

## Features

- 600 V, 30 A, Low Collector-Emitter Saturation Voltage ( $V_{CE(sat)}$ )
- Advanced trench-gate field-stop technology
- Low switching loss
- Fast switching
- RoHS compliant\*

## Applications

- Switch-Mode Power Supplies (SMPS)
- Uninterruptible Power Sources (UPS)
- Power Factor Correction (PFC)
- Induction heating

# BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)

### General Information

The Bourns® Model BIDNW30N60H3 IGBT device combines technology from a MOS gate and a bipolar transistor, resulting in an optimum component for high voltage and high current applications. This device uses Trench-Gate Field-Stop technology providing greater control of dynamic characteristics while resulting in a lower Collector-Emitter Saturation Voltage ( $V_{CE(sat)}$ ) and fewer switching losses.

### Additional Information

Click these links for more information:



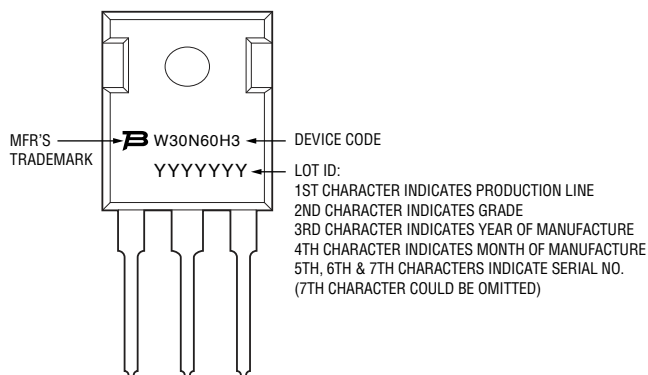
### Maximum Electrical Ratings ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CES}$	600	V
Continuous Collector Current ( $T_C = 25\text{ }^\circ\text{C}$ ), limited by $T_{jmax}$	$I_C$	60	A
Continuous Collector Current ( $T_C = 100\text{ }^\circ\text{C}$ ), limited by $T_{jmax}$	$I_C$	30	A
Pulsed Collector Current, $t_p$ limited by $T_{jmax}$	$I_{CP}$	120	A
Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
Continuous Forward Current ( $T_C = 100\text{ }^\circ\text{C}$ ), limited by $T_{jmax}$	$I_F$	12	A
Total Power Dissipation	$P_{total}$	230	W
Storage Temperature	$T_{STG}$	-55 to +150	$^\circ\text{C}$
Operating Junction Temperature	$T_j$	-55 to +150	$^\circ\text{C}$

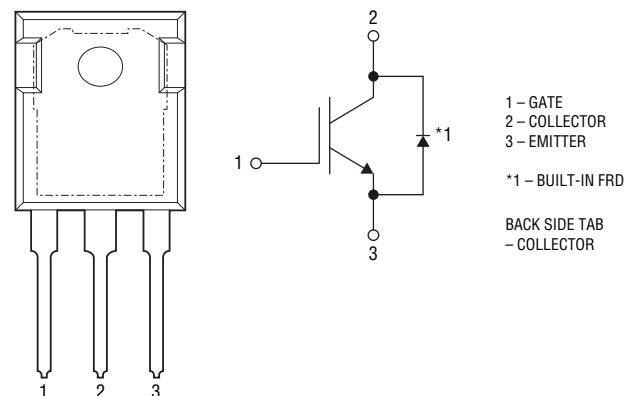
### Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)}_{IGBT}$	0.54	$^\circ\text{C/W}$
Diode Thermal Resistance Junction - Case	$R_{th(j-c)}_{Diode}$	1.5	$^\circ\text{C/W}$

### Typical Part Marking



### Internal Circuit



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# BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)

**BOURNS®**

## Static Electrical Characteristics ( $T_C = 25\text{ }^\circ\text{C}$ , Unless Otherwise Specified)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Collector-Emitter Breakdown Voltage	$BV_{CES}$	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	600	—	—	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$ $T_C = 25\text{ }^\circ\text{C}$	—	1.65	2.0	V
		$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$ $T_C = 125\text{ }^\circ\text{C}$	—	1.9	—	
Diode Forward On-Voltage	$V_F$	$I_F = 12\text{ A}, T_C = 25\text{ }^\circ\text{C}$	—	1.8	—	V
		$I_F = 12\text{ A}, T_C = 125\text{ }^\circ\text{C}$	—	1.4	—	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	4.0	5.0	6.5	V
Collector Cut-off Current	$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$	—	—	200	$\mu\text{A}$
Gate-Emitter Leakage Current	$I_{GES}$	$V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$	—	—	$\pm 400$	nA

## Dynamic Electrical Characteristics ( $T_C = 25\text{ }^\circ\text{C}$ , Unless Otherwise Specified)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Input Capacitance	$C_{ies}$	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V},$ $f = 1\text{ MHz}$	—	1780	—	pF
Output Capacitance	$C_{oes}$		—	100	—	
Reverse Transfer Capacitance	$C_{res}$		—	32	—	
Total Gate Charge	$Q_g$	$V_{CE} = 400\text{ V}, V_{GE} = 15\text{ V}$ $I_C = 30.0\text{ A}$	—	76	—	nC
Gate-Emitter Charge	$Q_{ge}$		—	20	—	
Gate-Collector Charge	$Q_{gc}$		—	38	—	

## IGBT Switching Characteristics (Inductive Load, $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

Parameter ( $T_C = 25\text{ }^\circ\text{C}$ )	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}, V_{GE} = 15\text{ V}$ $I_C = 30.0\text{ A}, R_G = 10\text{ }\Omega$	—	30	—	ns
Current Rise Time	$t_r$		—	105	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	67	—	ns
Current Fall Time	$t_f$		—	100	—	ns
Turn-on Switching Energy	$E_{on}$		—	1.85	—	mJ
Turn-off Switching Energy	$E_{off}$		—	0.45	—	mJ
Total Switching Energy	$E_{ts}$		—	2.3	—	mJ

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# BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)

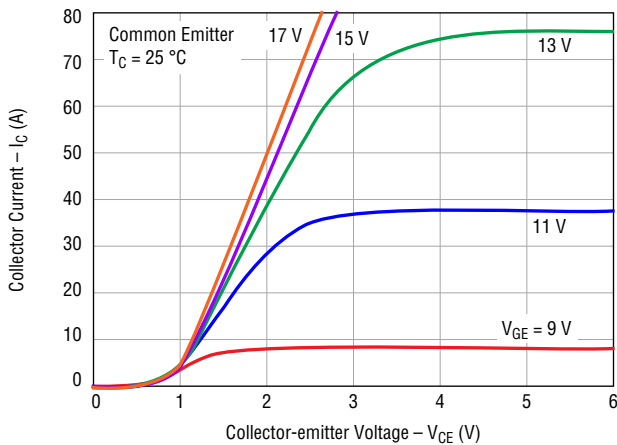


## Diode Switching Characteristics ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

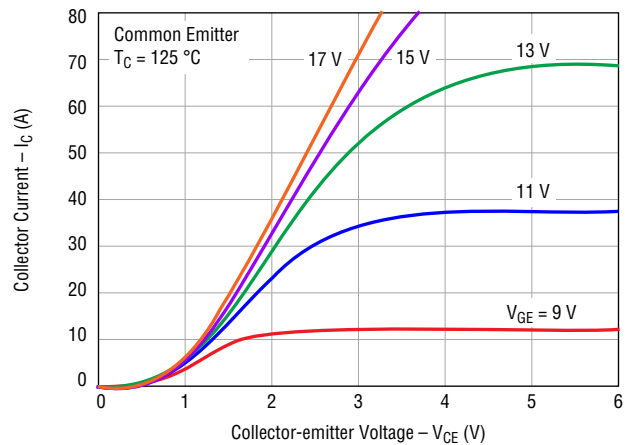
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	$t_{rr}$	$di_F/dt = 200\text{ A}/\mu\text{s}$ $I_F = 12.0\text{ A}$	—	28	—	ns
Reverse Recovery Charge	$Q_{rr}$		—	55	—	nC

## Electrical Characteristic Performance

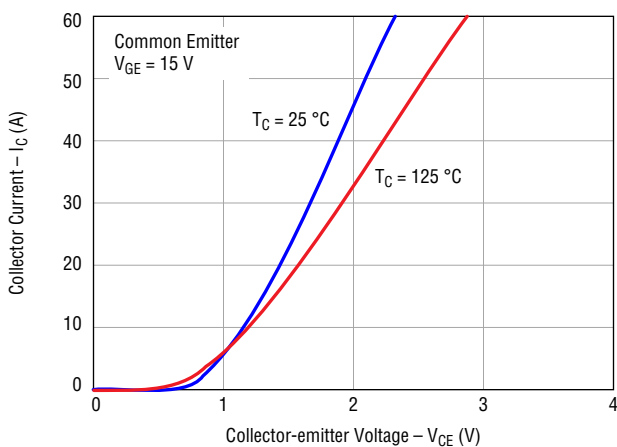
### Typical Output Characteristics



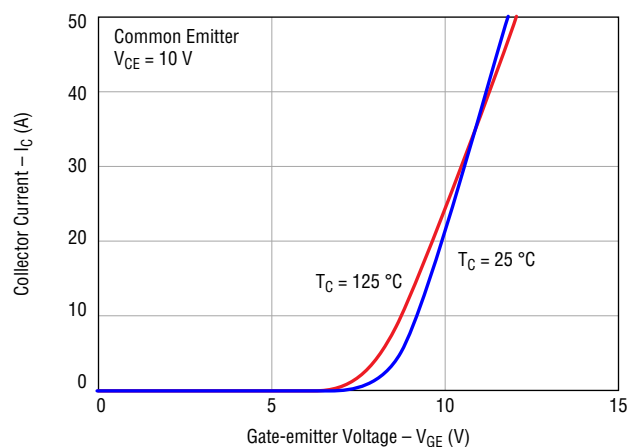
### Typical Output Characteristics



### Typical Saturation Voltage Characteristics



### Typical Transfer Characteristics



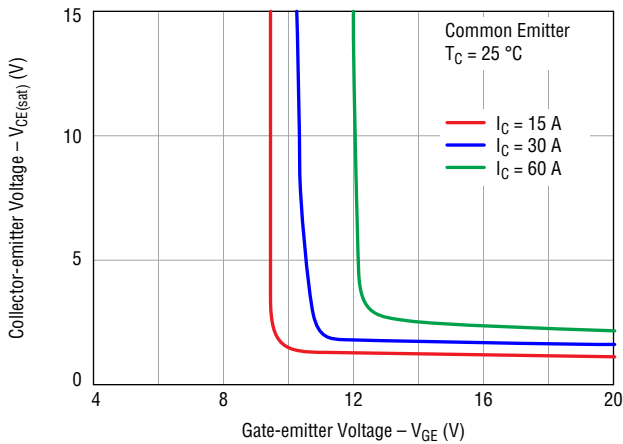
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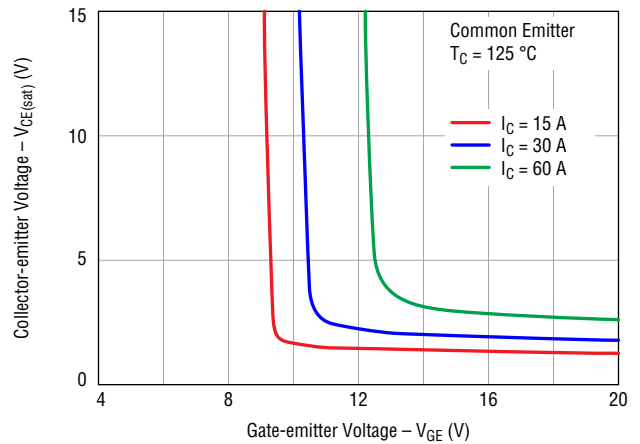
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## Electrical Characteristic Performance (continued)

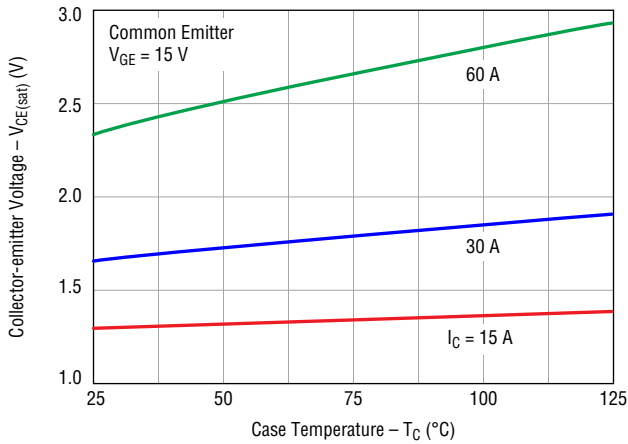
### Typical $V_{CE(sat)}$ vs $V_{GE}$ @ $T_C = 25^\circ\text{C}$



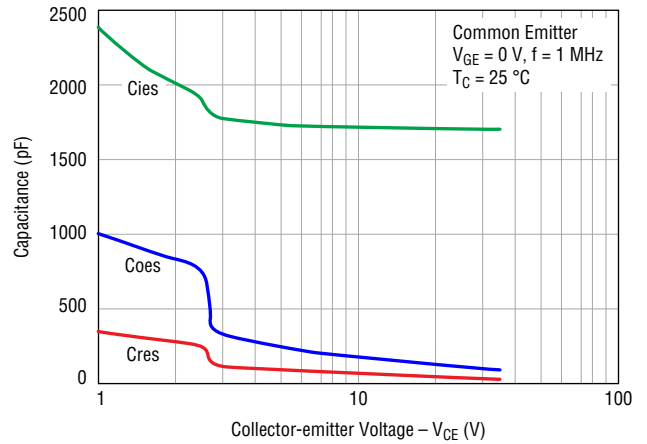
### Typical $V_{CE(sat)}$ vs $V_{GE}$ @ $T_C = 125^\circ\text{C}$



### Typical $V_{CE(sat)}$ vs Case Temperature



### Typical Capacitance Characteristics



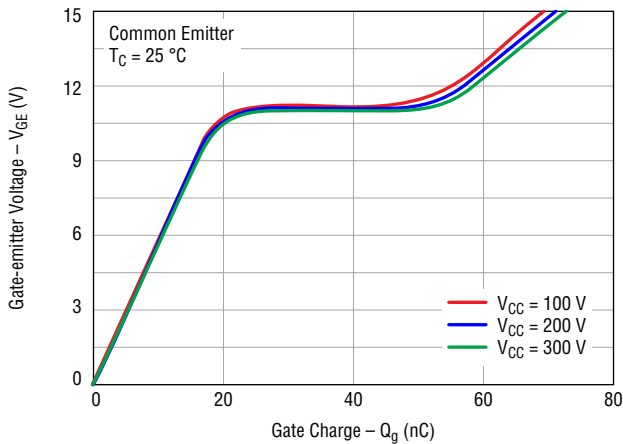
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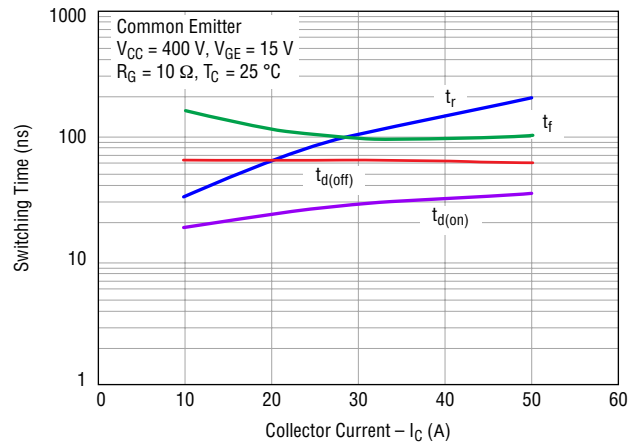
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## Electrical Characteristic Performance (continued)

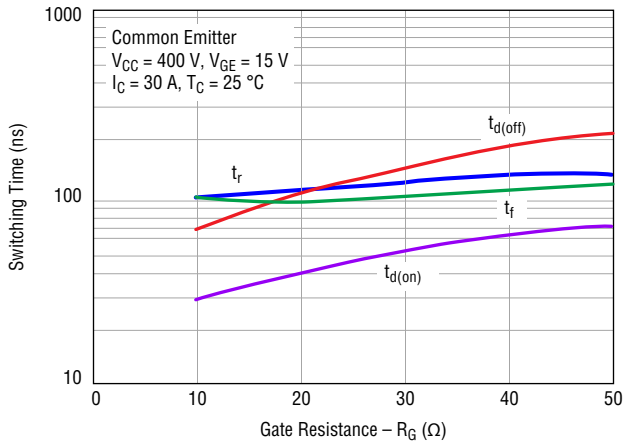
### Typical Gate Charge Characteristic



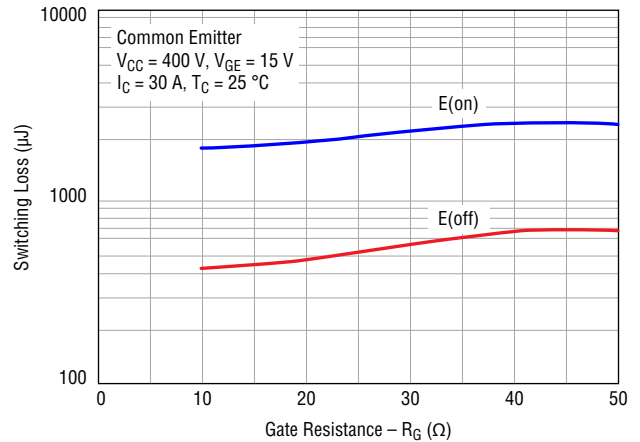
### Typical Switching Time Characteristics vs $I_C$



### Typical Switching Time Characteristics vs $R_G$



### Typical Switching Loss vs $R_G$



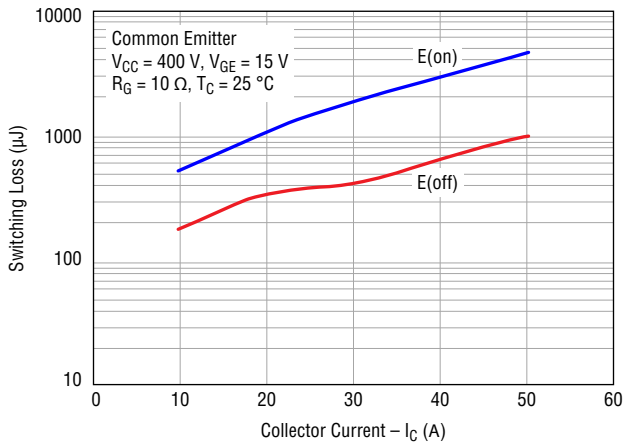
Specifications are subject to change without notice.

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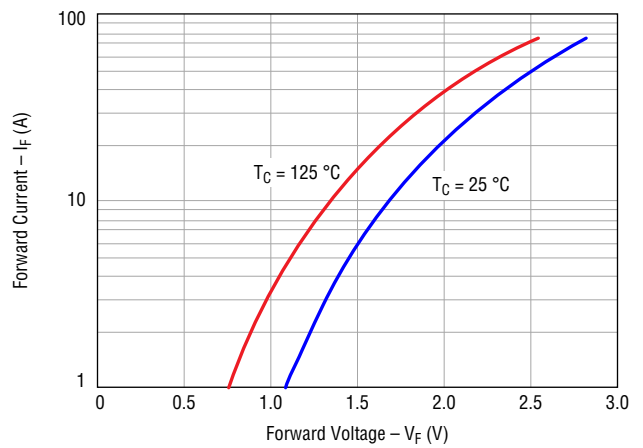
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**Electrical Characteristic Performance (continued)**

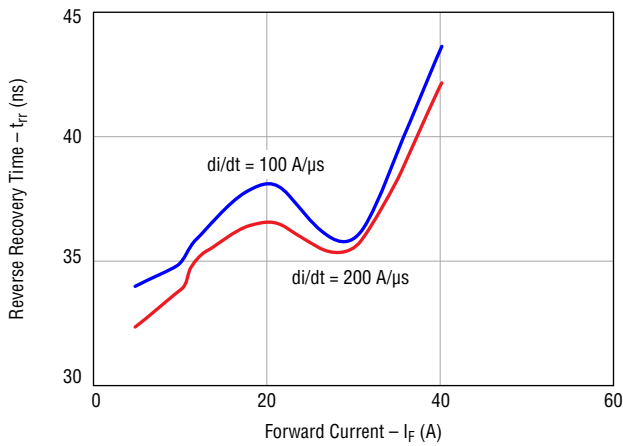
**Typical Switching Loss Characteristics vs  $I_C$**



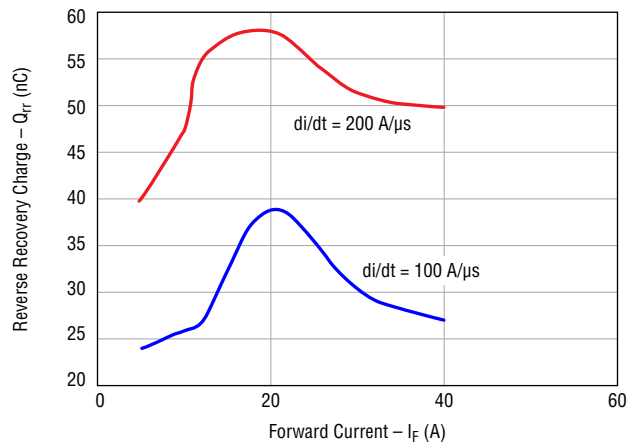
**Typical Diode  $I_F$  vs  $V_F$**



**Typical Reverse Recovery Time vs  $I_F$**



**Typical Reverse Recovery Charge vs  $I_F$**



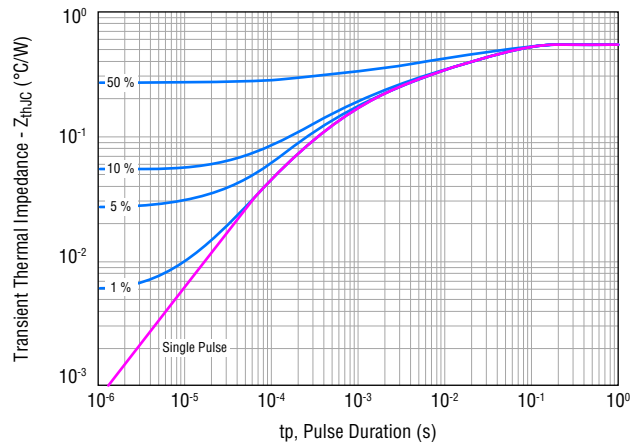
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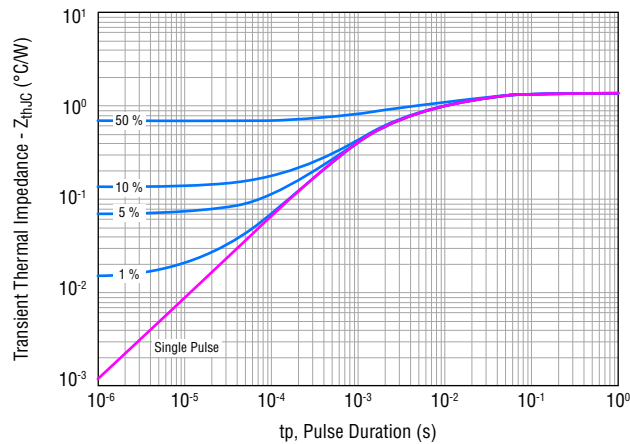
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**Electrical Characteristic Performance (continued)**

**IGBT Transient Thermal Impedance vs  $t_{p(on)}$  Duration ( $D=t_p/T$ )**



**Diode Transient Thermal Impedance vs  $t_{p(on)}$  Duration ( $D=t_p/T$ )**

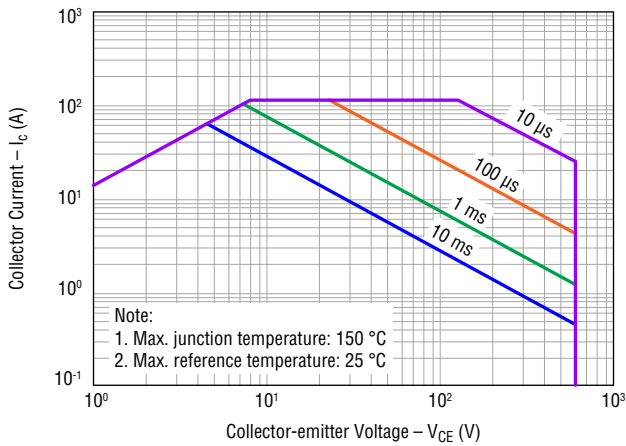


# BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)



## Electrical Characteristic Performance (continued)

### Forward Bias Safe Operating Area

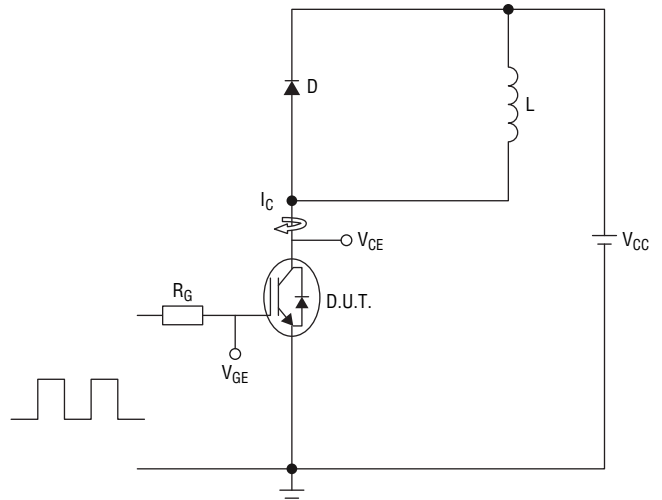


### How to Order

**B I D N W 3 0 N 6 0 H 3**

- B = Bourns®
- I = IGBT
- Type  
D = Discrete
- Packaging Code  
NW = TO-247N-3L
- Current Rating  
30 = 30 A
- Device Type  
N = N-channel
- Nominal Voltage (divided by 10)  
60 = 600 V
- Optimization  
H = High Speed
- Version Number

## Inductive Load Test Circuit



$L = 1.87 \text{ mH}$ ,  $V_{CE} = 400 \text{ V}$ ,  $V_{GE} = 15 \text{ V}$ ,  $I_C = 30 \text{ A}$ ,  $R_G = 10 \Omega$

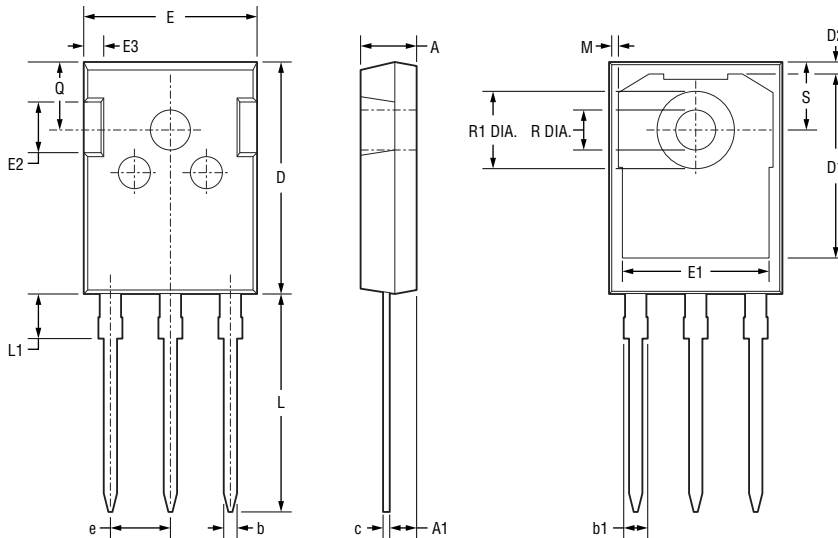
## Environmental Characteristics

ESD Class (HBM) .....2

# BIDNW30N60H3 Insulated Gate Bipolar Transistor (IGBT)



## Product Dimensions



DIMENSIONS:  $\frac{\text{MM}}{\text{(INCHES)}}$

Symbol	Min.	Nom.	Max.
A	4.90 (.193)	5.00 (.197)	5.10 (.201)
A1	2.31 (.091)	2.41 (.095)	2.51 (.099)
b	1.16 (.046)	—	1.26 (.050)
b1	—	—	2.25 (.089)
c	0.59 (.023)	—	0.66 (.026)
D	20.90 (.823)	21.00 (.827)	21.10 (.831)
D1	16.25 (.640)	16.55 (.652)	16.85 (.663)
D2	1.05 (.041)	1.17 (.046)	1.35 (.053)
E	15.70 (.618)	15.80 (.622)	15.90 (.626)
E1	13.10 (.516)	13.30 (.524)	13.50 (.531)
E2	4.40 (.173)	4.50 (.177)	4.60 (.181)
E3	1.50 (.059)	1.60 (.063)	1.70 (.067)
e	5.436 (.214) BSC		
L	19.80 (.780)	19.92 (.784)	20.10 (.791)
L1	—	—	4.30 (.169)
M	0.35 (.014)	—	0.95 (.037)
R	3.40 (.134)	3.50 (.138)	3.60 (.142)
R1	7.00 (.276)	—	7.40 (.291)
Q	5.60 (.220)	—	6.00 (.236)
S	6.05 (.238)	6.15 (.242)	6.25 (.246)

## Packaging Specifications

BIDNW30N60H3 ..... 30 pieces per tube



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