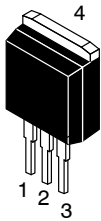




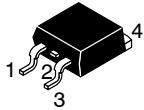
STB1081 Series

Ignition IGBT 350 V 400 mJ Avalanche Energy N-Channel D²PAK and I²PAK

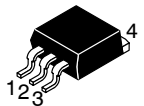
This Logic Level Insulated Gate Bipolar Transistor (IGBT) features monolithic circuitry integrating ESD and Over-Voltage clamped protection for use in inductive coil drivers applications. Primary uses include Ignition, Direct Fuel Injection, or wherever high voltage and high current switching is required.



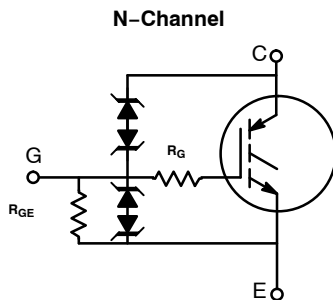
I²PAK
TO-262AA
CASE 418
STYLE 4



D²PAK
TO-263AB
CASE 418B
STYLE 4



D²PAK
CASE 418G
STYLE 1



- Ideal for Coil-On-Plug, IGBT-On-Coil, or Distributorless Ignition System Applications
- High Pulsed Current Capability up to 50 A
- Gate-Emitter ESD Protection
- Temperature Compensated Gate-Collector Voltage Clamp Limits Stress Applied to Load
- Integrated ESD Diode Protection
- Low Threshold Voltage to Interface Power Loads to Logic or Microprocessor Devices
- Low Saturation Voltage
- Optional Gate Resistor (R_G)

ORDERING INFORMATION

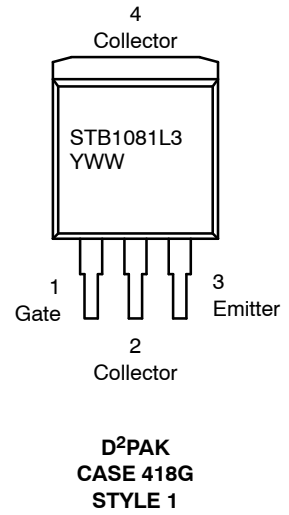
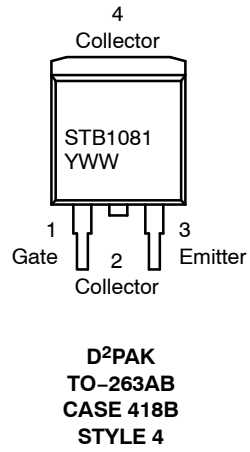
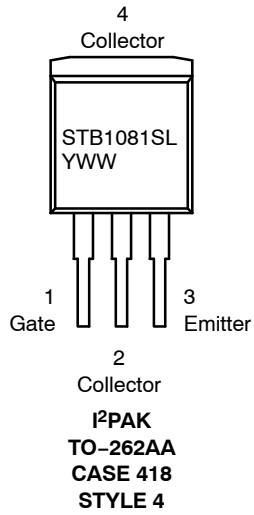
Device	Package	Shipping [†]
STB1081T4	D ² PAK	800 Tape & Reel
STB1081L3T4	D ² PAK	800 Tape & Reel
STB1081L3TF4	D ² PAK	800 Tape & Reel*
STB1081	D ² PAK	50 Units / Rail
STB1081TF4	D ² PAK	800 Tape & Reel*
STB1081SL3	I ² PAK	50 Units / Rail

*Parts mounted face-down in tape & reel.

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

STB1081 Series

MARKING DIAGRAMS & PIN ASSIGNMENTS



STB1081 = Device Code
 Y = Year
 WW = Work Week

STB1081 Series

MAXIMUM RATINGS (–55°C ≤ T_J ≤ 175°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V _{CES}	380	V _{DC}
Collector–Gate Voltage	V _{CER}	380	V _{DC}
Gate–Emitter Voltage	V _{GE}	22	V _{DC}
Collector Current–Continuous @ T _J = 25°C – Pulsed	I _C	15 50	A _{DC} A _{AC}
ESD (Human Body Model) R = 1500 Ω, C = 100 pF	ESD	8.0	kV
ESD (Machine Model) R = 0 Ω, C = 200 pF	ESD	800	V
Total Power Dissipation @ T _J = 25°C Derate above 25°C	P _D	150 1.0	Watts W/°C
Operating and Storage Temperature Range	T _J , T _{stg}	–55 to 175	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

UNCLAMPED COLLECTOR–TO–EMITTER AVALANCHE CHARACTERISTICS (–55°C ≤ T_J ≤ 175°C)

Characteristic	Symbol	Value	Unit
Single Pulse Collector–to–Emitter Avalanche Energy V _{CC} = 50 V, V _{GE} = 5.0 V, Pk I _L = 20 A, L = 2.0 mH, Starting T _J = 25°C V _{CC} = 50 V, V _{GE} = 5.0 V, Pk I _L = 17.4 A, L = 2.0 mH, Starting T _J = 150°C	E _{AS}	400 300	mJ
Reverse Avalanche Energy V _{CC} = 100 V, V _{GE} = 20 V, L = 6.0 mH, Pk I _L = 25.8 A, Starting T _J = 25°C	E _{AS(R)}	2000	mJ

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction–to–Case	R _{θJC}	1.0	°C/W
Thermal Resistance, Junction–to–Ambient TO–220 D ² PAK (Note 1)	R _{θJA}	62.5	
	R _{θJA}	50	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	T _L	275	°C

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

STB1081 Series

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Test Conditions	Temperature	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Collector–Emitter Clamp Voltage	BV_{CES}	$I_C = 2.0 \text{ mA}$	$T_J = -40^\circ\text{C to } 150^\circ\text{C}$	320	350	380	V_{DC}
		$I_C = 10 \text{ mA}$	$T_J = -40^\circ\text{C to } 150^\circ\text{C}$	330	360	380	
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE} = 300 \text{ V}, V_{GE} = 0 \text{ V}$	$T_J = 25^\circ\text{C}$	0	2.0	20	μA_{DC}
			$T_J = 150^\circ\text{C}$	0	10	40*	
			$T_J = -40^\circ\text{C}$	0	0.7	1.5	
Reverse Collector–Emitter Leakage Current	I_{ECS}	$V_{CE} = -24 \text{ V}$	$T_J = 25^\circ\text{C}$	0	0.35	1.0	mA
			$T_J = 150^\circ\text{C}$	0	8.0	15*	
			$T_J = -40^\circ\text{C}$	0	0.05	0.5	
Reverse Collector–Emitter Clamp Voltage	$B_{VCE(S)}$	$I_C = -75 \text{ mA}$	$T_J = 25^\circ\text{C}$	25	33	50*	V_{DC}
			$T_J = 150^\circ\text{C}$	25	36	50*	
			$T_J = -40^\circ\text{C}$	25	30	50*	
Gate–Emitter Clamp Voltage	BV_{GES}	$I_G = 5.0 \text{ mA}$	$T_J = -40^\circ\text{C to } 150^\circ\text{C}$	17	20	22	V_{DC}
Gate–Emitter Leakage Current	I_{GES}	$V_{GE} = 10 \text{ V}$	$T_J = -40^\circ\text{C to } 150^\circ\text{C}$	384	600	1000	μA_{DC}
Gate Resistor (Optional)	R_G	–	$T_J = -40^\circ\text{C to } 150^\circ\text{C}$	0	70	400	Ω
Gate Emitter Resistor	R_{GE}	–	$T_J = -40^\circ\text{C to } 150^\circ\text{C}$	10	16	26	$\text{k}\Omega$

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GE(th)}$	$I_C = 1.0 \text{ mA}, V_{GE} = V_{CE}$	$T_J = 25^\circ\text{C}$	1.4	1.7	2.0	V_{DC}
			$T_J = 150^\circ\text{C}$	0.75	1.1	1.4	
			$T_J = -40^\circ\text{C}$	1.6	1.9	2.1*	
Threshold Temperature Coefficient (Negative)	–	–	–	2.0	4.4	6.0	$\text{mV}/^\circ\text{C}$
Collector–to–Emitter On–Voltage	$V_{CE(on)}$	$I_C = 6.0 \text{ A}, V_{GE} = 4.0 \text{ V}$	$T_J = 25^\circ\text{C}$	1.0	1.3	1.6	V_{DC}
			$T_J = 150^\circ\text{C}$	0.9	1.2	1.5	
			$T_J = -40^\circ\text{C}$	1.1	1.4	1.7*	
		$I_C = 10 \text{ A}, V_{GE} = 4.0 \text{ V}$	$T_J = 25^\circ\text{C}$	1.3	1.6	1.9*	
			$T_J = 150^\circ\text{C}$	1.2	1.5	1.8	
			$T_J = -40^\circ\text{C}$	1.3	1.6	1.9*	
		$I_C = 15 \text{ A}, V_{GE} = 4.0 \text{ V}$	$T_J = 25^\circ\text{C}$	1.6	1.95	2.15	
			$T_J = 150^\circ\text{C}$	1.7	2.0	2.2*	
			$T_J = -40^\circ\text{C}$	1.6	1.9	2.1	
		$I_C = 20 \text{ A}, V_{GE} = 4.0 \text{ V}$	$T_J = 25^\circ\text{C}$	1.9	2.2	2.4	
			$T_J = 150^\circ\text{C}$	2.1	2.4	2.6*	
			$T_J = -40^\circ\text{C}$	1.85	2.15	2.35	
		$I_C = 25 \text{ A}, V_{GE} = 4.0 \text{ V}$	$T_J = 25^\circ\text{C}$	2.1	2.5	2.8	
			$T_J = 150^\circ\text{C}$	2.5	2.9	3.2*	
			$T_J = -40^\circ\text{C}$	2.0	2.4	2.7	

2. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.

*Maximum Value of Characteristic across Temperature Range.

STB1081 Series

ELECTRICAL CHARACTERISTICS (continued)

Characteristic	Symbol	Test Conditions	Temperature	Min	Typ	Max	Unit
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ON CHARACTERISTICS (continued) (Note 3)

Collector On-State Current	$I_{C(ON)}$	$V_{GE} = 4.0 \text{ V}$	$T_J = 25^\circ\text{C}$	30	37	55	A_{DC}
			$T_J = 150^\circ\text{C}$	25	31	50	
Forward Transconductance	g_{fs}	$V_{CE} = 5.0 \text{ V}, I_C = 6.0 \text{ A}$	$T_J = -40^\circ\text{C to } 150^\circ\text{C}$	8.0	18	25	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	C_{ISS}	$V_{CC} = 25 \text{ V}, V_{GE} = 0 \text{ V}$ $f = 1.0 \text{ MHz}$	$T_J = -40^\circ\text{C to } 150^\circ\text{C}$	700	1000	1300	pF
Output Capacitance	C_{OSS}			70	100	130	
Transfer Capacitance	C_{RSS}			2.0	5.0	8.0	

SWITCHING CHARACTERISTICS (Note 3)

Turn-Off Delay Time (Inductive)	$t_{d(off)}$	$V_{CC} = 300 \text{ V}, I_C = 6.5 \text{ A}$ $R_G = 1.0 \text{ k}\Omega, L = 300 \mu\text{H}$	$T_J = 25^\circ\text{C}$	0	4.0	10*	μSec
			$T_J = 150^\circ\text{C}$	0	4.5	10*	
Fall Time (Inductive)	t_f	$V_{CC} = 300 \text{ V}, I_C = 6.5 \text{ A}$ $R_G = 1.0 \text{ k}\Omega, L = 300 \mu\text{H}$	$T_J = 25^\circ\text{C}$	0	7.0	10	
			$T_J = 150^\circ\text{C}$	0	10	15*	
Turn-Off Delay Time (Resistive)	$t_{d(off)}$	$V_{CC} = 300 \text{ V}, I_C = 6.5 \text{ A}$ $R_G = 1.0 \text{ k}\Omega, R_L = 46 \Omega$	$T_J = 25^\circ\text{C}$	0	4.0	10*	μSec
			$T_J = 150^\circ\text{C}$	0	4.5	10*	
Fall Time (Resistive)	t_f	$V_{CC} = 300 \text{ V}, I_C = 6.5 \text{ A}$ $R_G = 1.0 \text{ k}\Omega, R_L = 46 \Omega$	$T_J = 25^\circ\text{C}$	0	13	20*	
			$T_J = 150^\circ\text{C}$	0	16	20*	
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 10 \text{ V}, I_C = 6.5 \text{ A}$ $R_G = 1.0 \text{ k}\Omega, R_L = 1.5 \Omega$	$T_J = 25^\circ\text{C}$	0	1.0	1.5*	μSec
			$T_J = 150^\circ\text{C}$	0	1.0	1.5*	
Rise Time	t_r	$V_{CC} = 10 \text{ V}, I_C = 6.5 \text{ A}$ $R_G = 1.0 \text{ k}\Omega, R_L = 1.5 \Omega$	$T_J = 25^\circ\text{C}$	0	4.5	6.0*	
			$T_J = 150^\circ\text{C}$	0	5.0	6.0*	

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

*Maximum Value of Characteristic across Temperature Range.

TYPICAL ELECTRICAL CHARACTERISTICS (unless otherwise noted)

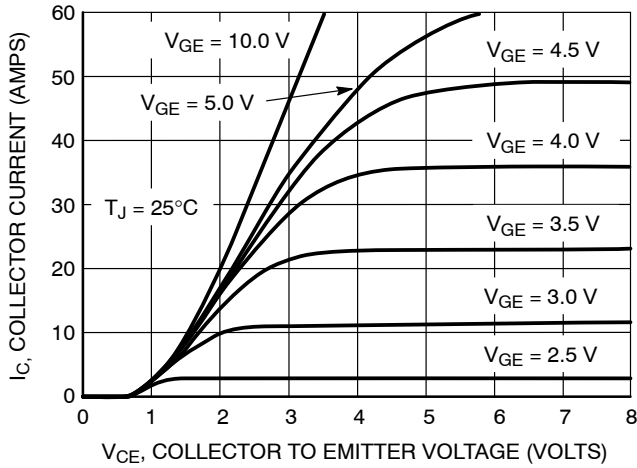


Figure 1. Output Characteristics

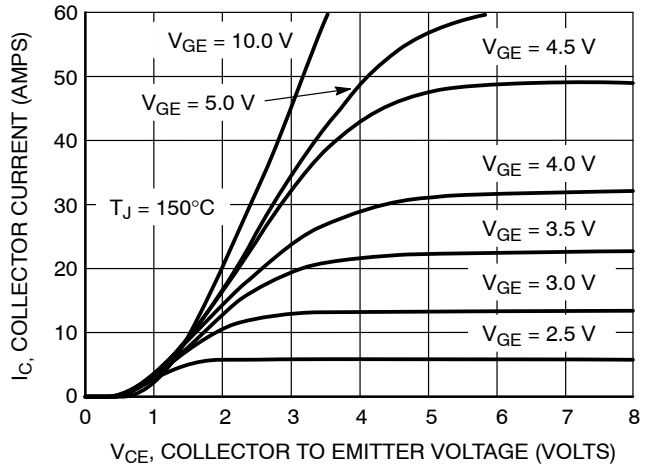


Figure 2. Output Characteristics

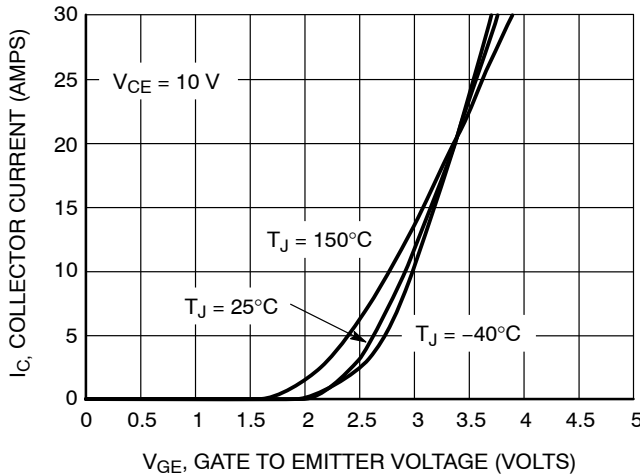


Figure 3. Transfer Characteristics

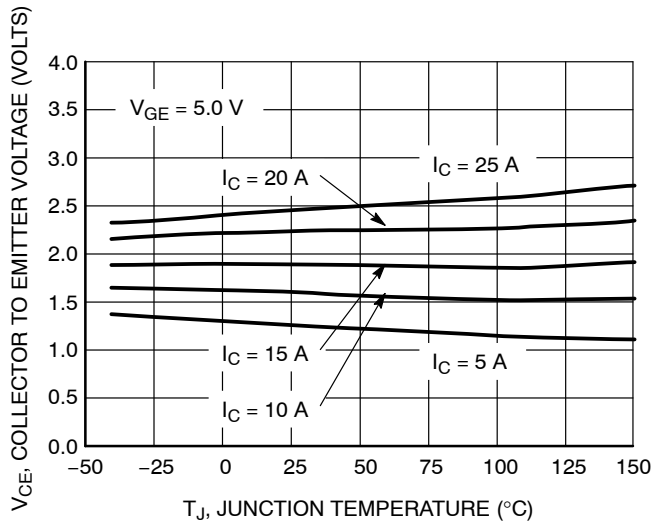


Figure 4. Collector-to-Emitter Saturation Voltage vs. Junction Temperature

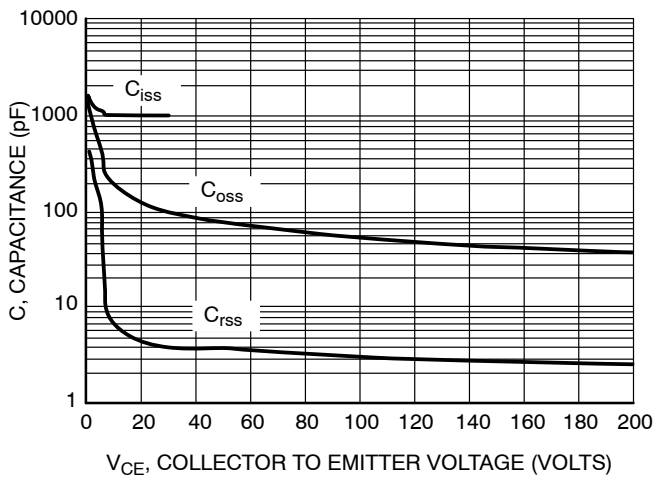


Figure 5. Capacitance Variation

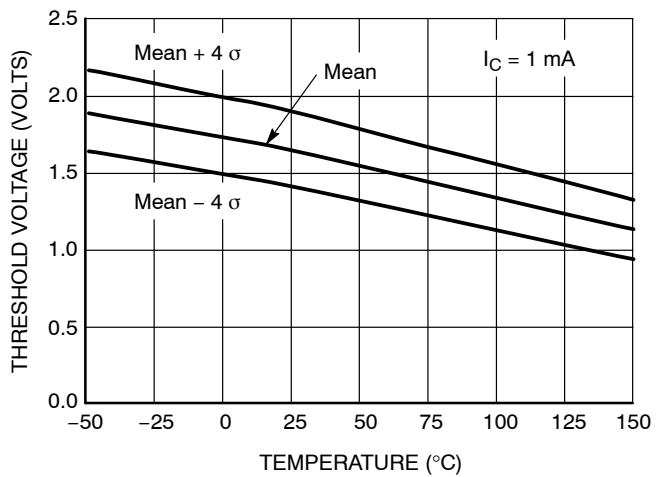


Figure 6. Threshold Voltage vs. Temperature

STB1081 Series

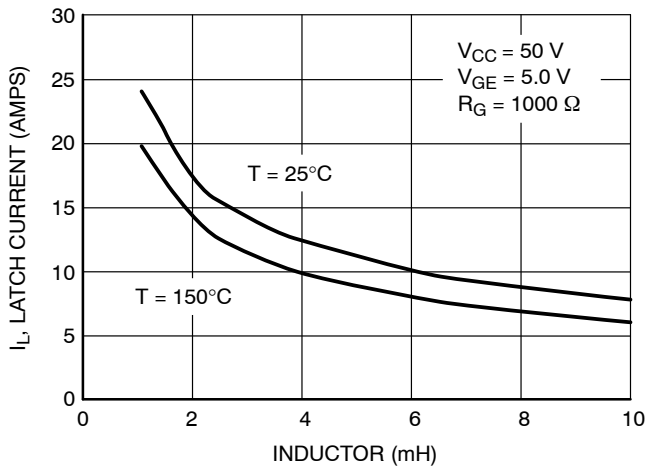


Figure 7. Minimum Open Secondary Latch Current vs. Inductor

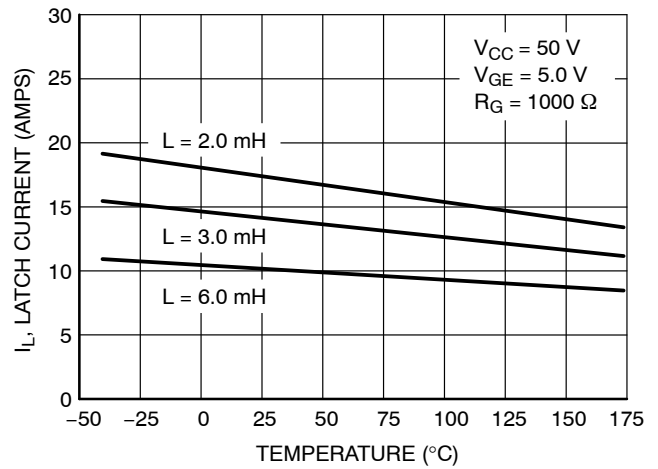


Figure 8. Minimum Open Secondary Latch Current vs. Temperature

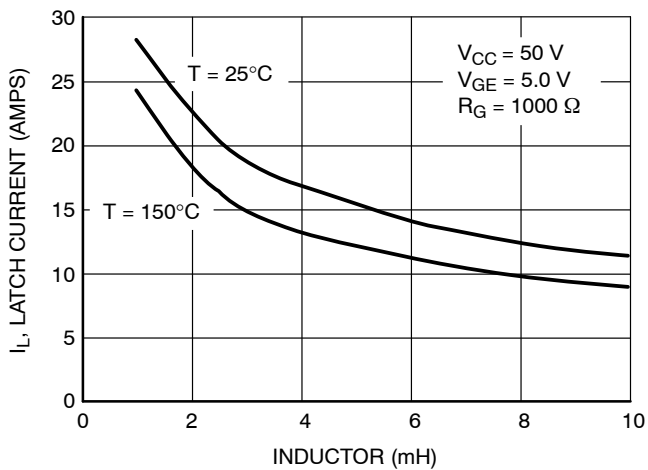


Figure 9. Typical Open Secondary Latch Current vs. Inductor

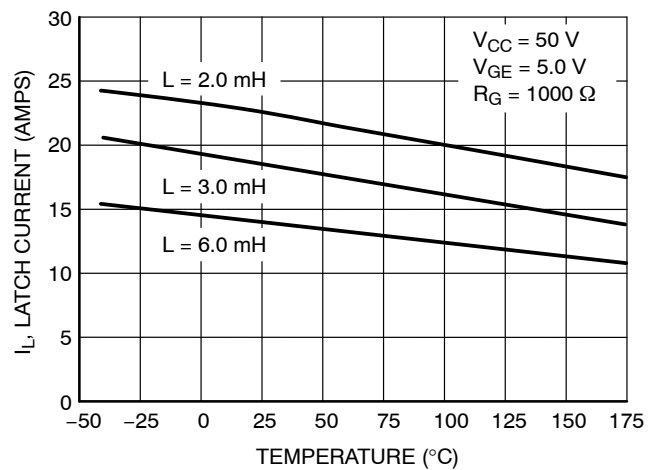


Figure 10. Typical Open Secondary Latch Current vs. Temperature

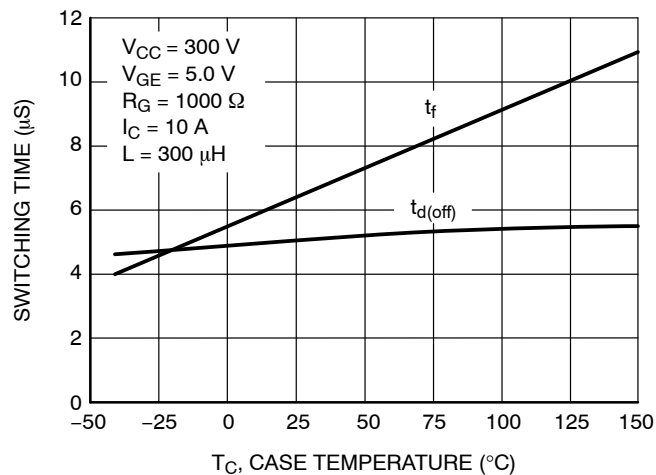
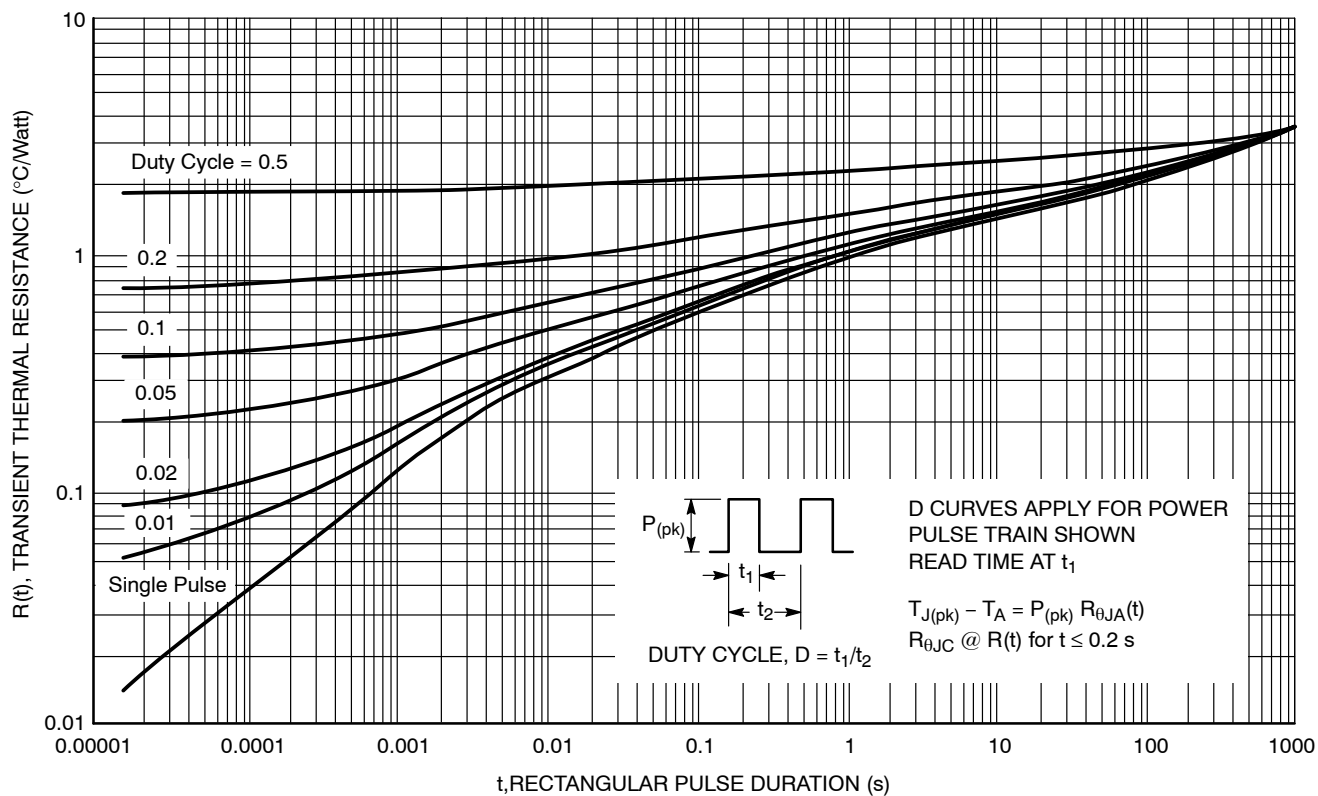
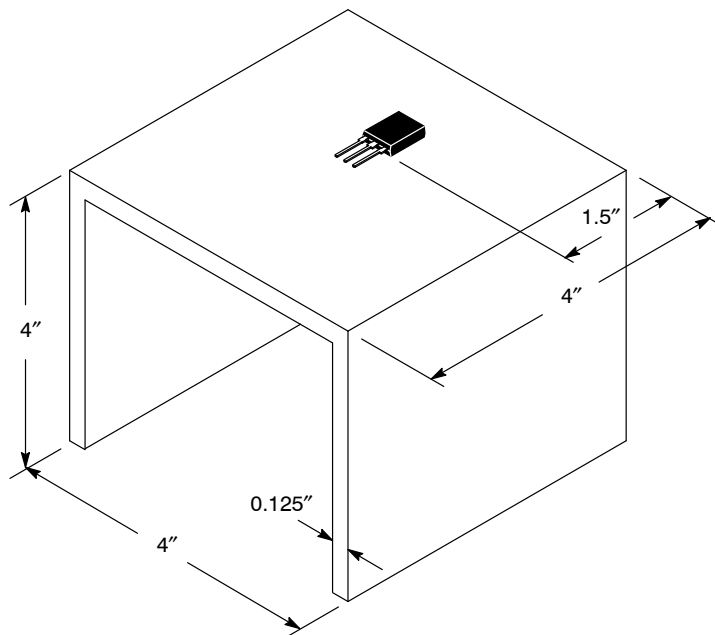


Figure 11. Switching Speed vs. Case Temperature

STB1081 Series



**Figure 12. Transient Thermal Resistance
(Non-normalized Junction-to-Ambient mounted on
fixture in Figure 13)**



**Figure 13. Test Fixture for Transient Thermal Curve
(48 square inches of 1/8" thick aluminum)**

STB1081 Series

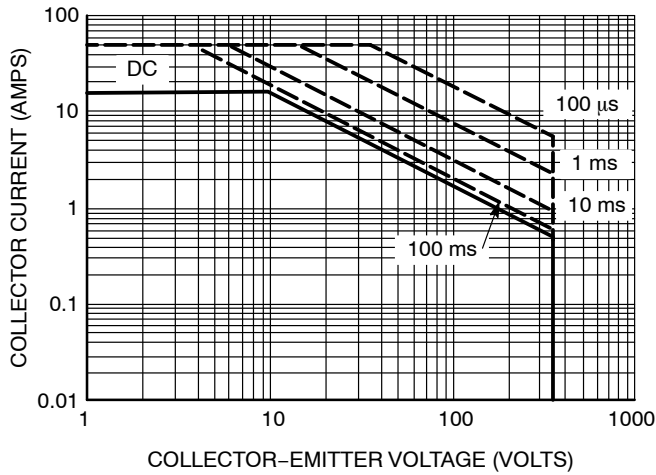


Figure 14. Single Pulse Safe Operating Area
(Mounted on an Infinite Heatsink at $T_C = 25^\circ\text{C}$)

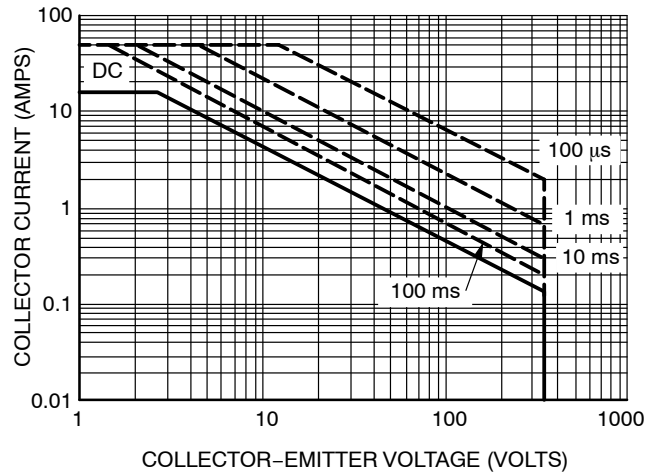


Figure 15. Single Pulse Safe Operating Area
(Mounted on an Infinite Heatsink at $T_C = 125^\circ\text{C}$)

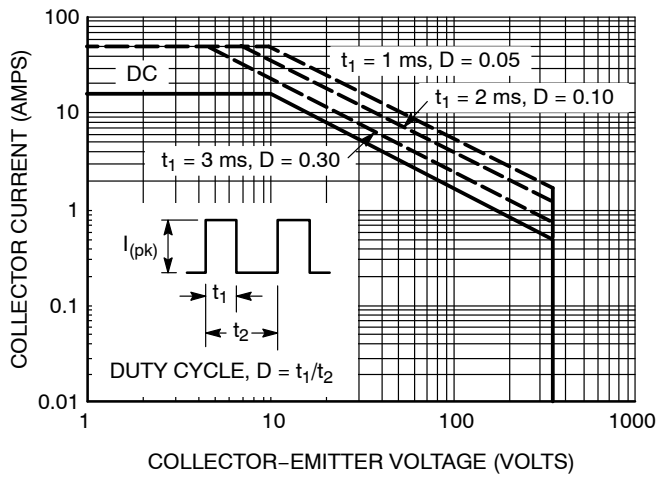


Figure 16. Pulse Train Safe Operating Area
(Mounted on an Infinite Heatsink at $T_C = 25^\circ\text{C}$)

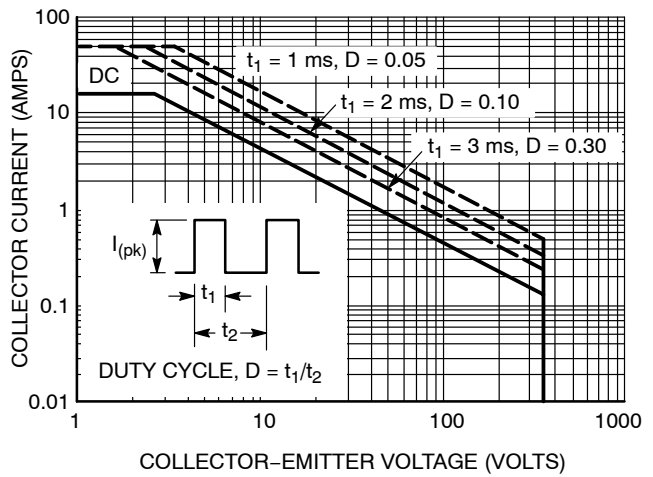
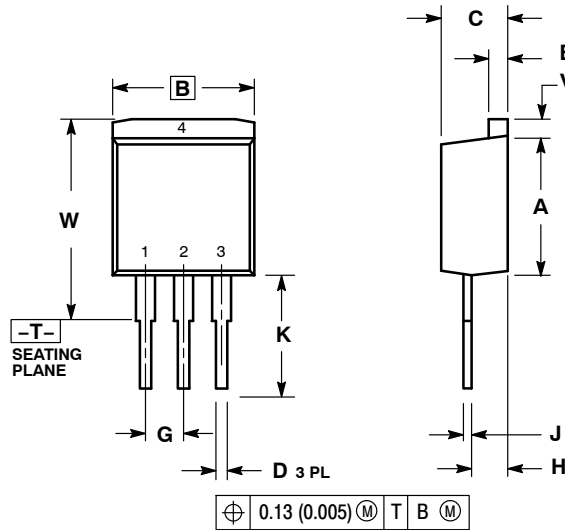


Figure 17. Pulse Train Safe Operating Area
(Mounted on an Infinite Heatsink at $T_C = 125^\circ\text{C}$)

STB1081 Series

PACKAGE DIMENSIONS

I²PAK
CASE 418-05
ISSUE H



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418-01 THRU -04 OBSOLETE, NEW STANDARD 418-05.

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
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	0.285	0.305	7.493	7.747
V	0.045	0.055	1.14	1.40
W	0.525	0.545	13.335	13.843

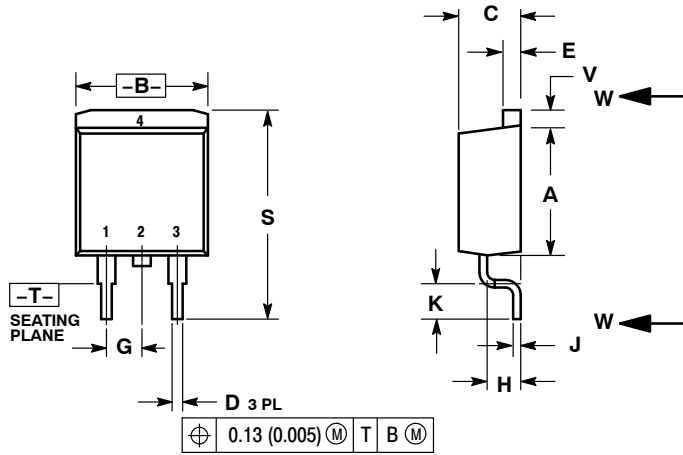
STYLE 4:

- PIN 1: GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STB1081 Series

PACKAGE DIMENSIONS

D²PAK
CASE 418B-04
ISSUE H



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.

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

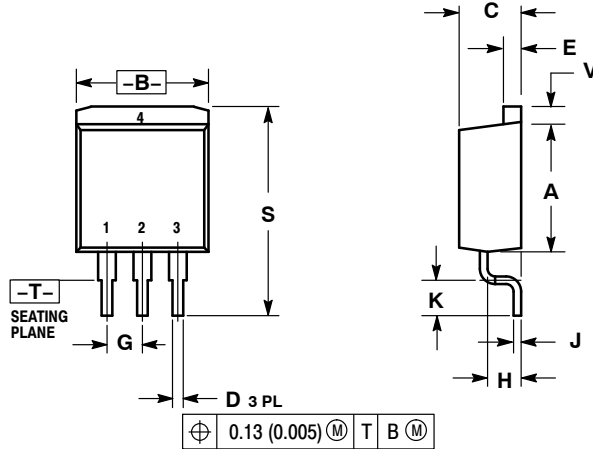
STYLE 4:

- PIN 1: GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STB1081 Series

PACKAGE DIMENSIONS

D²PAK
CASE 418G-01
ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

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
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
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

- STYLE 1:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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