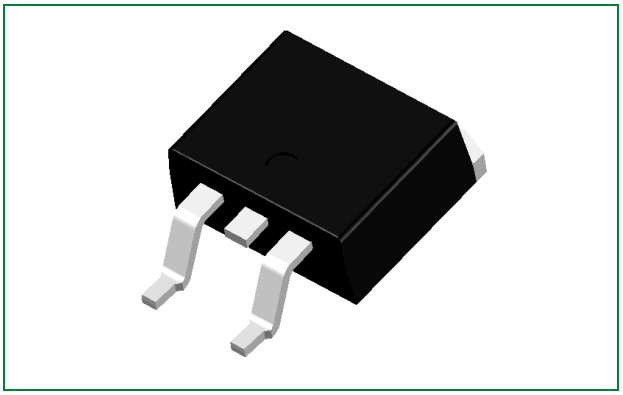
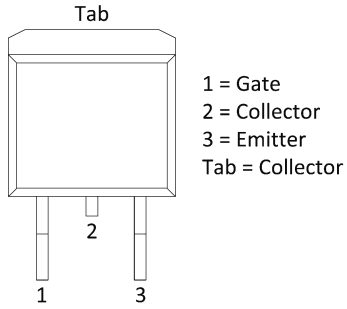
LGB8245TI
450 V, 20 A N-Channel Ignition IGBT



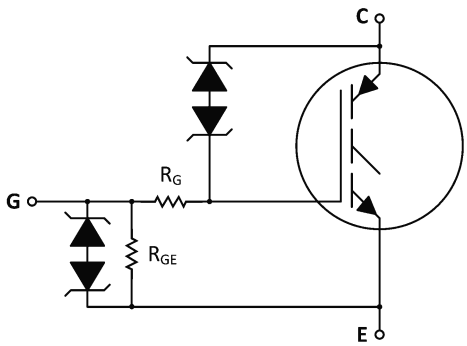
Agency Approvals

Environmental Approvals
Pb

Pinout Diagram



Functional Diagram



Product Summary

Characteristic	Value	Unit
V_{CES}	450	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
- D2PAK Package Offers Smaller Footprint for Increased Board Space
- Gate−Emitter ESD Protection
- Temperature Compensated Gate−Collector Voltage Clamp Limits Stress Applied to Load
- Low Threshold Voltage Interfaces Power Loads to Logic or Microprocessor Devices
- Low Saturation Voltage
- High Pulsed Current Capability
- AEC-Q101 Qualified
- These are Pb−Free Devices

Applications

- Ignition Systems

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

Characteristic	Conditions	Symbol	Value	Unit
Collector-Emitter Voltage	-	V_{CES}	500	V
Gate Voltage	-	V_{CER}	500	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 – Human Body Model	R = 1500 Ω, C = 100 pF	ESD	8.0	kV
ESD – Machine Model	R = 0 Ω,C = 200 pF		500	V
Total Power Dissipation	T_C = 25 °C	P_D	150	W
	Derating for >25 °C		1.0	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 = 9.5 A, L = 3.5 mH, R_G = 1 kΩ, Starting T_C = 150 °C	E_{AS}	158	mJ

Note: -55 °C ≤ T_J ≤ 150 °C

3. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.0	°C/W
Thermal Resistance, Junction to Ambient (D2PAK)[1]	$R_{\theta JA}$	62.5	°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 175 °C	430	450	470	V
		I_C = 10 mA		450	475	500	
Collector-Emitter Clamp Voltage[4]	BV_{CES}	I_C = 12 mA, L= 3.5 mH, R_G = 1 kΩ	T_J = -40 °C to 175 °C	420	450	480	V
Collector-Emitter Leakage Current	I_{CES}	V_{CE} = 15 V, V_{GE} = 0 V	T_J = 25 °C	-	0.002	1.0	µA
		V_{CE} = 250 V, R_G = 1 kΩ	T_J = -40 °C to 175 °C	0.5	2.0	100	
Reverse Collector-Emitter Leakage Current	I_{ECS}	V_{CE} = -24 V	T_J = 25 °C	-	0.4	1.0	mA
			T_J = 175 °C	-	20	35	
			T_J = -40 °C	-	0.04	0.2	
Reverse Collector-Emitter Clamp Voltage	$BV_{CES(R)}$	I_C = -75 mA	T_J = 25 °C	30	33	39	V
			T_J = 175 °C	31	35	40	
			T_J = -40 °C	30	31	37	
Gate-Emitter Clamp Voltage	BV_{GES}	I_G = ±5.0 mA	T_J = -40 °C to 175 °C	12	12.5	14	V
Gate-Emitter Leakage Current	I_{GES}	V_{GE} = ±5.0 V	T_J = -40 °C to 175 °C	200	316	350	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			Unit
				Min	Typ	Max	
Gate Threshold Voltage	$V_{GE(th)}$	I_C = 1.0 mA, V_{GE} = V_{CE}	T_J = 25 °C	1.5	1.8	2.1	V
			T_J = 175 °C	0.7	1.0	1.3	
			T_J = -40 °C	1.7	2.0	2.3	
Threshold Temperature Coefficient (Negative)	-	-	-	4.0	4.6	5.2	mV/°C
Collector-Emitter On-Voltage	$V_{CE(on)}$	I_C = 10 A, V_{GE} = 3.7 V	T_J = -40 °C to 175 °C	0.8	1.11	1.97	V
		I_C = 10 A, V_{GE} = 4.0 V	T_J = -40 °C to 175 °C	0.8	1.10	1.85	
		I_C = 15 A, V_{GE} = 4.0 V	T_J = -40 °C to 175 °C	0.8	1.24	2.00	
Forward Transconductance	gfs	V_{CE} = 5.0 V, I_C = 6.0 A	T_J = 25 °C	10	19	25	Mhos

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	1100	1400	1600	pF
Output Capacitance	C_{OSS}			50	65	80	
Transfer Capacitance	C_{RSS}			15	20	25	

7. Switching Characteristics

Characteristic	Symbol	Conditions	Temperature	Value			Unit
				Min	Typ	Max	
Turn-on Delay Time (Resistive) 10% V_{GE} to 10% I_C	$t_{d(on)R}$	V_{CE} = 14 V, V_{GE} = 5.0 V, R_G = 1.0 kΩ, R_L = 1.0 Ω	T_J = -40 °C to 175 °C	0.1	1.0	2.0	µs
Rise Time (Resistive) 10% I_C to 90% I_C	t_{rR}			1.0	3.4	6.0	
Turn-off Delay Time (Resistive) 90% V_{GE} to 90% I_C	$t_{d(off)R}$			2.0	4.5	8.0	
Fall Time (Resistive) 90% I_C to 10% I_C	t_{fR}			3.0	8.0	12	
Turn-off Delay Time (Inductive) 90% V_{GE} to 90% I_C	$t_{d(off)L}$	V_{CE} = BV_{CES}, L = 0.5 mH, R_G = 1.0 kΩ, I_C = 10 A, V_{GE} = 5.0 V	T_J = -40 °C to 175 °C	6.5	9.7	12.5	µs
Fall Time (Inductive) 90% I_C to 10% I_C	t_{fL}			6.0	8.3	11	

Note: Electrical Characteristics at temperature other than 25 °C, Dynamic and Switching characteristics are not subject to production testing. Not subject to production testing.

8. Figure Data

Figure 1. Self-Clamped Inductive Switching

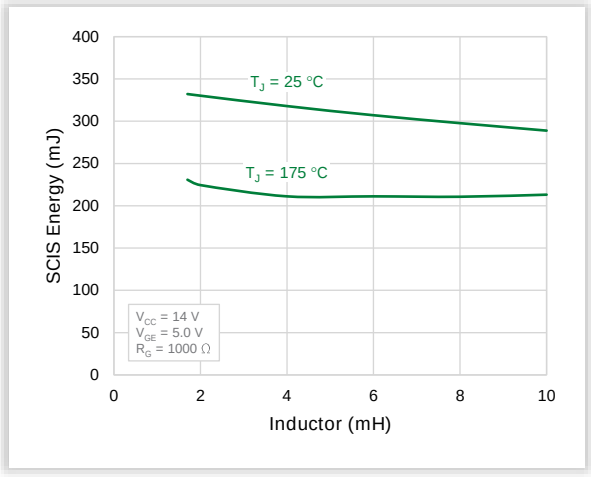


Figure 2. Open Secondary Avalanche Current vs. Temperature

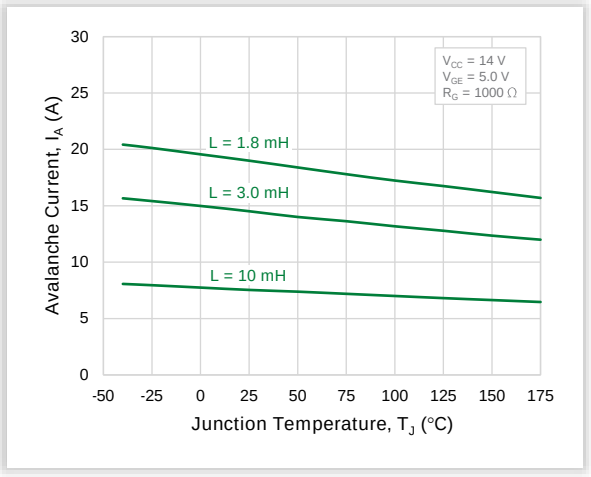


Figure 3. Collector-Emitter Voltage vs. Junction Temperature

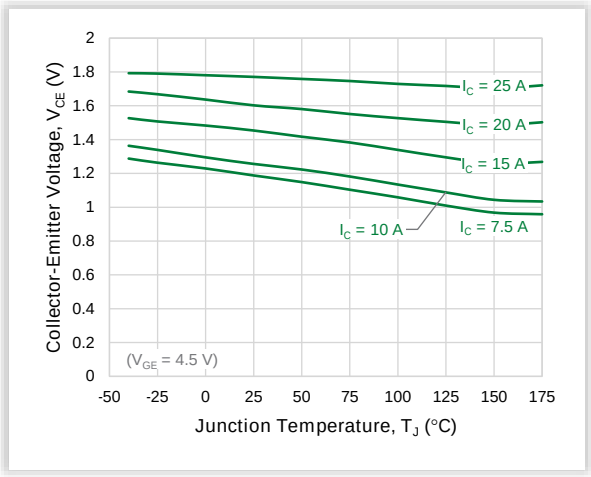


Figure 4. Output Characteristics (T_J = 25 °C)

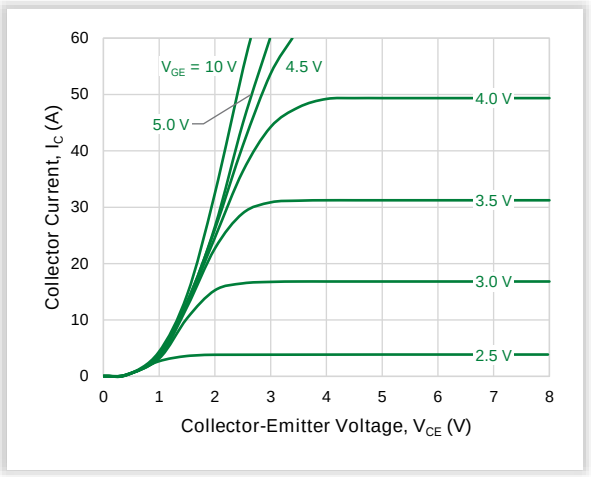


Figure 5. Output Characteristics (T_J = -40 °C)

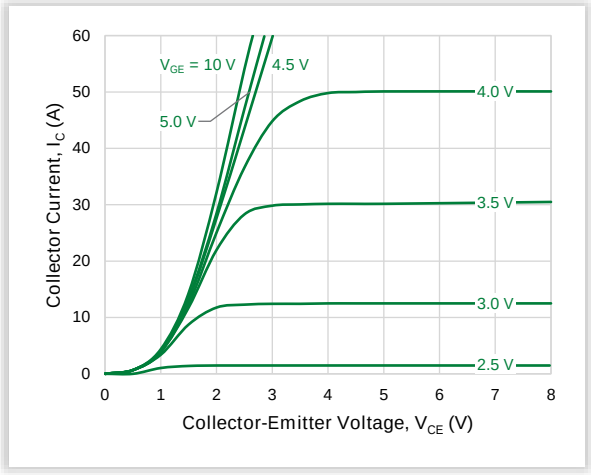


Figure 6. Output Characteristics (T_J = 175 °C)

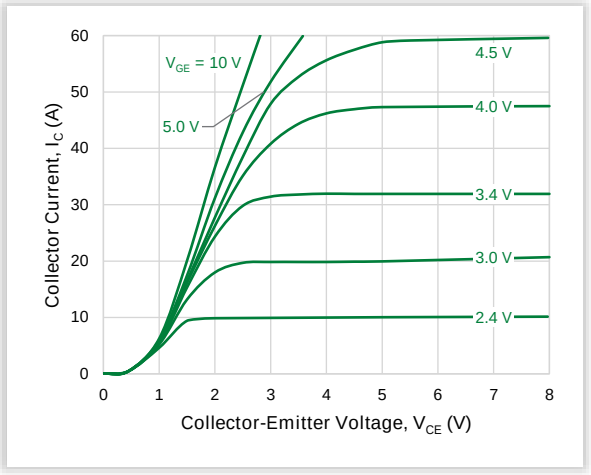


Figure 7. Transfer Characteristics

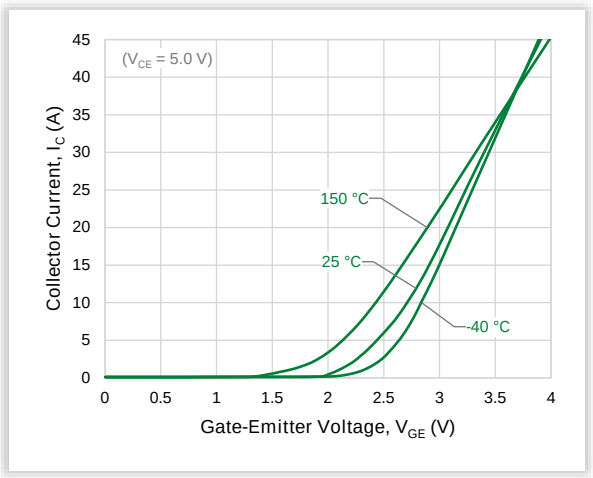


Figure 8. Collector-Emitter Leakage Current vs. Temperature

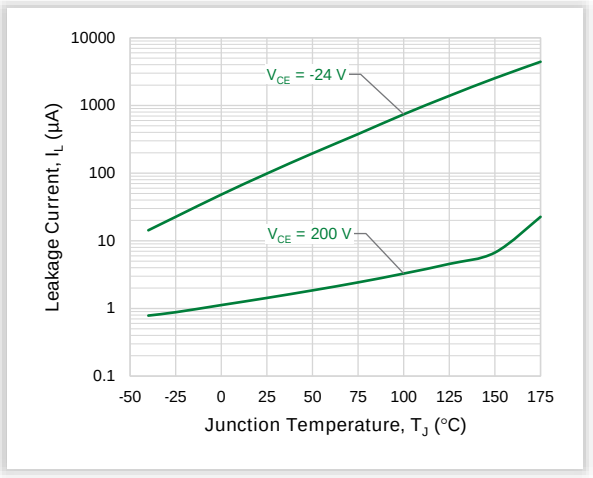


Figure 9. Gate Threshold Voltage vs. Temperature

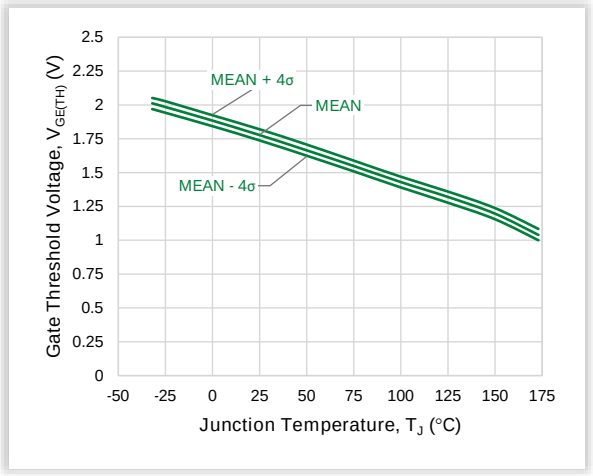


Figure 10. Capacitance Variance

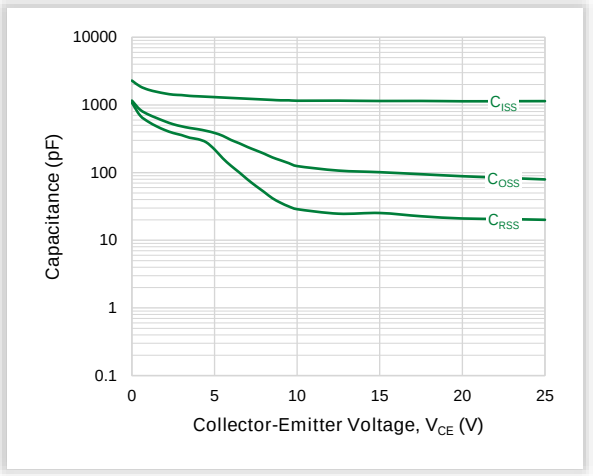


Figure 11. Resistive Switching Fall Time vs. Temperature

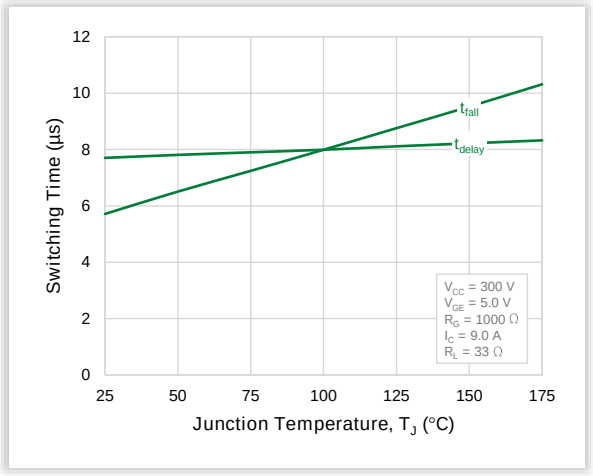


Figure 12. Inductive Switching Fall Time vs. Temperature

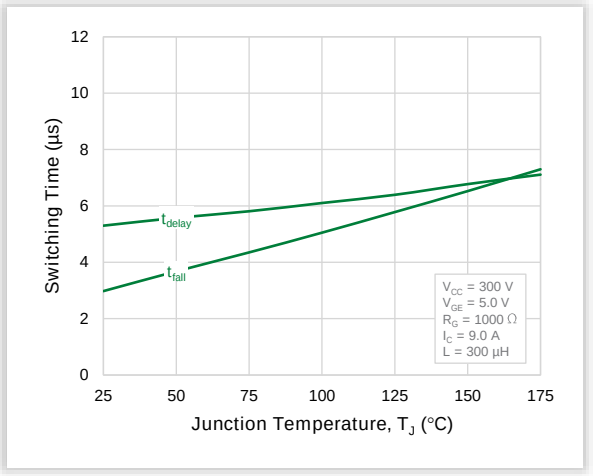


Figure 13. Minimum Pad Transient Thermal Resistance

(Non-normalized Junction-Ambient)

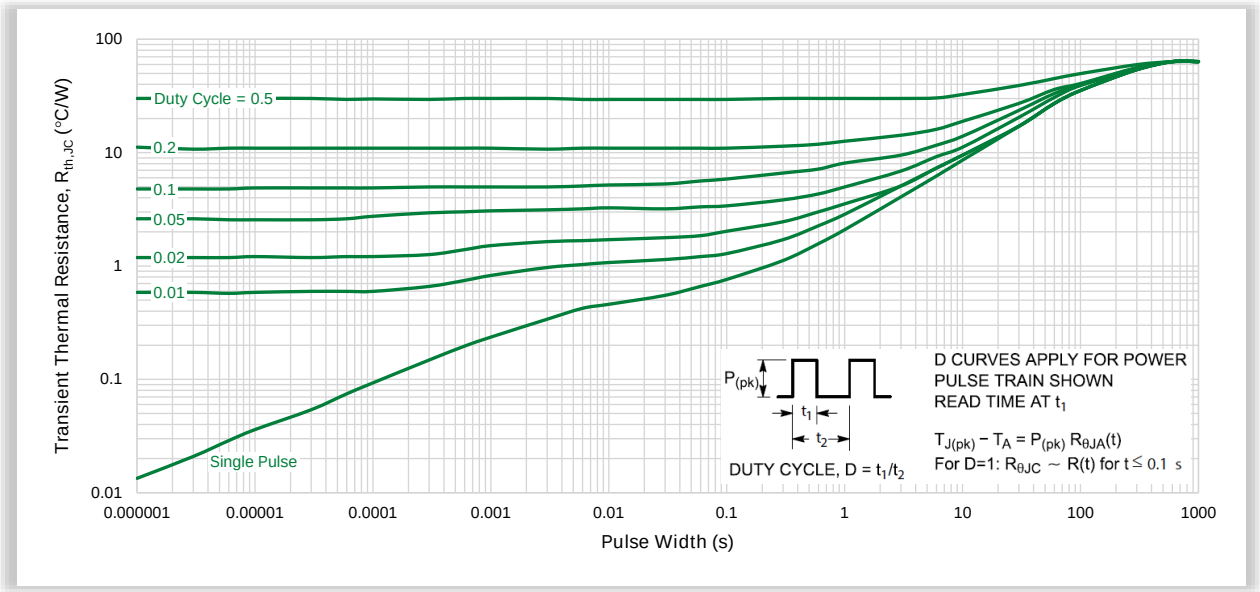
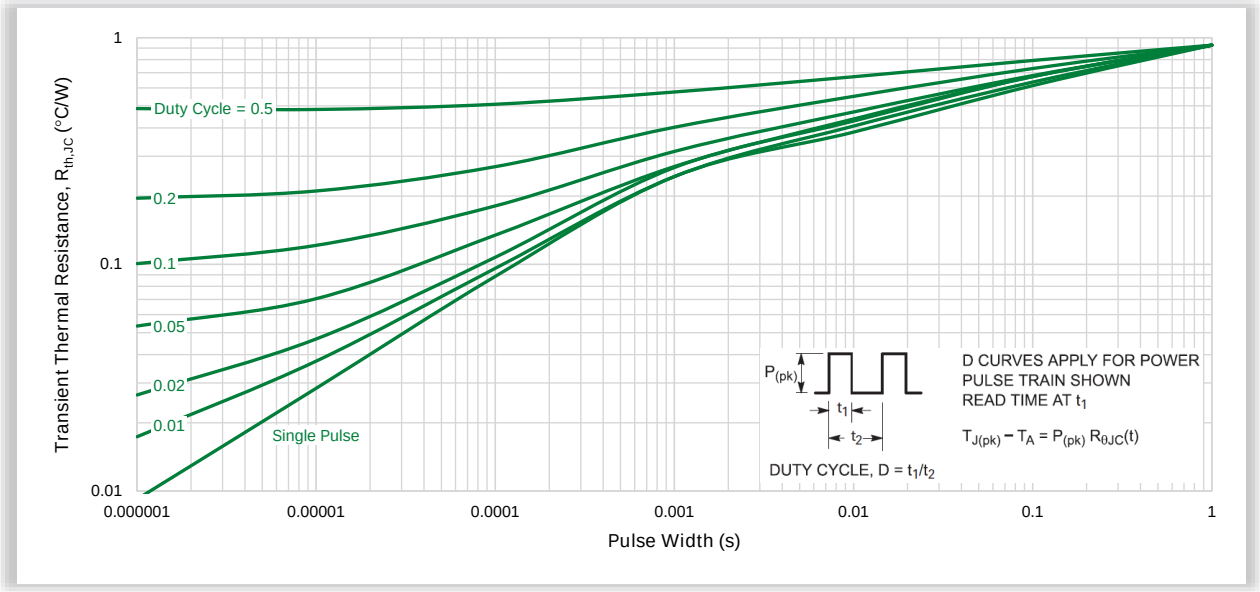
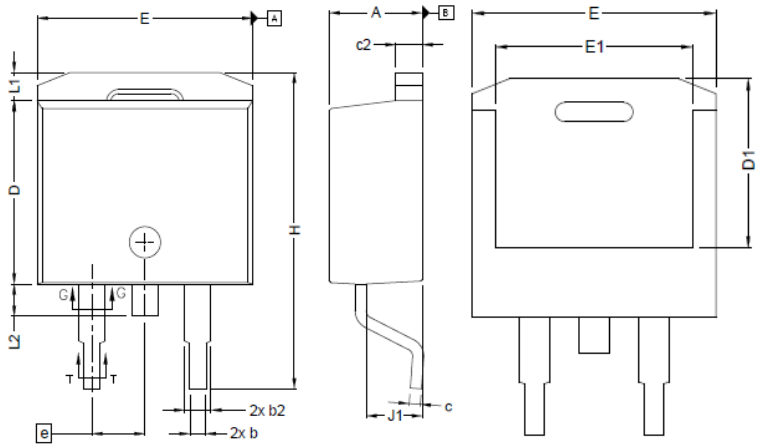


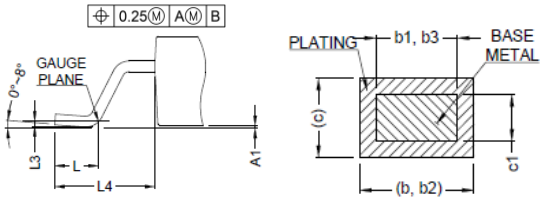
Figure 14. Best Case Transient Thermal Resistance

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



9. Package Dimensions

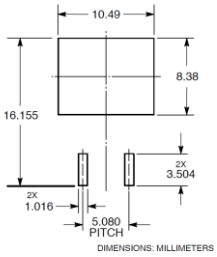




(Section G-G & TT)

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

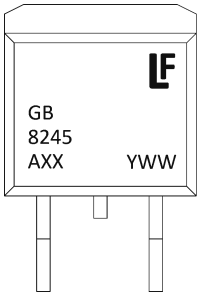
Recommended Solder Pad Layout:



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



GB8245	= Device Code
A	= Assembly Location
XX	= Lot Number
Y	= Year
WW	= Work Week

11. Packing Options

Part Number	Package	Packing Mode	M.O.Q.
LGB8245TI	D2PAK (Pb-Free)	Tape & Reel	800

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