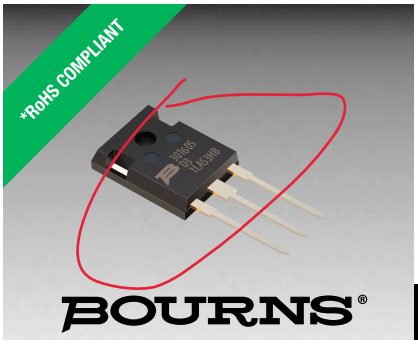
PRELIMINARY



Features

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

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:

PRODUCT | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

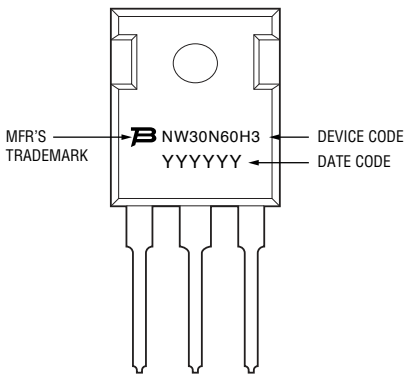
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current (T_C = 25 °C)	I_C	60	A
Continuous Collector Current (T_C = 100 °C)	I_C	30	A
Pulsed Collector Current	I_{CP}	120	A
Gate-Emitter Voltage	V_{GE}	±20	V
Continuous Forward Current (T_C = 25 °C)	I_F	12	A
Total Power Dissipation	P_{total}	230	W
Storage Temperature	T_{STG}	-55 to +150	°C
Operating Junction Temperature	T_J	-55 to +150	°C

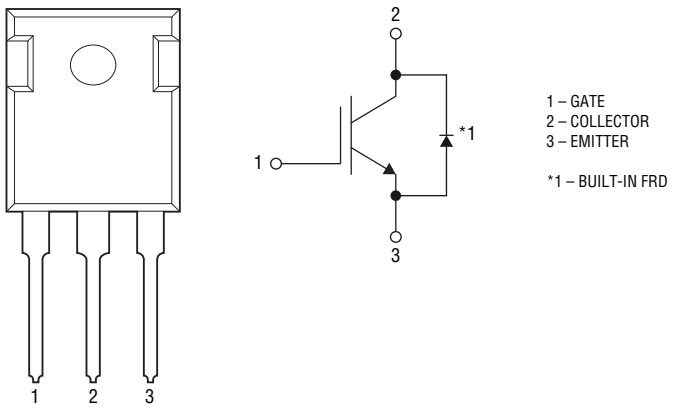
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)\_IGBT}$	0.54	°C/W
Diode Thermal Resistance Junction - Case	$R_{th(j-c)\_Diode}$	1.5	°C/W

Typical Part Marking



Internal Circuit



1 – GATE
2 – COLLECTOR
3 – EMITTER

*1 – BUILT-IN FRD

WARNING Cancer and Reproductive Harm
www.P65Warnings.ca.gov

*RoHS Directive 2015/863, Mar 31, 2015 and Annex.
Specifications are subject to change without notice.
Users should verify actual device performance in their specific applications.
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Static Electrical Characteristics (T_C = 25 °C, Unless Otherwise Specified)

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

Dynamic Electrical Characteristics (T_C = 25 °C, Unless Otherwise Specified)

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

IGBT Switching Characteristics (Inductive Load, T_C = 25 °C, unless otherwise specified)

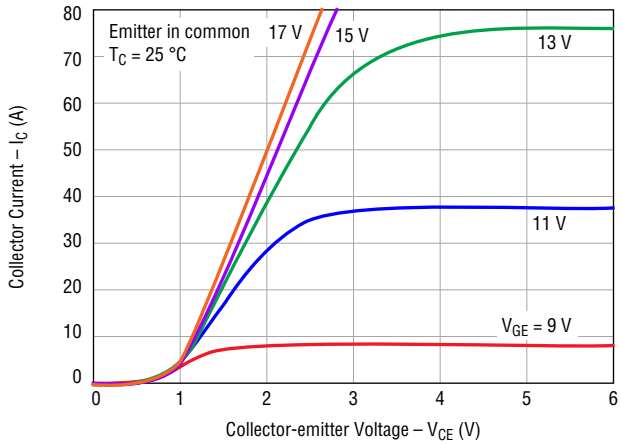
Parameter (T_C = 25 °C)	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 30.0 A, R_G = 10 Ω	—	30	—	ns
Current Rise Time	t_r		—	105	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	67	—	ns
Current Fall Time	t_f		—	100	—	ns
Turn-on Switching Energy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

Diode Switching Characteristics (T_C = 25 °C, unless otherwise specified)

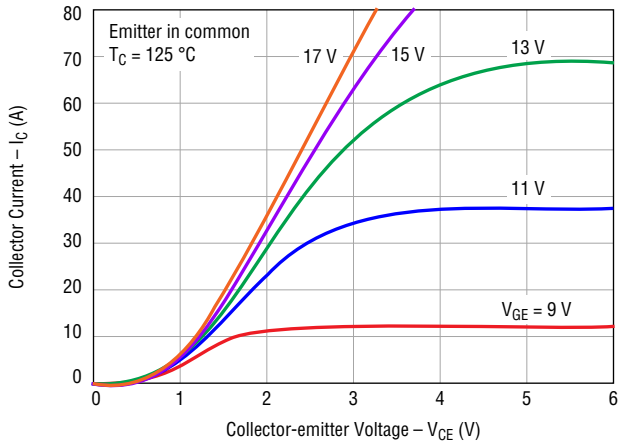
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/μs I_F = 12.0 A	—	28	—	ns
Reverse Recovery Charge	Q_{rr}		—	55	—	nC

Electrical Characteristic Performance

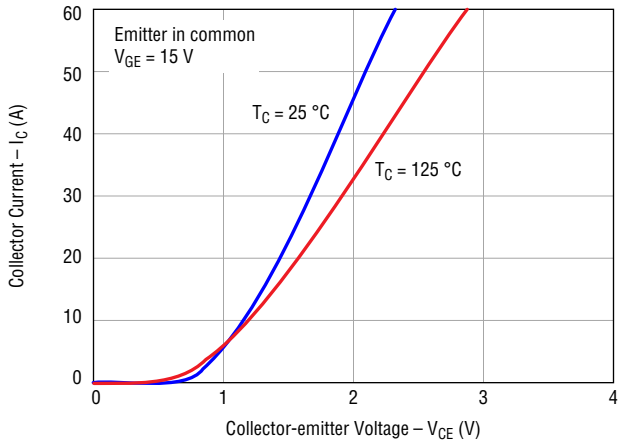
Typical Output Characteristics



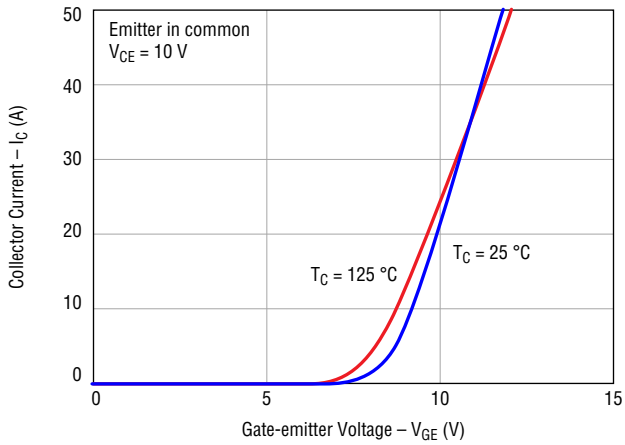
Typical Output Characteristics



Typical Saturation Voltage Characteristics

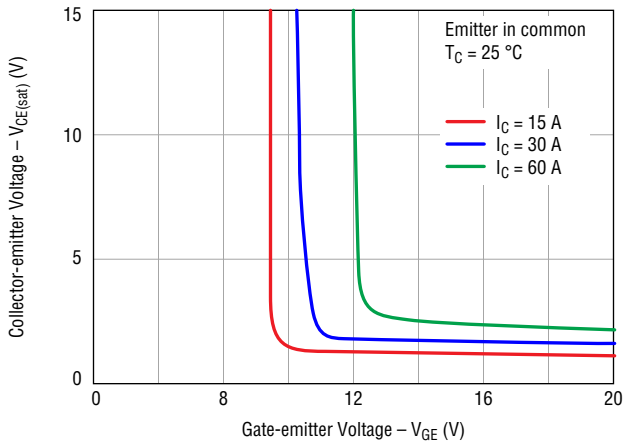


Typical Transfer Characteristics

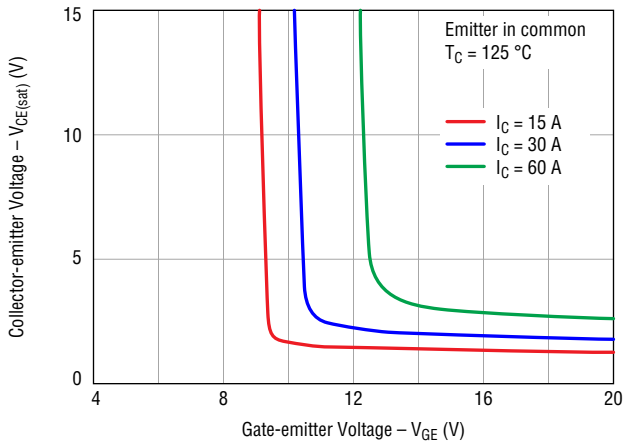


Electrical Characteristic Performance (continued)

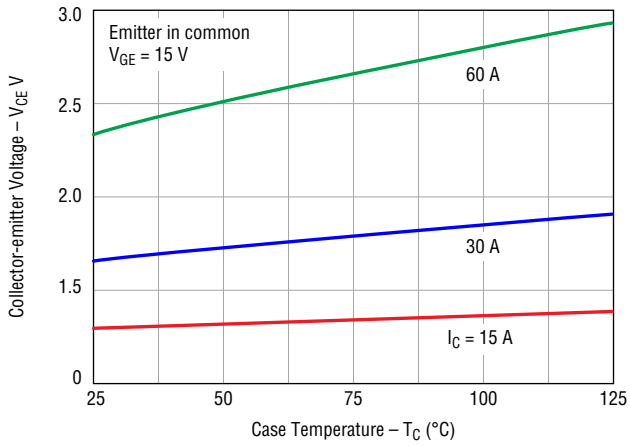
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



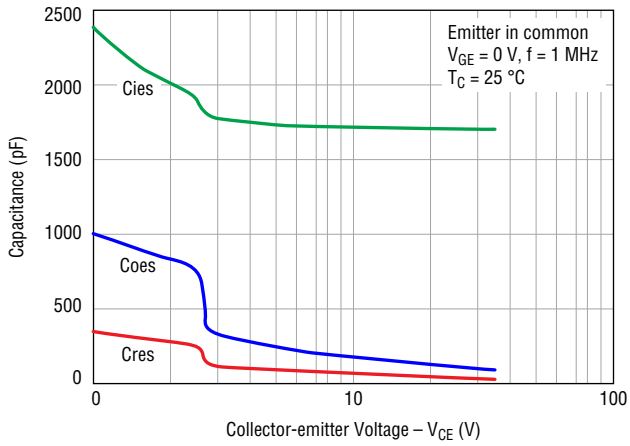
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

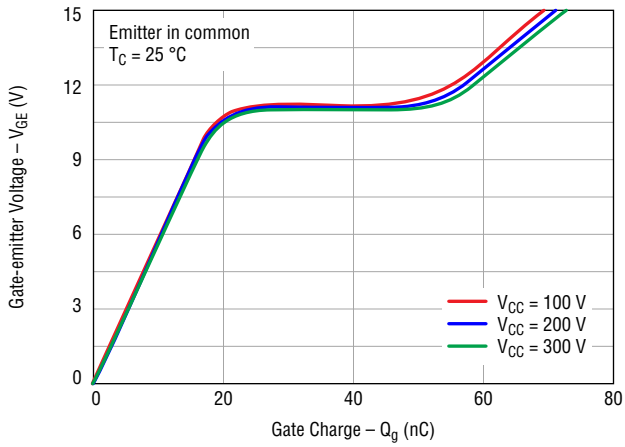


Typical Capacitance Characteristics

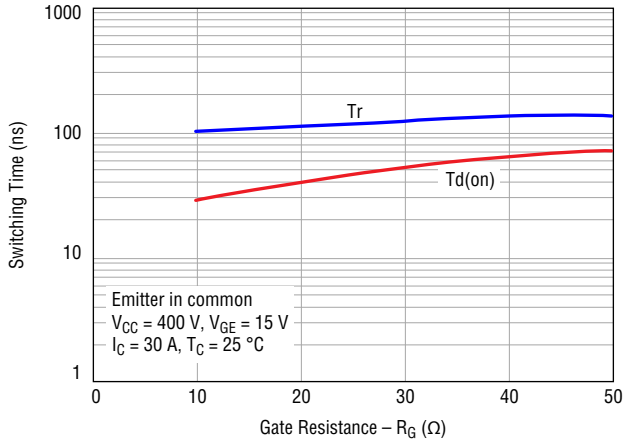


Electrical Characteristic Performance (continued)

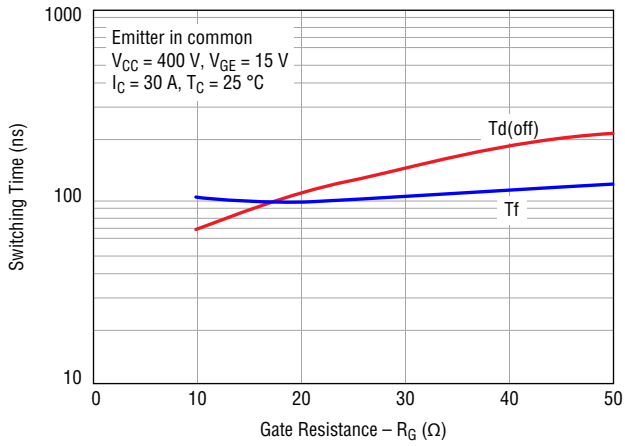
Typical Gate Charge Characteristic



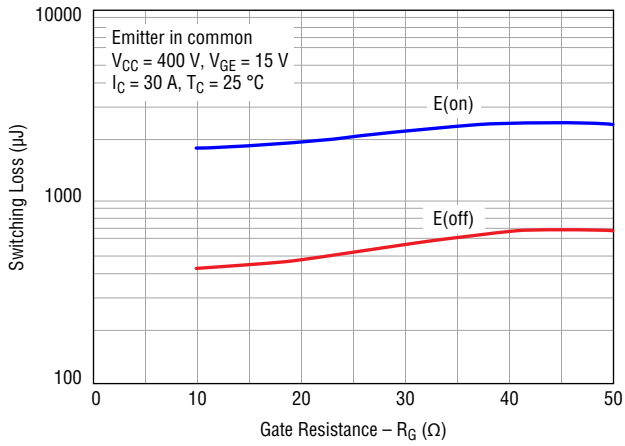
Typical Turn-on Characteristics vs R_G



Typical Turn-off Characteristics vs R_G

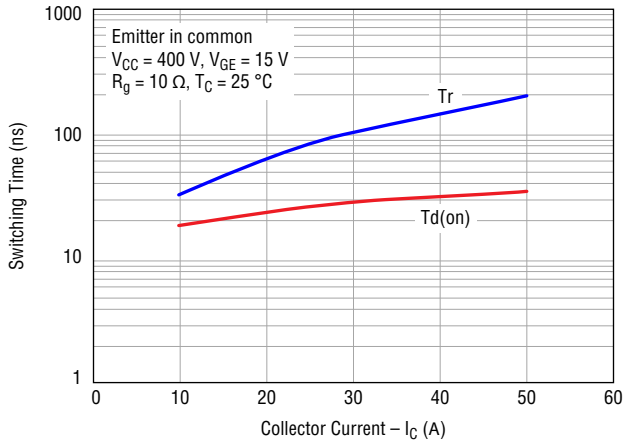


Typical Switching Loss vs R_G

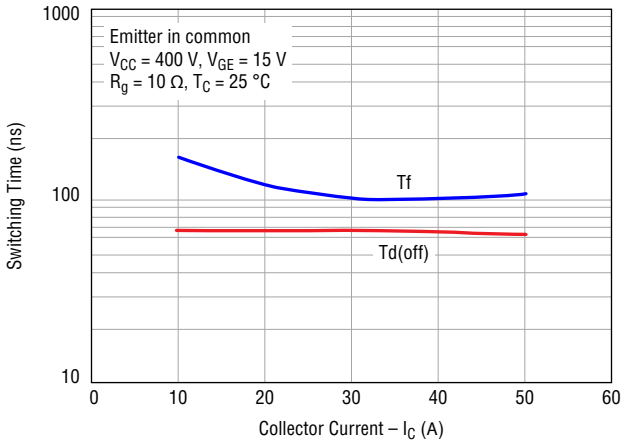


Electrical Characteristic Performance (continued)

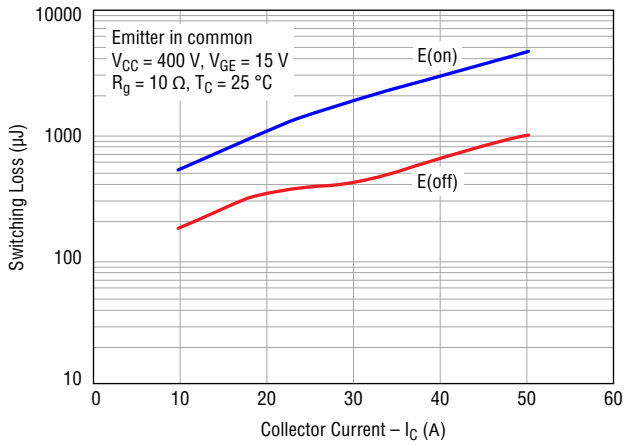
Typical Turn-on Characteristics vs I_C



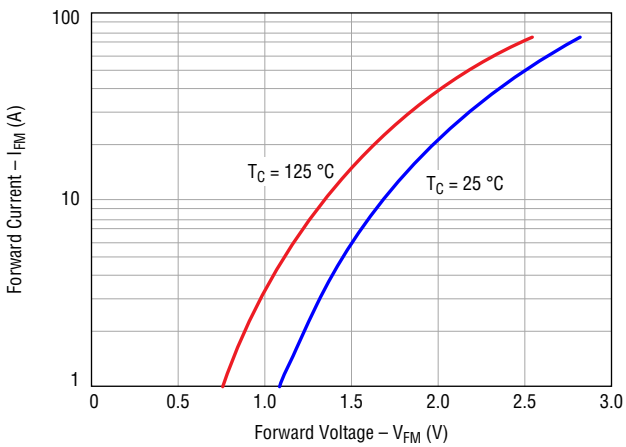
Typical Turn-off Characteristics vs I_C



Typical Switching Loss Characteristics vs I_C

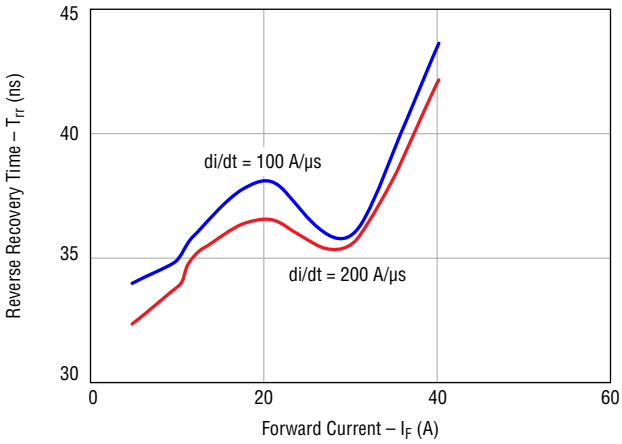


Typical Diode I_F vs V_F

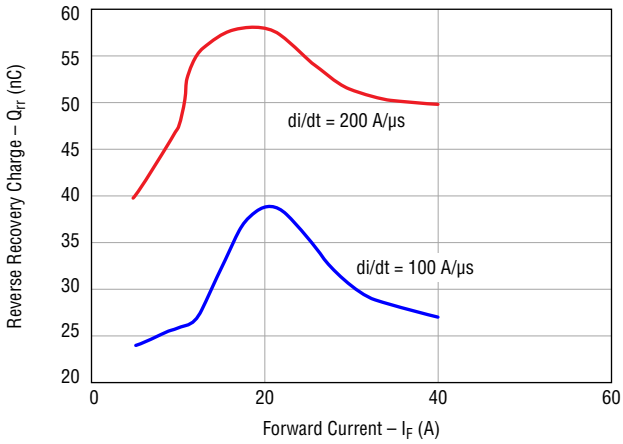


Electrical Characteristic Performance (continued)

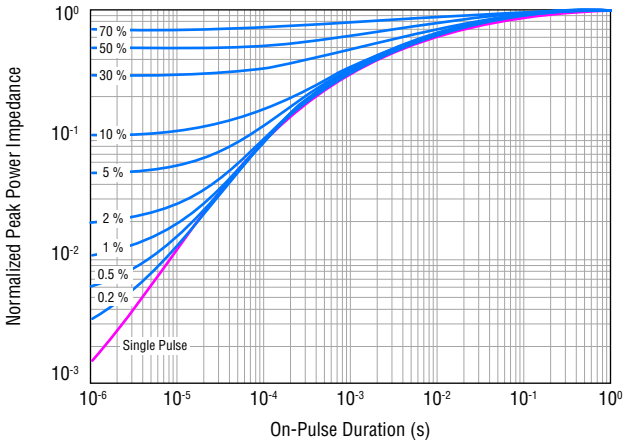
Typical Reverse Recovery Time vs I_F



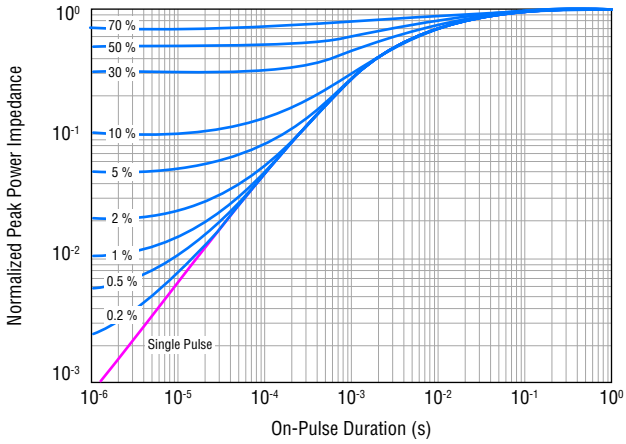
Typical Reverse Recovery Charge vs I_F



Peak Power Impedance vs $T_{p(on)}$ Duration (IGBT)

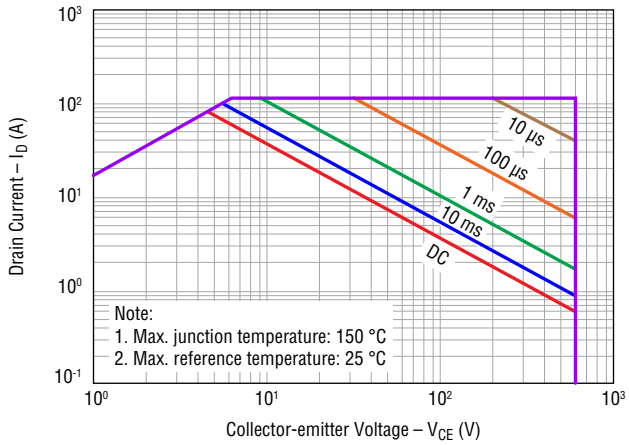


Peak Power Impedance vs $T_{p(on)}$ Duration (Diode)



Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area

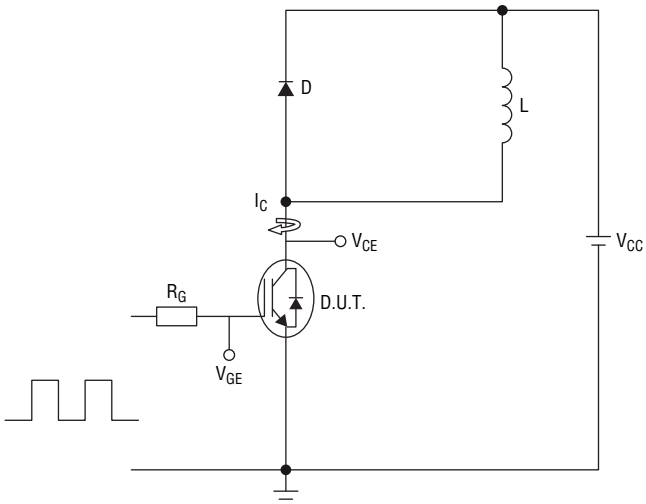


How to Order

B I D NW 30 N 60 H 3

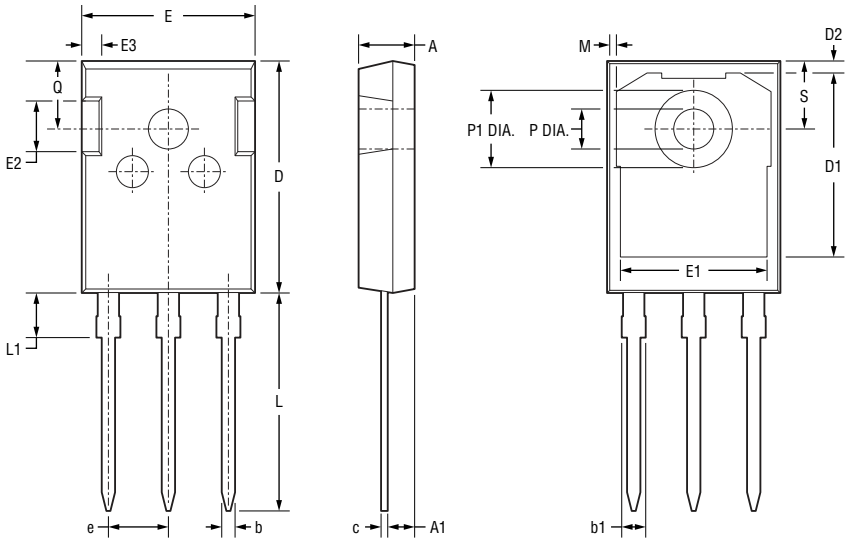
- B = Bourns®
- I = IGBT
- Type
  - D = Discrete
- Packaging Code
  - NW = TO-247N-3L
- Current Rating
  - 30 = 30 A
- Device Type
  - N = N-channel
- Nominal Voltage (divided by 10)
  - 60 = 600 V
- Optimization
  - H = ???
- Version Number

Inductive Load Test Circuit



L = 1.87 mH, V_{CE} = 400 V, V_{GE} = 15 V, I_C = 30 A, R_G = 10 Ω

Product Dimensions



DIMENSIONS: MM / (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)
P	3.40 (.134)	3.50 (.138)	3.60 (.142)
P1	7.00 (.276)	—	7.40 (.291)
Q	5.60 (.220)	—	6.00 (.236)
S	6.05 (.238)	6.15 (.242)	6.25 (.246)

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REV. 11/21

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