NGTB20N120IHWG

IGBT − Induction Cooking

This Insulated Gate Bipolar Transistor (IGBT) features a robust and cost effective Field Stop (FS) Trench construction, provides and superior performance in demanding switching applications, and offers low on−state voltage with minimal switching loss. The IGBT is well suited for resonant or soft switching applications.

Features

- Extremely Efficient Trench with Fieldstop Technology
- Low Switching Loss Reduces System Power Dissipation
- Optimized for Low Losses in IH Cooker Application
- This is a Pb−Free Device

Typical Applications

- Inductive Heating
- Consumer Appliances
- Soft Switching

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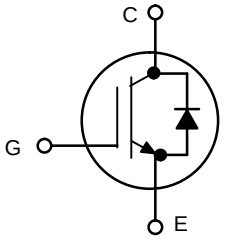
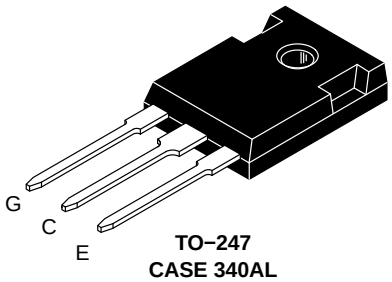
20 A, 1200 V
V_{CEsat} = 2.20 V
E_{off} = 0.48 mJ





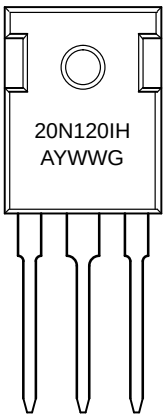
TO−247
CASE 340AL

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−emitter voltage @ T_J = 25°C	V_{CES}	1200	V
Collector current @ Tc = 25°C @ Tc = 100°C	I_C	 40 20	A
Pulsed collector current, T_{pulse} limited by T_{Jmax}, 10 μs Pulse, V_{GE} = 15 V	I_{CM}	80	A
Diode forward current @ Tc = 25°C @ Tc = 100°C	I_F	 40 20	A
Diode pulsed current, T_{pulse} limited by T_{Jmax}, 10 μs Pulse, V_{GE} = 0 V	I_{FM}	80	A
Gate−emitter voltage Transient Gate−emitter voltage (T_{pulse} = 5 μs, D < 0.10)	V_{GE}	±20 ±25	V
Power Dissipation @ Tc = 25°C @ Tc = 100°C	P_D	 341 170	W
Operating junction temperature range	T_J	−40 to +175	°C
Storage temperature range	T_{stg}	−55 to +175	°C
Lead temperature for soldering, 1/8″ from case for 5 seconds	T_{SLD}	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

ORDERING INFORMATION

Device	Package	Shipping
NGTB20N120IHWG	TO−247 (Pb−Free)	30 Units / Rail

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal resistance junction−to−case	$R_{\theta JC}$	0.44	°C/W
Thermal resistance junction−to−ambient	$R_{\theta JA}$	40	°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
STATIC CHARACTERISTIC						
Collector−emitter breakdown voltage, gate−emitter short−circuited	V_{GE} = 0 V, I_C = 500 μA	$V_{(BR)CES}$	1200	−	−	V
Collector−emitter saturation voltage	V_{GE} = 15 V, I_C = 20 A V_{GE} = 15 V, I_C = 20 A, T_J = 175°C	V_{CEsat}	− −	2.20 2.30	2.65 −	V
Gate−emitter threshold voltage	V_{GE} = V_{CE}, I_C = 250 μA	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector−emitter cut−off current, gate−emitter short−circuited	V_{GE} = 0 V, V_{CE} = 1200 V V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 150°C	I_{CES}	− −	− −	0.1 2.8	mA
Gate leakage current, collector−emitter short−circuited	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	−	−	100	nA
DYNAMIC CHARACTERISTIC						
Input capacitance	V_{CE} = 20 V, V_{GE} = 0 V, f = 1 MHz	C_{ies}	−	3590	−	pF
Output capacitance		C_{oes}	−	90	−	
Reverse transfer capacitance		C_{res}	−	70	−	
Gate charge total	V_{CE} = 600 V, I_C = 20 A, V_{GE} = 15 V	Q_g	−	150	−	nC
Gate to emitter charge		Q_{ge}	−	31	−	
Gate to collector charge		Q_{gc}	−	67	−	
SWITCHING CHARACTERISTIC, INDUCTIVE LOAD						
Turn−off delay time	T_J = 25°C V_{CC} = 600 V, I_C = 20 A R_g = 10 Ω V_{GE} = 0 V/ 15V	$t_{d(off)}$	−	170	−	ns
Fall time		t_f	−	155	−	
Turn−off switching loss		E_{off}	−	0.48	−	mJ
Turn−off delay time	T_J = 150°C V_{CC} = 600 V, I_C = 20 A R_g = 10 Ω V_{GE} = 0 V/ 15V	$t_{d(off)}$	−	185	−	ns
Fall time		t_f	−	210	−	
Turn−off switching loss		E_{off}	−	0.92	−	mJ
DIODE CHARACTERISTIC						
Forward voltage	V_{GE} = 0 V, I_F = 20 A V_{GE} = 0 V, I_F = 20 A, T_J = 175°C	V_F	− −	2.2 3.8	2.75	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

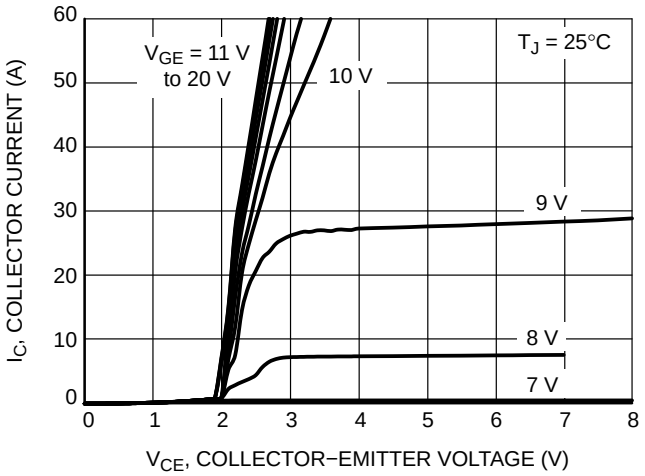


Figure 1. Output Characteristics

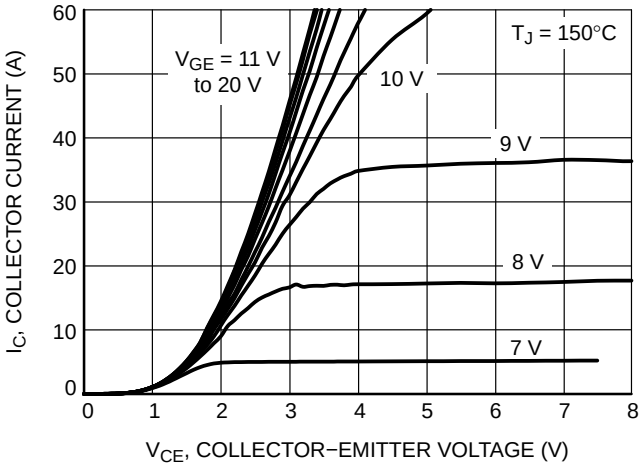


Figure 2. Output Characteristics

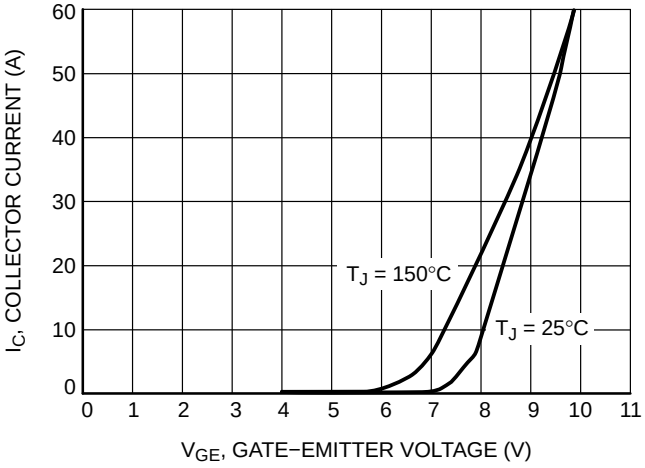


Figure 3. Typical Transfer Characteristics

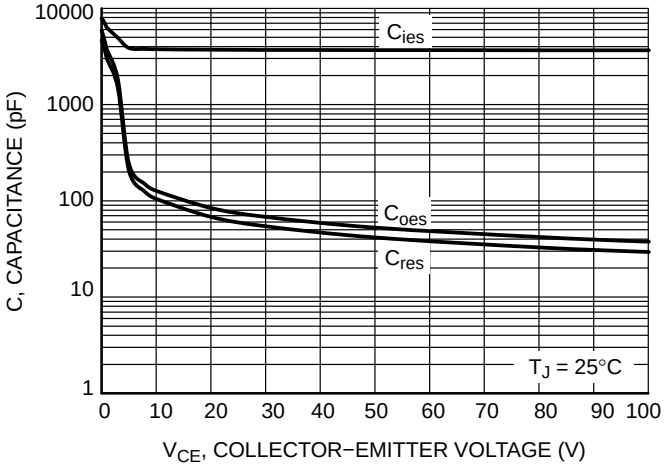


Figure 4. Typical Capacitance

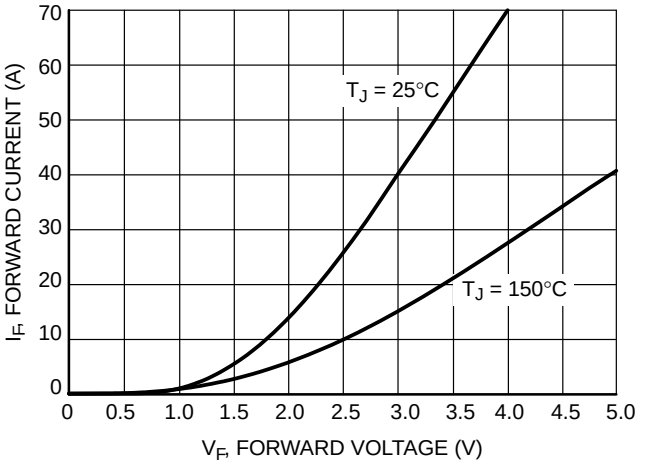


Figure 5. Diode Forward Characteristics

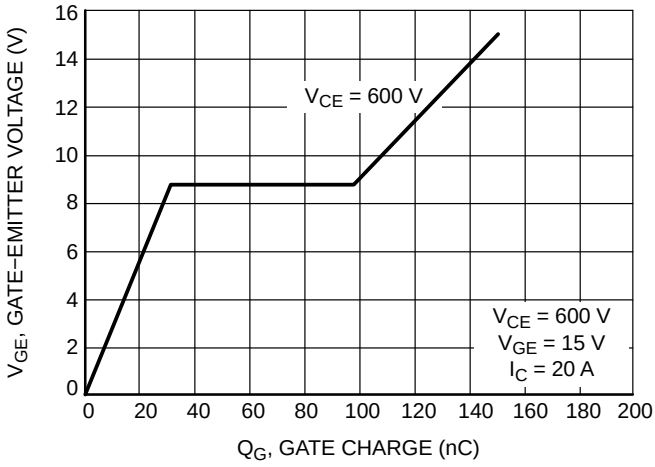


Figure 6. Typical Gate Charge

TYPICAL CHARACTERISTICS

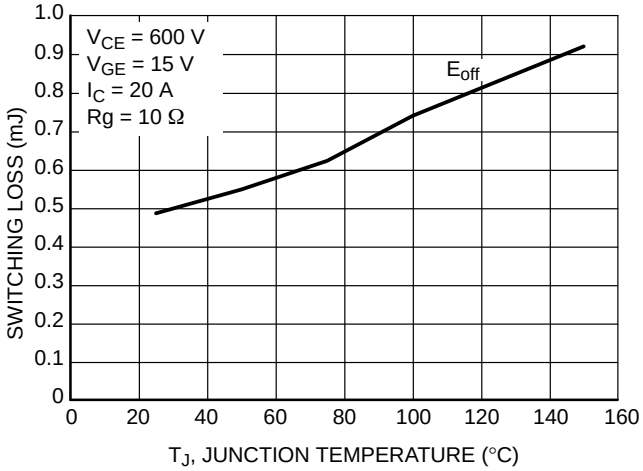


Figure 7. Switching Loss vs. Temperature

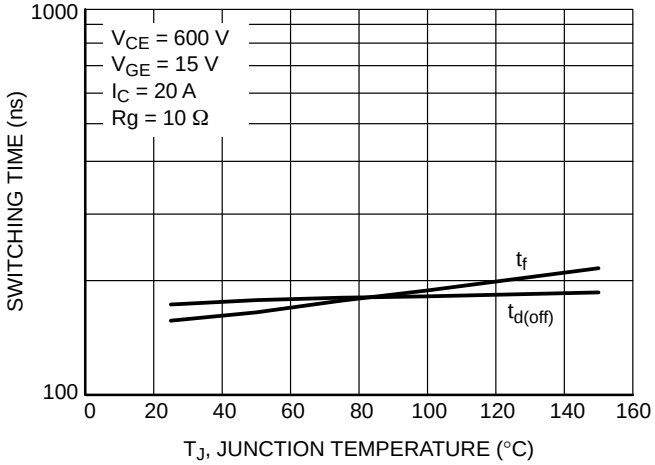


Figure 8. Switching Time vs. Temperature

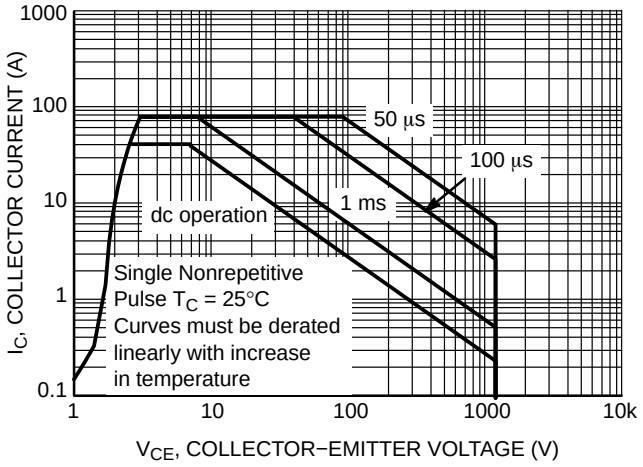


Figure 9. Safe Operating Area

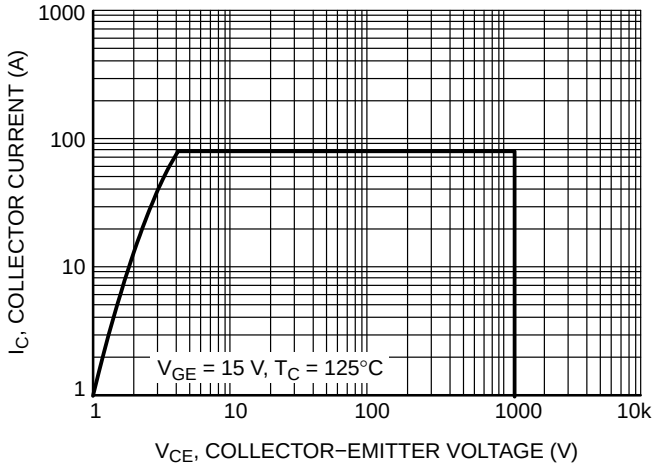
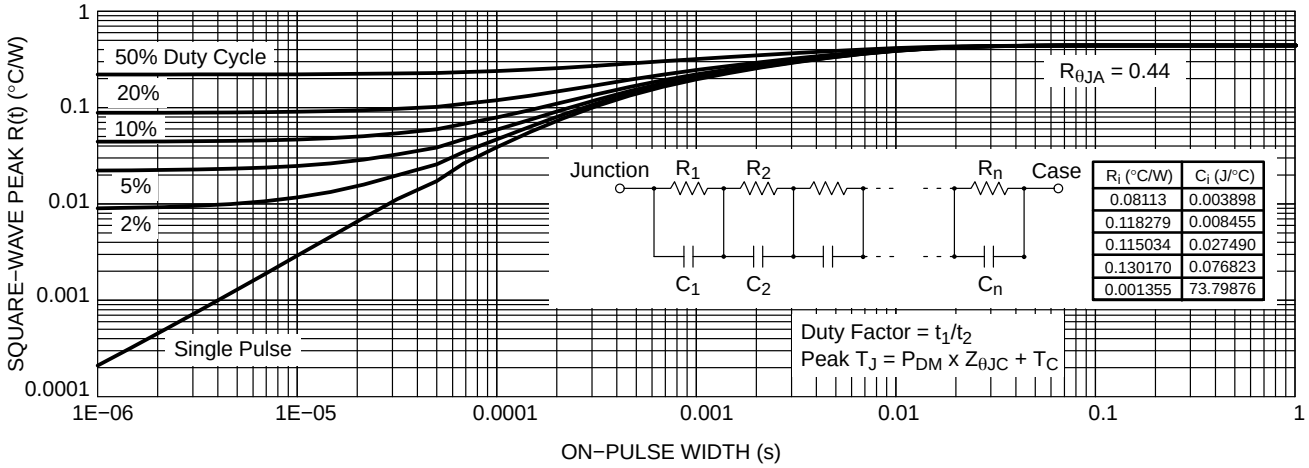


Figure 10. Reverse Bias Safe Operating Area



R_i (°C/W)	C_i (J/°C)
0.08113	0.003898
0.118279	0.008455
0.115034	0.027490
0.130170	0.076823
0.001355	73.79876

Figure 11. IGBT Transient Thermal Impedance

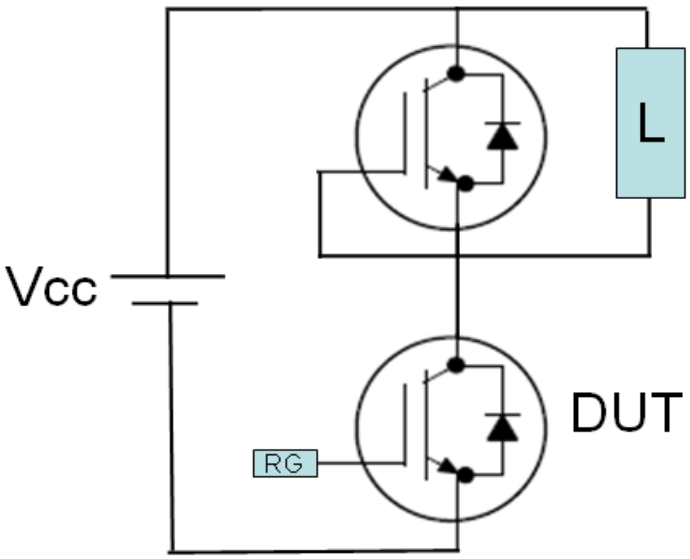


Figure 12. Test Circuit for Switching Characteristics

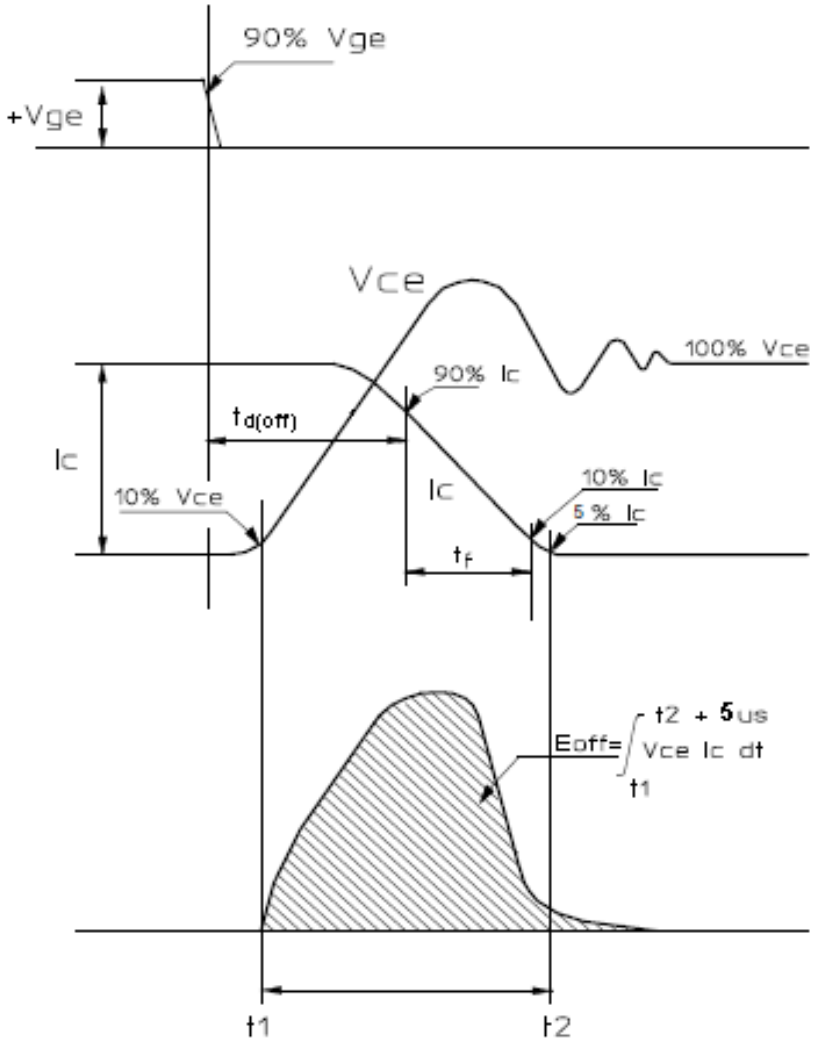


Figure 13. Definition of Turn Off Waveform

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

TO−247
CASE 340AL
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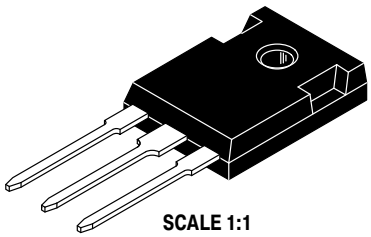
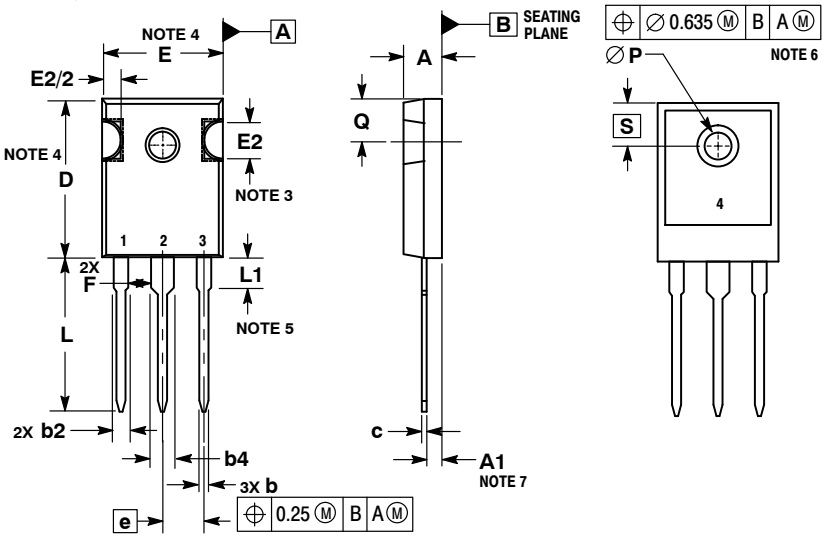
DATE 17 MAR 2017



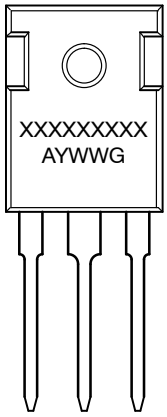
SCALE 1:1



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. SLOT REQUIRED, NOTCH MAY BE ROUNDED.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
5. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.
6. ∅P SHALL HAVE A MAXIMUM DRAFT ANGLE OF 1.5° TO THE TOP OF THE PART WITH A MAXIMUM DIAMETER OF 3.91.
7. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.

	MILLIMETERS	
DIM	MIN	MAX
A	4.70	5.30
A1	2.20	2.60
b	1.07	1.33
b2	1.65	2.35
b4	2.60	3.40
c	0.45	0.68
D	20.80	21.34
E	15.50	16.25
E2	4.32	5.49
e	5.45 BSC	
F	2.655	---
L	19.80	20.80
L1	3.81	4.32
P	3.55	3.65
Q	5.40	6.20
S	6.15 BSC	

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking.
Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present.

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