Ignition IGBT 18 Amps, 450 Volts

N-Channel DPAK

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 Applications
- DPAK 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
- Emitter Ballasting for Short-Circuit Capability
- This is a Pb-Free Device

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

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CES}	500	V_{DC}
Collector-Gate Voltage	V_{CER}	500	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	400	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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

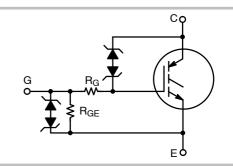


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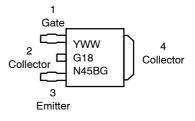
18 AMPS 450 VOLTS

 $V_{CE(on)} \le 2.1 \text{ V } @ I_C = 10 \text{ A}, V_{GE} \ge 4.5 \text{ V}$





MARKING DIAGRAM



G18N45B = Device Code
Y = Year
WW = Work Week
G = Pb-Free Device

ORDERING INFORMATION

Device	Package	Shipping [†]
NGD18N45CLBT4G	DPAK (Pb-Free)	2500/Tape & Reel

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

UNCLAMPED COLLECTOR-TO-EMITTER AVALANCHE CHARACTERISTICS (Note 2)

Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds

Characteristic	Symbol	Value	Unit
Single Pulse Collector–to–Emitter Avalanche Energy $V_{CC} = 50 \text{ V, } V_{GE} = 5.0 \text{ V, Pk } I_L = 26.0 \text{ A, L} = 1.0 \text{ mH, Starting } T_J = 25^{\circ}\text{C}$ $V_{CC} = 50 \text{ V, } V_{GE} = 5.0 \text{ V, Pk } I_L = 10.0 \text{ A, L} = 8.4 \text{ mH, Starting } T_J = 25^{\circ}\text{C}$ $V_{CC} = 50 \text{ V, } V_{GE} = 5.0 \text{ V, Pk } I_L = 15.4 \text{ A, L} = 2.0 \text{ mH, Starting } T_J = 150^{\circ}\text{C}$ $V_{CC} = 50 \text{ V, } V_{GE} = 5.0 \text{ V, Pk } I_L = 5.7 \text{ A, L} = 15.2 \text{ mH, Starting } T_J = 150^{\circ}\text{C}$	E _{AS}	338 420 237 247	mJ
IAXIMUM SHORT-CIRCUIT TIMES			
Short Circuit Withstand Time – Test 1 (See Figure 17, 3 Pulses with 10 ms Period, T _a = 105°C)	t _{sc1-1}	1000	μS
Short Circuit Withstand Time – Test 1 (See Figure 17, 3 Pulses with 10 ms Period, T _a = 150°C)	t _{sc1-2}	800	μS
Short Circuit Withstand Time – Test 2 (See Figure 18, 3 Pulses with 10 ms Period, T _a = 105°C)	t _{sc2-1}	5	ms
Short Circuit Withstand Time – Test 2 (See Figure 18, 3 Pulses with 10 ms Period, T _a = 150°C)	t _{sc2-2}	1	ms
HERMAL CHARACTERISTICS			
Thermal Resistance, Junction to Case	$R_{ heta JC}$	1.3	°C/W

DPAK (Note 1)

 $R_{\theta JA}$

 T_L

°C/W

٥С

95

275

ELECTRICAL CHARACTERISTICS

Thermal Resistance, Junction to Ambient

Characteristic	Symbol	Test Conditions	Temperature	Min	Тур	Max	Unit
OFF CHARACTERISTICS (Note 2)							
Collector-Emitter Clamp Voltage	BV _{CES}	I _C = 2.0 mA	T _J = -40°C to 150°C	430	455	470	V _{DC}
		I _C = 10 mA	T _J = -40°C to 150°C	440	475	500	
Zero Gate Voltage Collector Current	I _{CES}		T _J = 25°C	_	0.5	20	μA _{DC}
		$V_{CE} = 350 \text{ V},$ $V_{GE} = 0 \text{ V}$	T _J = 150°C	_	75	250	
		· GL · ·	$T_J = -40^{\circ}C$	_	0.2	10	
		V _{CE} = 15 V, V _{GE} = 0 V	T _J = 25°C	-	-	2.0	
Reverse Collector-Emitter Leakage Current	I _{ECS}		T _J = 25°C	-	0.7	1.0	mA
		$V_{CE} = -24 \text{ V}$	T _J = 150°C	-	12	25	
			$T_J = -40^{\circ}C$	_	0.1	1.0	
Reverse Collector-Emitter Clamp Voltage	B _{VCES(R)}		$T_J = 25^{\circ}C$	24	27	30	V_{DC}
		$I_C = -75 \text{ mA}$	T _J = 150°C	26	29	33]
			$T_J = -40^{\circ}C$	23	26	29	
Gate-Emitter Clamp Voltage	BV _{GES}	I _G = 5.0 mA	$T_J = -40^{\circ}\text{C} \text{ to}$ 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	590	700	μA _{DC}
Gate Resistor	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

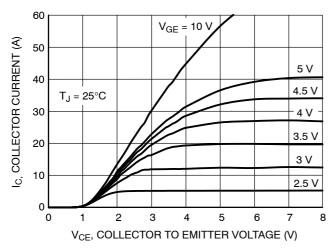
^{1.} When surface mounted to an FR4 board using the minimum recommended pad size.

ELECTRICAL CHARACTERISTICS (continued)

Characteristic	Symbol	Test Conditions	Temperature	Min	Тур	Max	Unit
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	1.56	1.9	V _{DC}
			T _J = 150°C	0.75	1.08	1.4	
		I GE I GE	T _J = -40°C	1.2	1.75	2.1	
Collector-to-Emitter On-Voltage	V _{CE(on)}	I _C = 7 A, V _{GE} = 4.5 V	T _J = -40°C to 150°C	1.10	1.84	2.30	٧
		I _C = 7 A, V _{GE} = 4.0 V	T _J = -40°C to 150°C	1.15	1.89	2.35	
		I _C = 7 A, V _{GE} = 3.7 V	T _J = -40°C to 150°C	1.20	1.93	2.50	
		I _C = 10 A, V _{GE} = 4.5 V	T _J = -40°C to 150°C	1.45	2.07	2.65	
		I _C = 10 A, V _{GE} = 4.0 V	T _J = -40°C to 150°C	1.50	2.13	2.80	
		I _C = 10 A, V _{GE} = 3.7 V	T _J = -40°C to 150°C	1.55	2.19	2.85	
		I _C = 10 mA, V _{GE} = 4.5 V	T _J = -40°C to 150°C	-	0.65	1.00	
Threshold Temperature Coefficient (Negative)	-	-	_	_	3.5	-	mV/°C
Forward Transconductance	gfs	V _{CE} = 5.0 V, I _C = 6.0 A	T _J = -40°C to 150°C	6.0	14	25	Mhos
YNAMIC CHARACTERISTICS (Note 2)	•		•		•		
Input Capacitance	C _{ISS}			400	780	1000	pF
Output Capacitance	C _{OSS}	V _{CC} = 25 V, V _{GE} = 0 V f = 1.0 MHz	$T_J = -40^{\circ}\text{C to}$ 150°C	50	72	100	1
Transfer Capacitance	C _{RSS}	1 = 1.0 WH12		4.0	6	10	1
WITCHING CHARACTERISTICS (Note	2)						
Turn-Off Delay Time	t _{d(off)}	$V_{CC} = 300 \text{ V}, V_{GE} = 5 \text{ V}$ $R_G = 1.0 \text{ k}\Omega, R_L = 46 \Omega,$	T _J = 25°C	1.0	2.9	12	μSec
Fall Time	t _f	$V_{CC} = 300 \text{ V}, V_{GE} = 5 \text{ V}$ $R_G = 1.0 \text{ k}\Omega, R_L = 46 \Omega,$	T _J = 25°C	1.0	2.5	7.0	
Turn-On Delay Time	t _{d(on)}	$V_{CC} = 14 \text{ V}, V_{GE} = 5 \text{ V}$ $R_G = 1.0 \text{ k}\Omega, R_L = 1 \Omega$	T _J = 25°C	0.1	0.42	1.4	μSec
Rise Time	t _r	V_{CC} = 14 V, V_{GE} = 5 V R_G = 1.0 k Ω , R_L = 1 Ω	T _J = 25°C	1.0	2.5	9.0	1

^{2.} Electrical Characteristics at temperature other than 25°C, Dynamic and Switching characteristics are not subject to production testing.

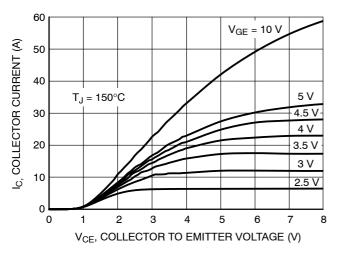
TYPICAL ELECTRICAL CHARACTERISTICS (unless otherwise noted)



60 $V_{GE} = 10$ C. COLLECTOR CURRENT (A) 50 5 V 40 4.5 V $T_J = -40^{\circ}C$ 4 V 30 3.5 V 20 3 V 10 2.5 V 0 0 V_{CE}, COLLECTOR TO EMITTER VOLTAGE (V)

Figure 1. Output Characteristics

Figure 2. Output Characteristics



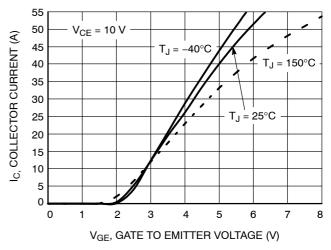
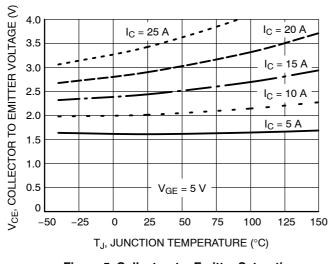


Figure 3. Output Characteristics

Figure 4. Transfer Characteristics



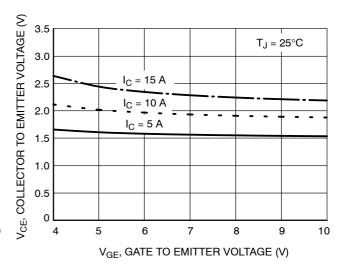


Figure 5. Collector-to-Emitter Saturation Voltage vs. Junction Temperature

Figure 6. Collector-to-Emitter Voltage vs.

Gate-to-Emitter Voltage

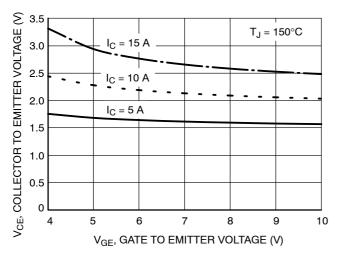


Figure 7. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

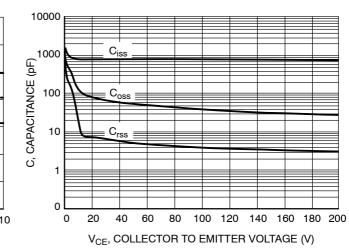


Figure 8. Capacitance Variation

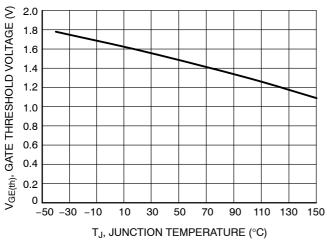


Figure 9. Gate Threshold Voltage vs. Junction Temperature

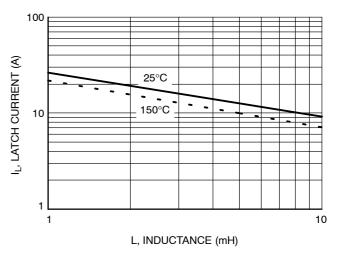


Figure 10. Minimum Open Secondary Latch Current vs. Inductance

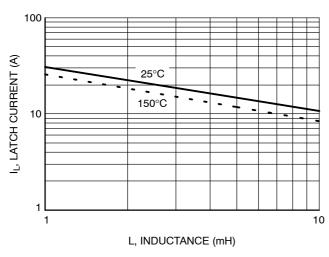


Figure 11. Typical Open Secondary Latch
Current vs. Inductance

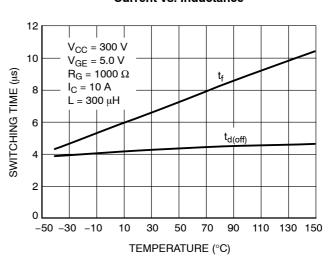


Figure 12. Inductive Switching Fall Time vs.
Temperature

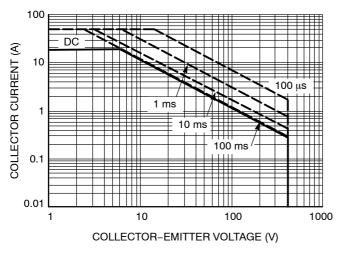


Figure 13. Single Pulse Safe Operating Area (Mounted on an Infinite Heatsink at $T_A = 25$ °C)

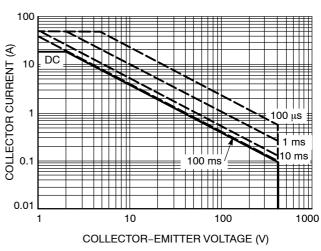


Figure 14. Single Pulse Safe Operating Area (Mounted on an Infinite Heatsink at T_A = 125°C)

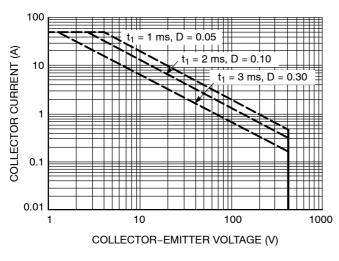


Figure 15. Pulse Train Safe Operating Area (Mounted on an Infinite Heatsink at $T_C = 25$ °C)

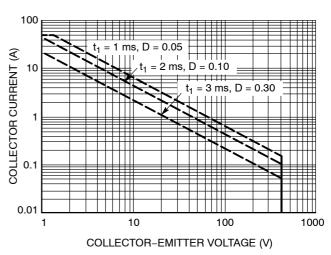


Figure 16. Pulse Train Safe Operating Area (Mounted on an Infinite Heatsink at $T_C = 125$ °C)

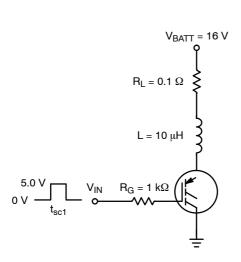


Figure 17. Circuit Configuration for Short Circuit Test #1

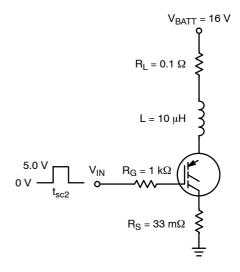


Figure 18. Circuit Configuration for Short Circuit Test #2

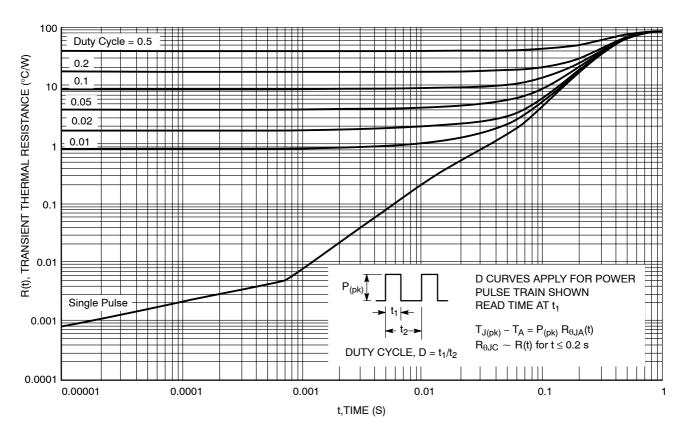
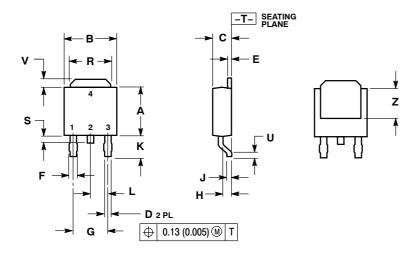


Figure 19. Transient Thermal Resistance (Non-normalized Junction-to-Ambient mounted on minimum pad area)

PACKAGE DIMENSIONS

DPAK CASE 369C **ISSUE C**



NOTES:

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

	INC	INCHES MILL		ETERS	
DIM	MIN	MAX	MIN	MAX	
Α	0.235	0.245	5.97	6.22	
В	0.250	0.265	6.35	6.73	
C	0.086	0.094	2.19	2.38	
D	0.027	0.035	0.69	0.88	
Е	0.018	0.023	0.46	0.58	
F	0.037	0.045	0.94	1.14	
G	0.180	BSC	4.58	BSC	
Η	0.034	0.040	0.87	1.01	
7	0.018	0.023	0.46	0.58	
K	0.102	0.114	2.60	2.89	
L	0.090	BSC	2.29 BSC		
R	0.180	0.215	4.57	5.45	
S	0.025	0.040	0.63	1.01	
U	0.020		0.51		
٧	0.035	0.050	0.89	1.27	
Z	0.155		3.93		

STYLE 7: PIN 1. GATE

2. COLLECTOR

3 FMITTER

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