvals

Environmental Approvals
Pb

Pinout Diagram



Functional Diagram



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.

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

Applications

- Ignition Systems

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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

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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

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5. Electrical Characteristics – On

Characteristic	Symbol	Conditions	Temperature	Value			Unit
				Min	Typ	Max	
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%

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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	

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8. Figure Data

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

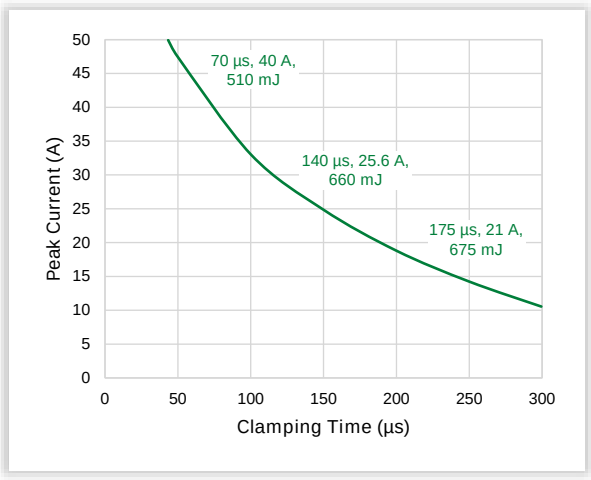

Figure 2. Typical Self Clamped Inductive Switching Performance (SCIS) @ 150 °C

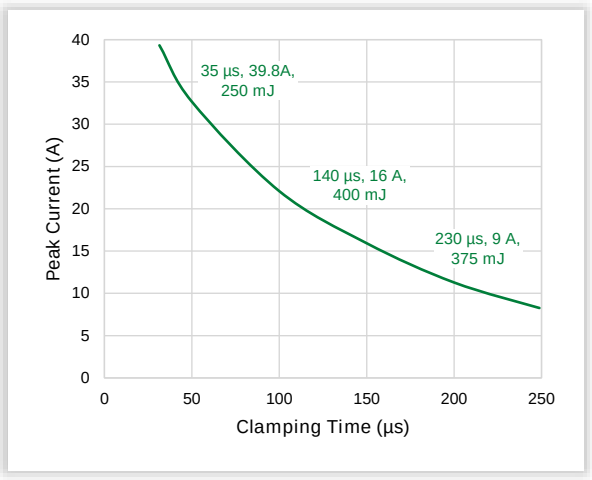

Figure 3. Collector-Emitter Voltage vs. Collector Current

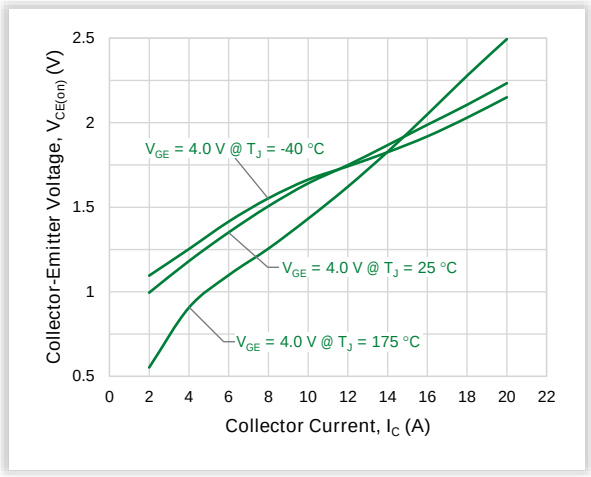

Figure 4. Collector-Emitter Voltage vs. Junction Temperature

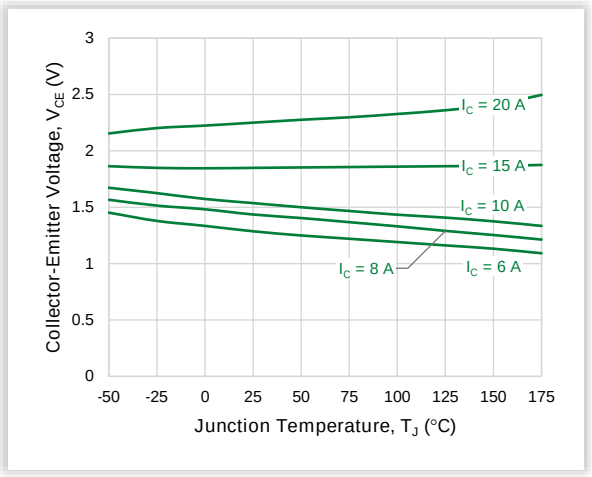

Figure 5. Output Characteristics (T_J = 25 °C)

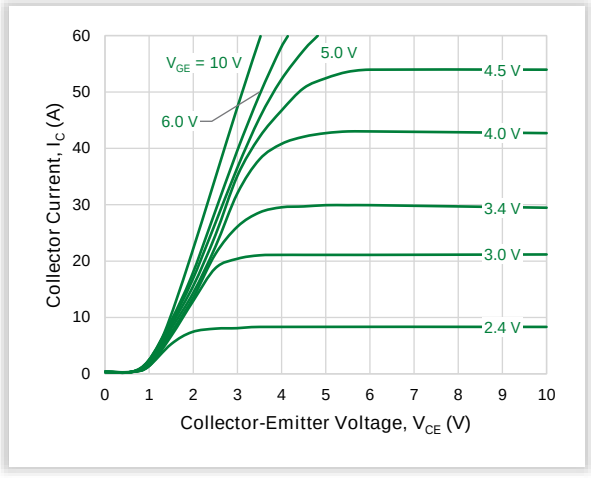

Figure 6. Output Characteristics (T_J = -40 °C)

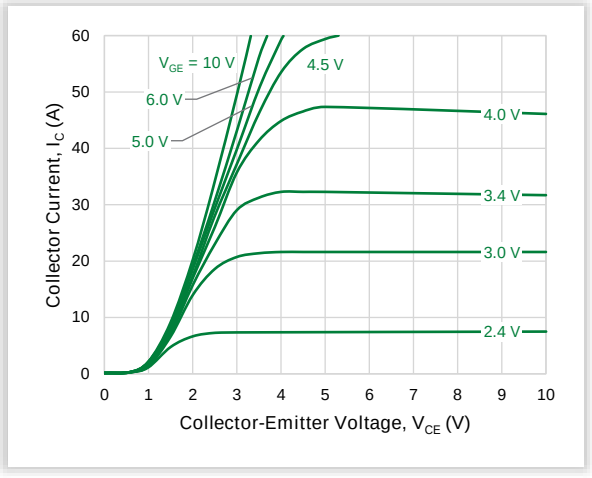

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Figure 7. Output Characteristics (T_J = 150 °C)

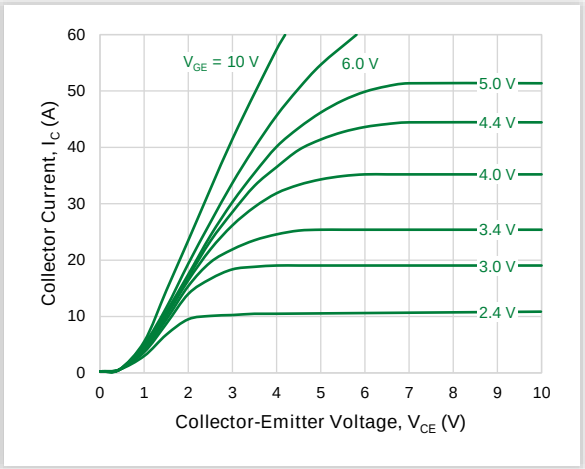

Figure 8. Transfer Characteristics

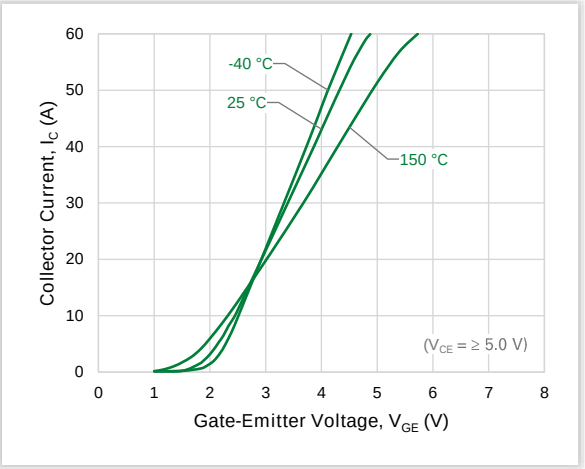

Figure 9. Collector-Emitter Leakage Current vs. Temperature

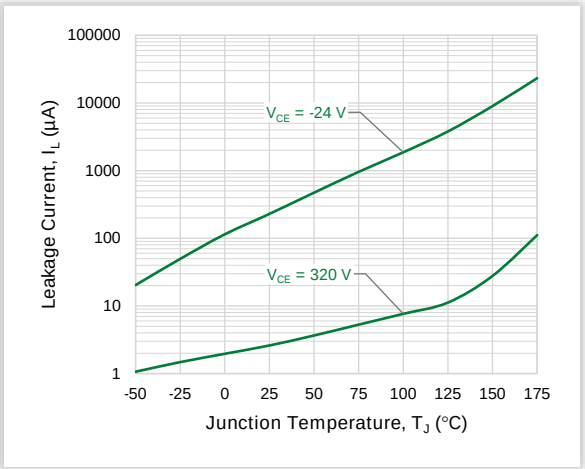

Figure 10. Gate Threshold Voltage vs. Temperature

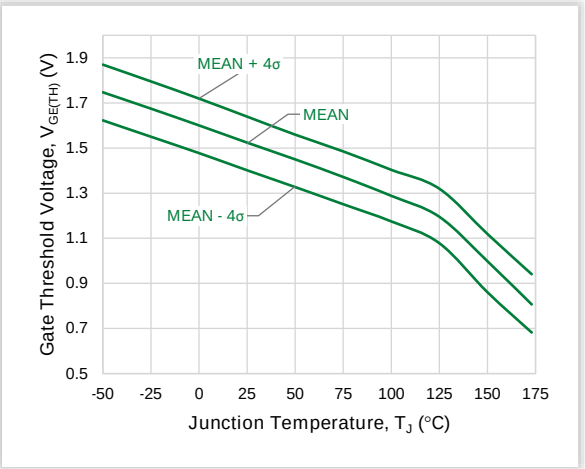

Figure 11. Capacitance Variance

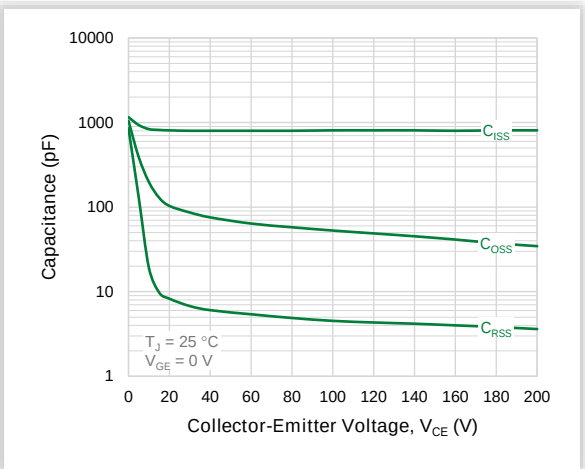

Figure 12. Resistive Switching Time Variation vs. Temperature

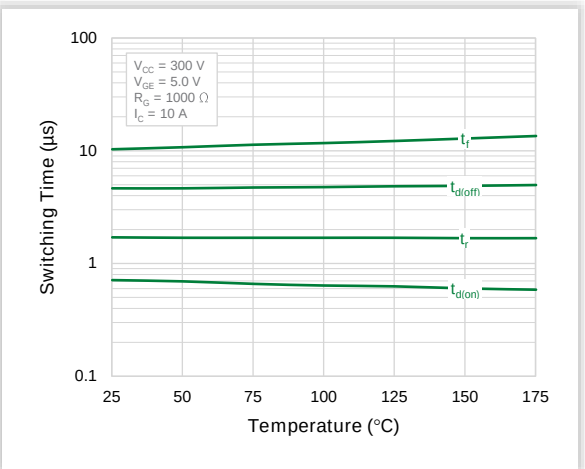

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Figure 13. Inductive Switching Time Variation vs. Temperature

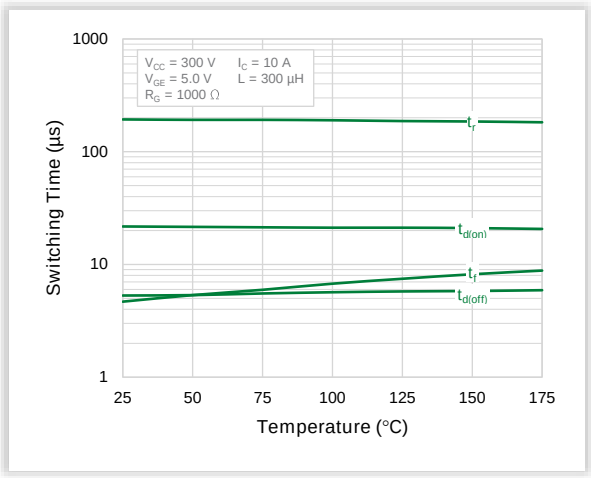


Figure 14. Forward Biased Safe Operating Area

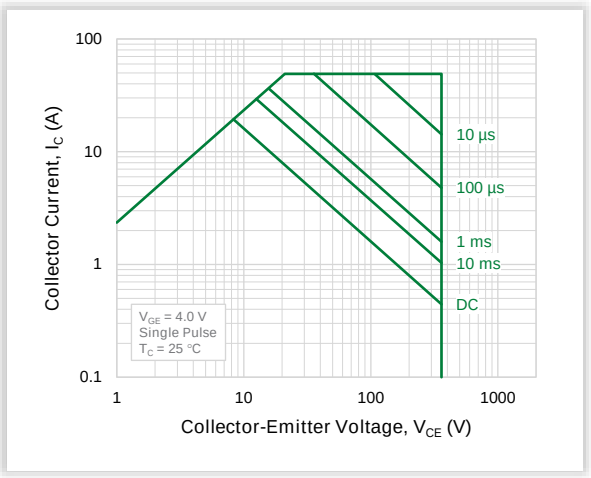
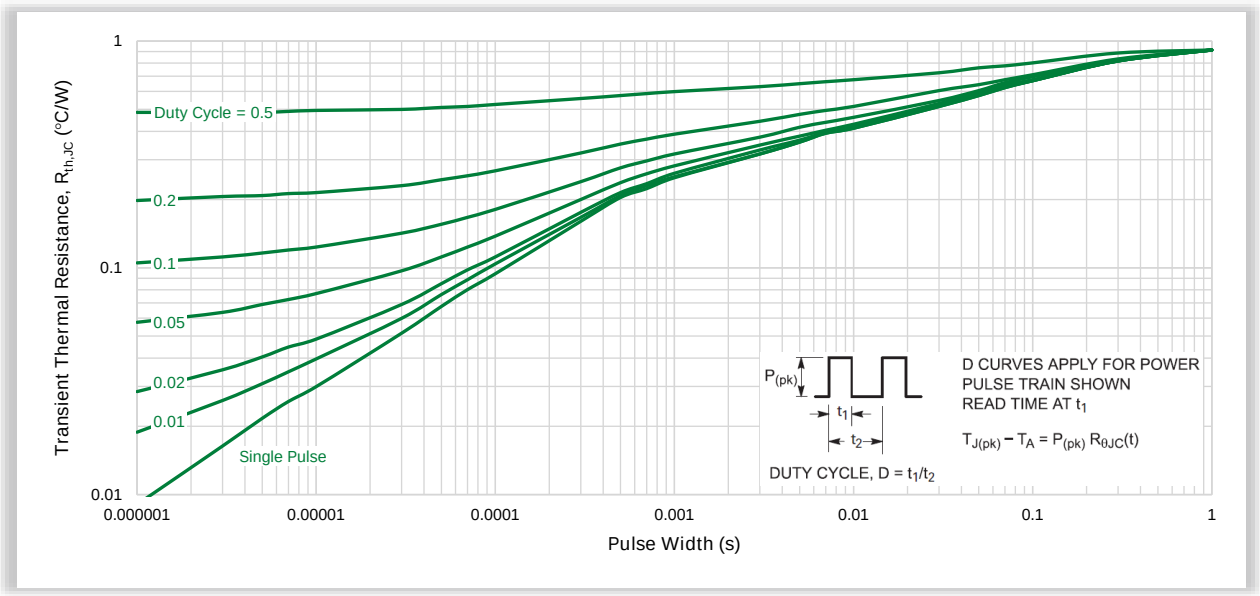


Figure 15. Best Case Transient Thermal Resistance

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



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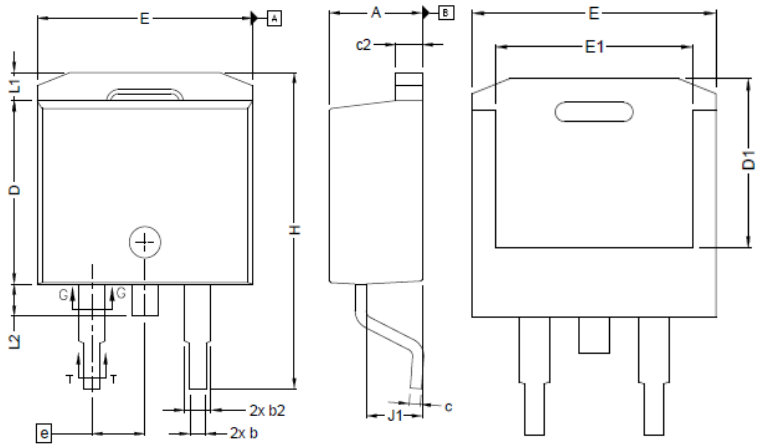
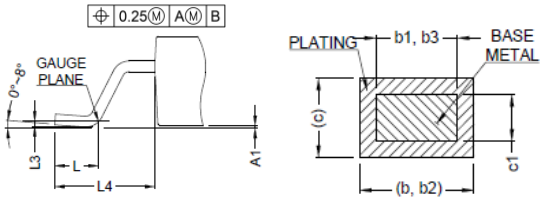
9. Package Dimensions

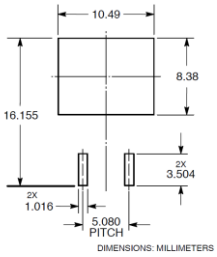




(Section G-G & TT)

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

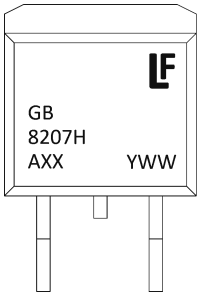
Recommended Solder Pad Layout:



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

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