NGB18N40CLBT4

Ignition IGBT
18 Amps, 400 Volts
N-Channel D^{2}PAK

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.

- Ideal for Coil-on-Plug Applications
- Gate-Emitter ESD Protection
- Temperature Compensated Gate-Collector Voltage Clamp Limits Stress Applied to Load
- Integrated ESD Diode Protection
- New Design Increases Unclamped Inductive Switching (UIS) Energy Per Area
- Low Threshold Voltage to Interface Power Loads to Logic or Microprocessor Devices
- Low Saturation Voltage
- High Pulsed Current Capability
- Optional Gate Resistor (R_G) and Gate-Emitter Resistor (R_{GE})
- Emitter Ballasting for Short-Circuit Capability

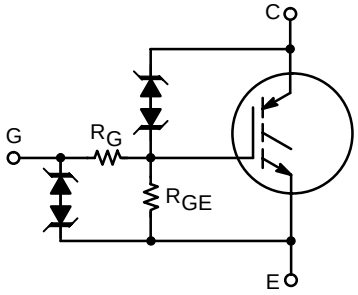
MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

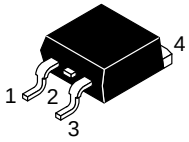
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	430	V_{DC}
Collector-Gate Voltage	V_{CER}	430	V_{DC}
Gate-Emitter Voltage	V_{GE}	18	V_{DC}
Collector Current-Continuous @ T_C = 25°C - Pulsed	I_C	18 50	A_{DC} A_{AC}
ESD (Human Body Model) R = 1500 Ω, C = 100 pF	ESD	8.0	kV
ESD (Machine Model) R = 0 Ω, C = 200 pF	ESD	800	V
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	115 0.77	Watts W/°C
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C

ON Semiconductor®

http://onsemi.com

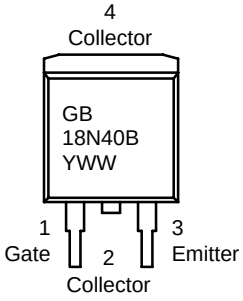
18 AMPS
400 VOLTS
$V_{CE(on)}$ ≤ 2.0 V @
I_C = 10 A, V_{GE} ≥ 4.5 V





D^{2}PAK
CASE 418B
STYLE 4

MARKING DIAGRAM



GB18N40B = NGB18N40CLB
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NGB18N40CLBT4	D^{2}PAK	800/Tape & Reel

UNCLAMPED COLLECTOR-T O-EMITTER AVALANCHE CHARACTERISTICS ($-55° \le T_J \le 175°C$)

Characteristic	Symbol	Value	Unit
Single Pulse Collector-to-Emitter Avalanche Energy V_{CC} = 50 V, V_{GE} = 5.0 V, Pk I_L = 21.1 A, L = 1.8 mH, Starting T_J = 25°C V_{CC} = 50 V, V_{GE} = 5.0 V, Pk I_L = 18.3 A, L = 1.8 mH, Starting T_J = 125°C	E_{AS}	 400 300	mJ
Reverse Avalanche Energy V_{CC} = 100 V, V_{GE} = 20 V, Pk I_L = 25.8 A, L = 6.0 mH, Starting T_J = 25°C	$E_{AS(R)}$	 2000	mJ

MAXIMUM SHORT-CIRCUIT TIMES ($-55°C \le T_J \le 150°C$)

Short Circuit Withstand Time 1 (See Figure 17, 3 Pulses with 10 ms Period)	t_{sc1}	750	μs
Short Circuit Withstand Time 2 (See Figure 18, 3 Pulses with 10 ms Period)	t_{sc2}	5.0	ms

THERMAL CHARACTERISTICS

Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.3	°C/W
Thermal Resistance, Junction to Ambient D^2PAK (Note 1)	$R_{\theta JA}$	50	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 5 seconds	T_L	275	°C

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Test Conditions	Temperature	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Collector-Emitter Clamp Voltage	BV_{CES}	I_C = 2.0 mA	T_J = -40°C to 150°C	380	395	420	V_{DC}
		I_C = 10 mA	T_J = -40°C to 150°C	390	405	430	
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 350 V, V_{GE} = 0 V	T_J = 25°C	-	2.0	20	μA_{DC}
			T_J = 150°C	-	10	40*	
			T_J = -40°C	-	1.0	10	
Reverse Collector-Emitter Leakage Current	I_{ECS}	V_{CE} = -24 V	T_J = 25°C	-	0.7	2.0	mA
			T_J = 150°C	-	12	25*	
			T_J = -40°C	-	0.1	1.0	
Reverse Collector-Emitter Clamp Voltage	$B_{VCES(R)}$	I_C = -75 mA	T_J = 25°C	27	33	37	V_{DC}
			T_J = 150°C	30	36	40	
			T_J = -40°C	25	32	35	
Gate-Emitter Clamp Voltage	BV_{GES}	I_G = 5.0 mA	T_J = -40°C to 150°C	11	13	15	V_{DC}
Gate-Emitter Leakage Current	I_{GES}	V_{GE} = 10 V	T_J = -40°C to 150°C	384	640	1000	μA_{DC}
Gate Resistor (Optional)	R_G	-	T_J = -40°C to 150°C	-	70	-	Ω
Gate Emitter Resistor	R_{GE}	-	T_J = -40°C to 150°C	10	16	26	kΩ
ON CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GE(th)}$	I_C = 1.0 mA, V_{GE} = V_{CE}	T_J = 25°C	1.1	1.4	1.9	V_{DC}
			T_J = 150°C	0.75	1.0	1.4	
			T_J = -40°C	1.2	1.6	2.1*	
Threshold Temperature Coefficient (Negative)	-	-	-	-	3.4	-	mV/°C

1. When surface mounted to an FR4 board using the minimum recommended pad size.
2. Pulse Test: Pulse Width ≤ 300 μS, Duty Cycle ≤ 2%.

*Maximum Value of Characteristic across Temperature Range.

ELECTRICAL CHARACTERISTICS (continued)

Characteristic	Symbol	Test Conditions	Temperature	Min	Typ	Max	Unit
ON CHARACTERISTICS (continued) (Note 3)							
Collector-to-Emitter On-Voltage	$V_{CE(on)}$	I_C = 6.0 A, V_{GE} = 4.0 V	T_J = 25°C	1.0	1.4	1.6	V_{DC}
			T_J = 150°C	0.9	1.3	1.6	
			T_J = -40°C	1.1	1.45	1.7*	
		I_C = 8.0 A, V_{GE} = 4.0 V	T_J = 25°C	1.3	1.6	1.9*	
			T_J = 150°C	1.2	1.55	1.8	
			T_J = -40°C	1.4	1.6	1.9*	
		I_C = 10 A, V_{GE} = 4.0 V	T_J = 25°C	1.4	1.8	2.05	
			T_J = 150°C	1.5	1.8	2.0	
			T_J = -40°C	1.4	1.8	2.1*	
		I_C = 15 A, V_{GE} = 4.0 V	T_J = 25°C	1.8	2.2	2.5	
			T_J = 150°C	2.0	2.4	2.6*	
			T_J = -40°C	1.7	2.1	2.5	
		I_C = 10 A, V_{GE} = 4.5 V	T_J = 25°C	1.3	1.8	2.0*	
			T_J = 150°C	1.3	1.75	2.0*	
			T_J = -40°C	1.4	1.8	2.0*	
Forward Transconductance	gfs	V_{CE} = 5.0 V, I_C = 6.0 A	T_J = -40°C to 150°C	8.0	14	25	Mhos
DYNAMIC CHARACTERISTICS							
Input Capacitance	C_{ISS}	V_{CC} = 25 V, V_{GE} = 0 V f = 1.0 MHz	T_J = -40°C to 150°C	400	800	1000	pF
Output Capacitance	C_{OSS}			50	75	100	
Transfer Capacitance	C_{RSS}			4.0	7.0	10	
SWITCHING CHARACTERISTICS							
Turn-Off Delay Time (Resistive)	$t_{d(off)}$	V_{CC} = 300 V, I_C = 6.5 A R_G = 1.0 kΩ, R_L = 46 Ω,	T_J = 25°C	-	4.0	10	µSec
Fall Time (Resistive)	t_f	V_{CC} = 300 V, I_C = 6.5 A R_G = 1.0 kΩ, R_L = 46 Ω,	T_J = 25°C	-	9.0	15	
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 10 V, I_C = 6.5 A R_G = 1.0 kΩ, R_L = 1.5 Ω	T_J = 25°C	-	0.7	4.0	µSec
Rise Time	t_r	V_{CC} = 10 V, I_C = 6.5 A R_G = 1.0 kΩ, R_L = 1.5 Ω	T_J = 25°C	-	4.5	7.0	

3. Pulse Test: Pulse Width ≤ 300 µS, Duty Cycle ≤ 2%.
*Maximum Value of Characteristic across Temperature Range.

TYPICAL ELECTRICAL CHARACTERISTICS (unless otherwise noted)

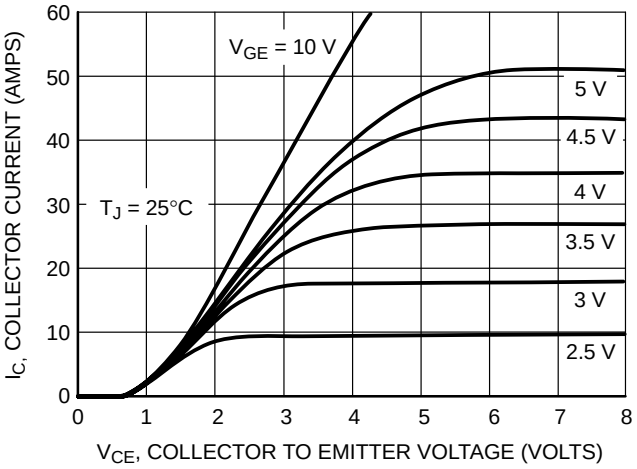


Figure 1. Output Characteristics

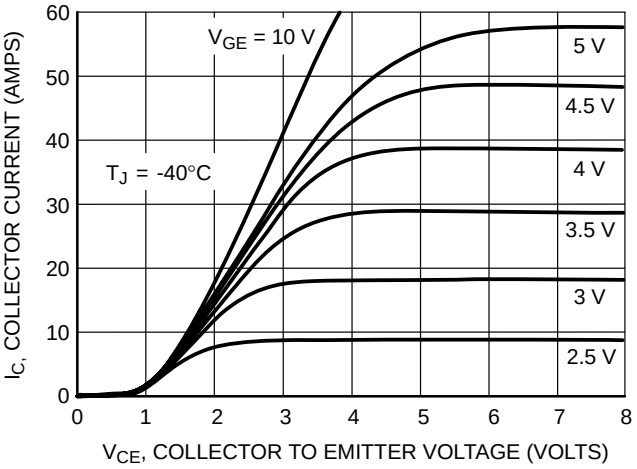


Figure 2. Output Characteristics

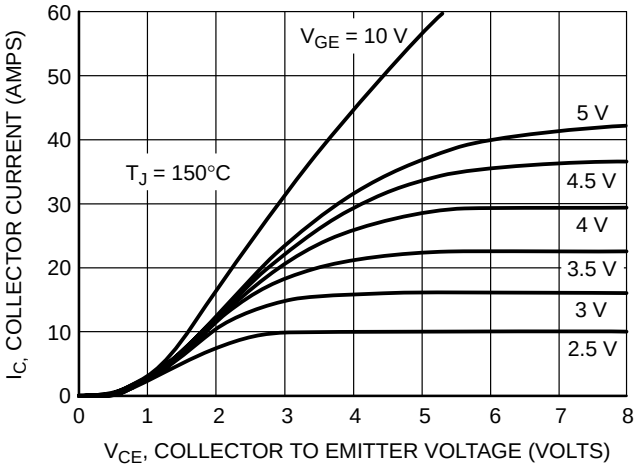


Figure 3. Output Characteristics

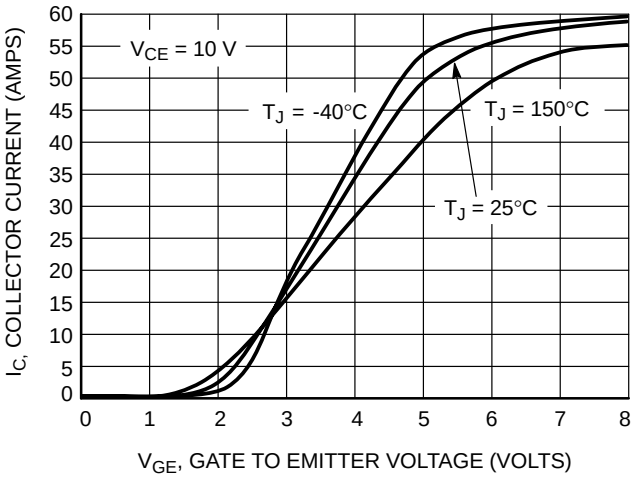


Figure 4. Transfer Characteristics

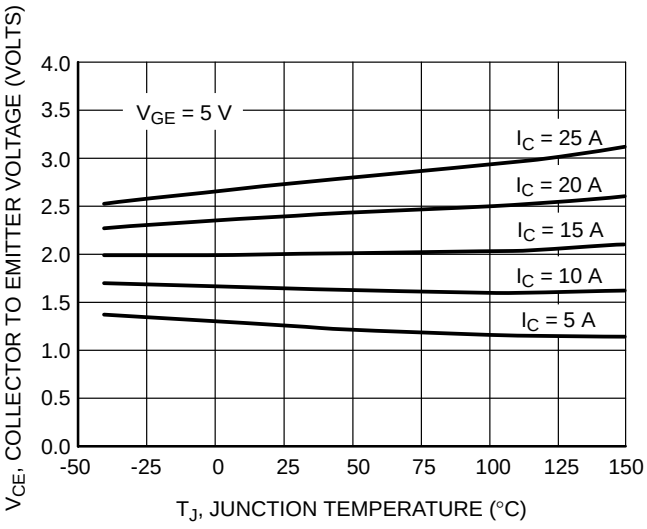


Figure 5. Collector-to-Emitter Saturation Voltage versus Junction Temperature

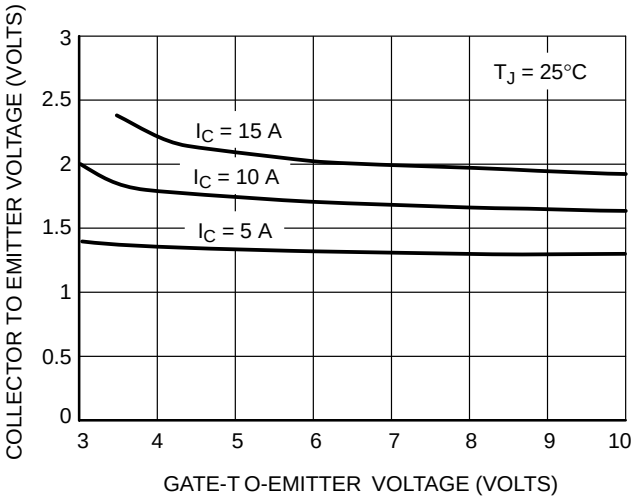


Figure 6. Collector-to-Emitter Voltage versus Gate-to-Emitter Voltage

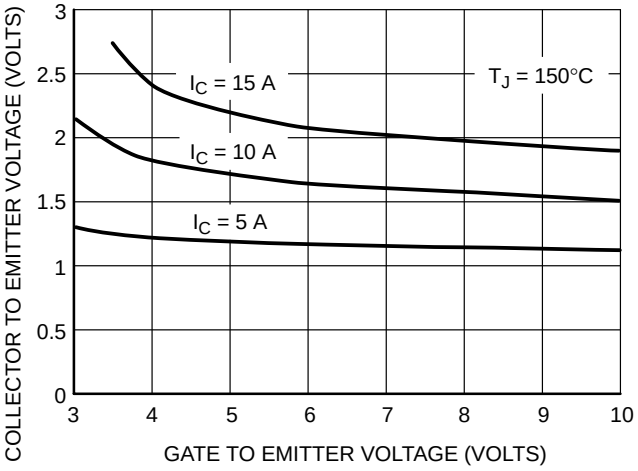


Figure 7. Collector-to-Emitter Voltage versus Gate-to-Emitter Voltage

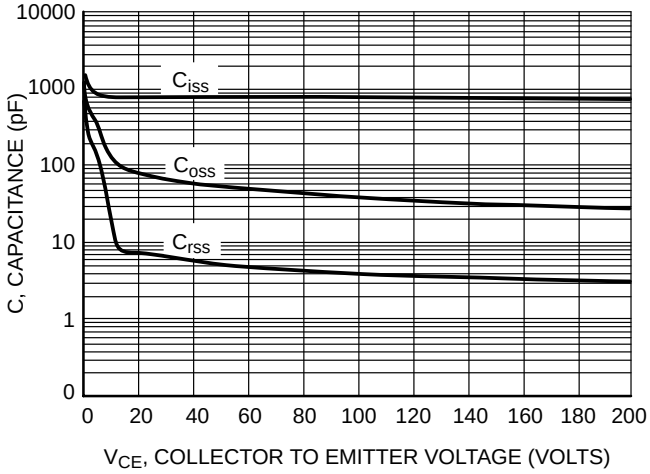


Figure 8. Capacitance Variation

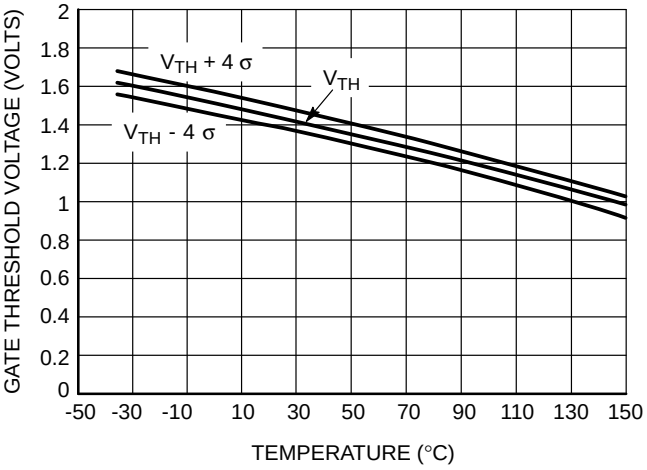


Figure 9. Gate Threshold Voltage versus Temperature

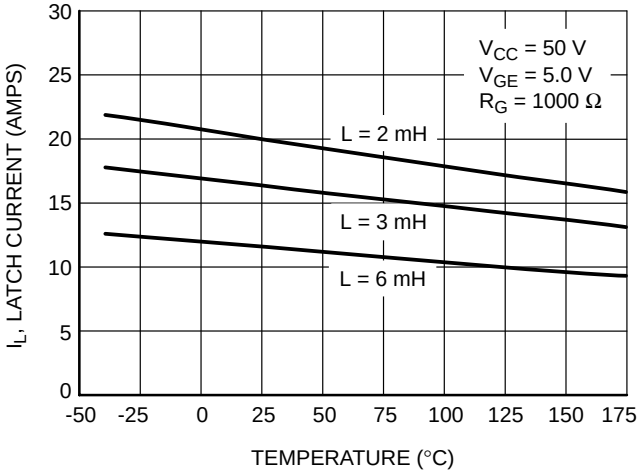


Figure 10. Minimum Open Secondary Latch Current versus Temperature

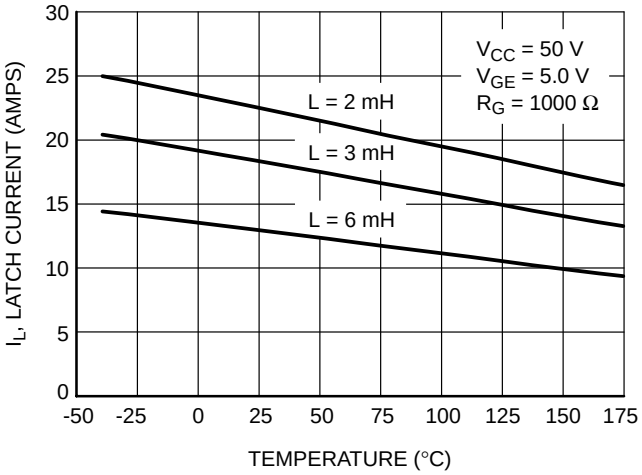


Figure 11. Typical Open Secondary Latch Current versus Temperature

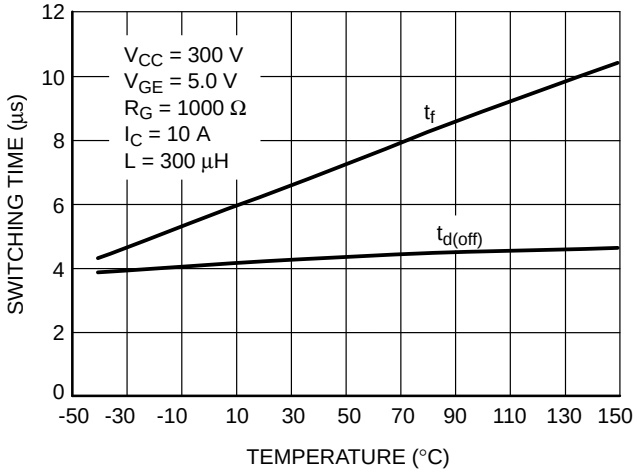


Figure 12. Inductive Switching Fall Time versus Temperature

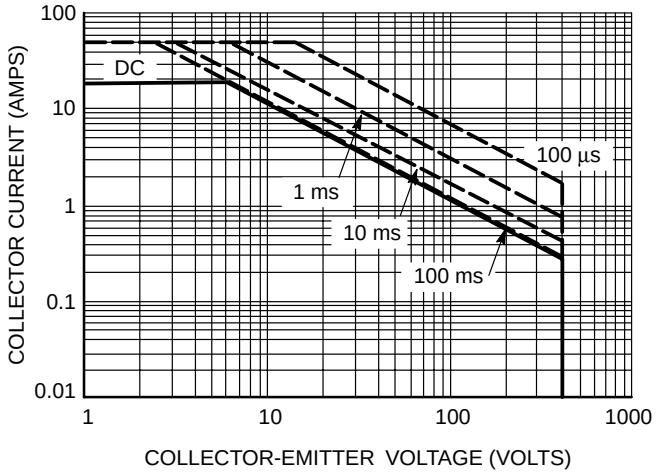


Figure 13. Single Pulse Safe Operating Area (Mounted on an Infinite Heatsink at T_A = 25°C)

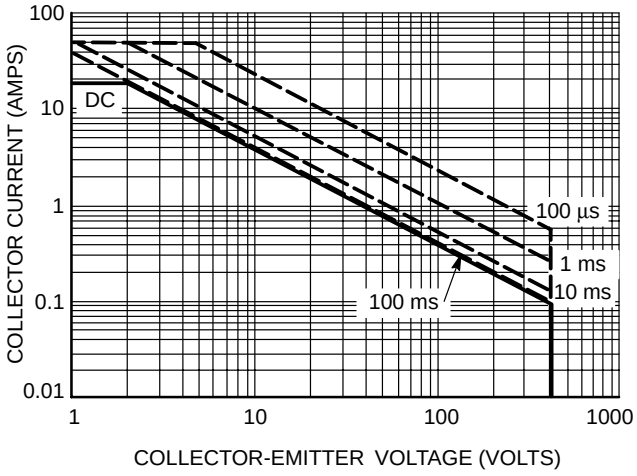


Figure 14. Single Pulse Safe Operating Area (Mounted on an Infinite Heatsink at T_A = 125°C)

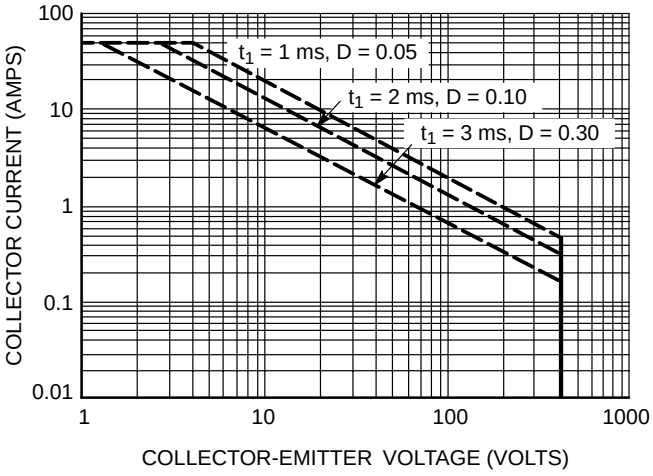


Figure 15. Pulse Train Safe Operating Area (Mounted on an Infinite Heatsink at T_C = 25°C)

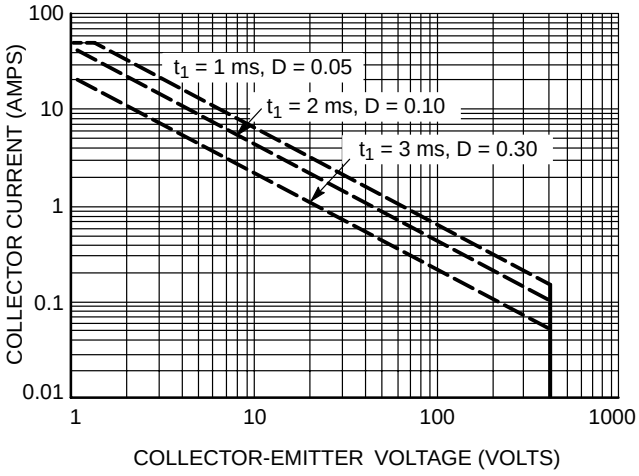


Figure 16. Pulse Train Safe Operating Area (Mounted on an Infinite Heatsink at T_C = 125°C)

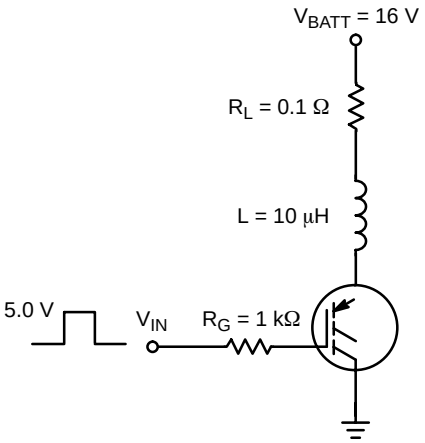


Figure 17. Circuit Configuration for Short Circuit Test #1

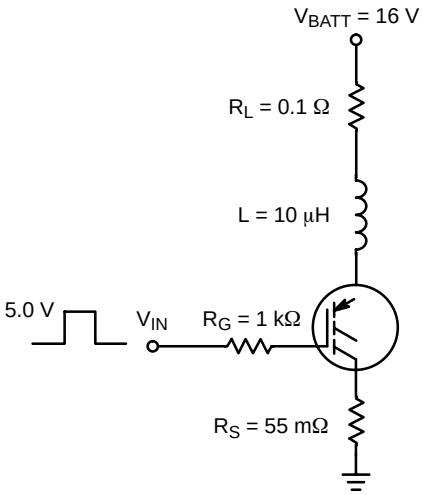


Figure 18. Circuit Configuration for Short Circuit Test #2

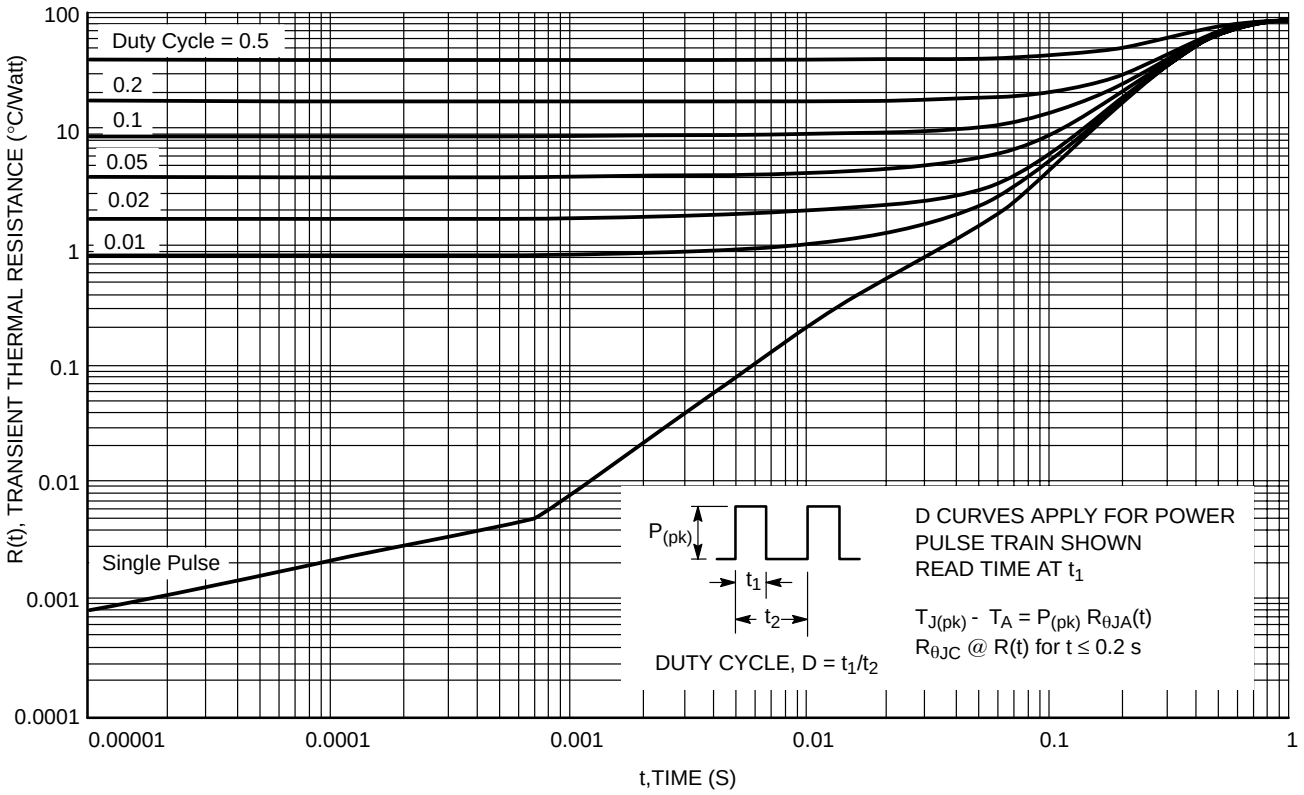
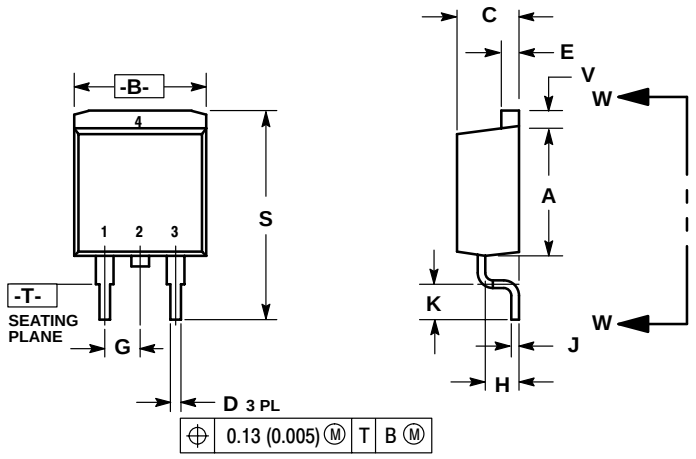


Figure 19. Transient Thermal Resistance (Non-normalized Junction-to-Ambient mounted on minimum pad area)

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.

	INCHES		MILLIMETERS	
DIM	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

PUBLICATION ORDERING INFORMATION

Literature Fulfillment:
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