

BOURNS®

Features

- 600V, 5A, Low $V_{CE(sat)}$
- Novel field stop technology
- Optimized for conduction
- Robust
- RoHS compliant*

Applications

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

BIDD05N60T Insulated Gate Bipolar Transistor (IGBT)

General Information

The Bourns® Model BIDD05N60T 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. In addition, this structure increases the robustness of the device.

Additional Information

Click these links for more information:

PRODUCT SELECTOR | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

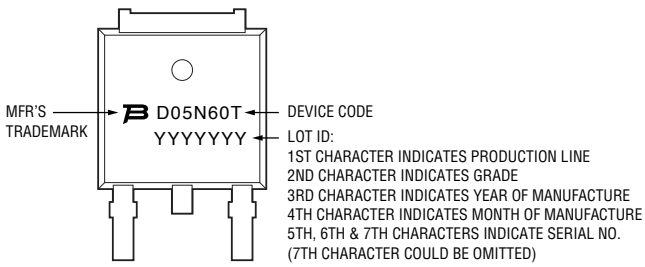
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current (T_C = 25 °C), limited by T_{jmax}	I_C	10	A
Continuous Collector Current (T_C = 100 °C), limited by T_{jmax}	I_C	5	A
Pulsed Collector Current, t_p limited by T_{jmax}	I_{CP}	15	A
Gate-Emitter Voltage	V_{GE}	±30	V
Continuous Forward Current (T_C = 25 °C), limited by T_{jmax}	I_F	10	A
Short-circuit Withstand Time (V_{CE} = 300 V, V_{GE} = 15 V)	T_{SC}	10	μs
Total Power Dissipation	P_{total}	82	W
Storage Temperature	T_{STG}	-55 to +150	°C
Operating Junction Temperature	T_j	-55 to +150	°C

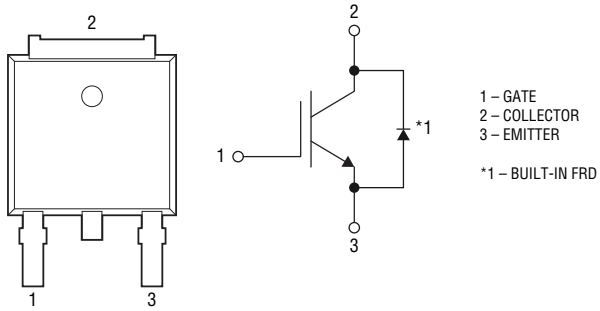
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)_IGBT}$	1.51	°C/W
Diode Thermal Resistance Junction - Case	$R_{th(j-c)_Diode}$	2.14	°C/W

Typical Part Marking



Internal Circuit



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

*RoHS Directive 2015/863, Mar 31, 2015 and Annex.
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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 = 5 A T_C= 25 °C	—	1.5	2.0	V
		V_{GE} = 15 V, I_C = 5 A T_C= 125 °C	—	1.7	—	
Diode Forward On-Voltage	V_F	I_F = 5 A, T_C = 25 °C	—	1.3	1.8	V
		I_F = 5 A, T_C = 125 °C	—	1.1	—	V
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 μA	3.5	5.5	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	—	340	—	pF
Output Capacitance	C_{oes}		—	26	—	
Reverse Transfer Capacitance	C_{res}		—	7.6	—	
Total Gate Charge	Q_g	V_{CE} = 400 V, V_{GE} = 15 V I_C = 5.0 A	—	18.5	—	nC
Gate-Emitter Charge	Q_{ge}		—	5.1	—	
Gate-Collector Charge	Q_{gc}		—	8.6	—	

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 = 5.0 A, R_G = 10 Ω	—	7	—	ns
Current Rise Time	t_r		—	14	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	18	—	ns
Current Fall Time	t_f		—	145	—	ns
Turn-on Switching Energy	E_{on}		—	0.2	—	mJ
Turn-off Switching Energy	E_{off}		—	0.07	—	mJ
Total Switching Energy	E_{ts}		—	0.27	—	mJ

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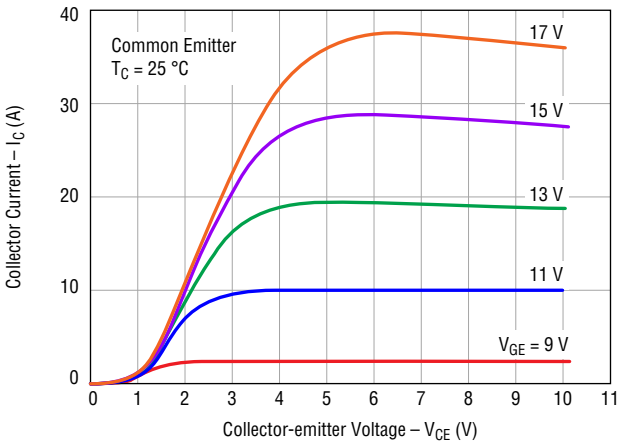
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Diode Switching Characteristics (T_C = 25 °C, unless otherwise specified)

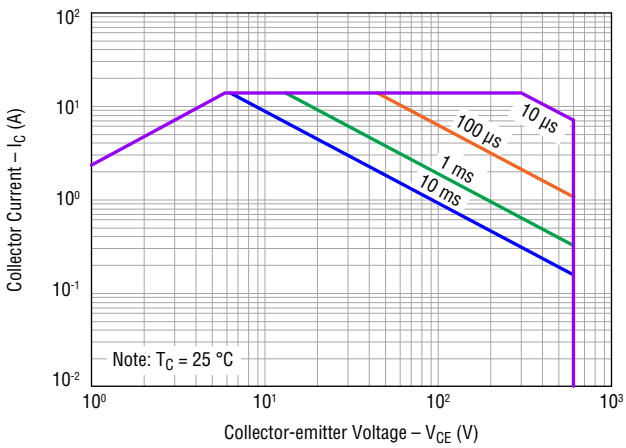
Parameter (T_C = 25 °C)	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/μs I_F = 5.0 A	—	40	—	ns
Reverse Recovery Charge	Q_{rr}		—	80	—	nC

Electrical Characteristic Performance

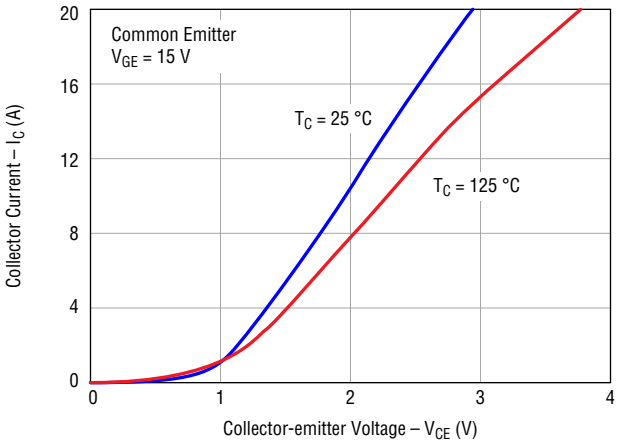
Typical Output Characteristics



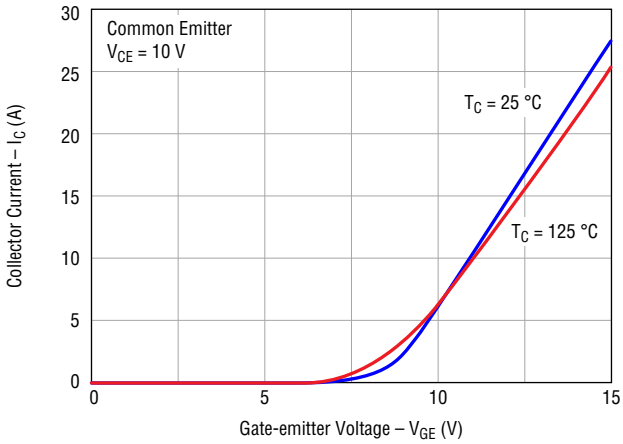
Forward Bias Safe Operating Area



Typical Saturation Voltage Characteristics



Typical Transfer Characteristics

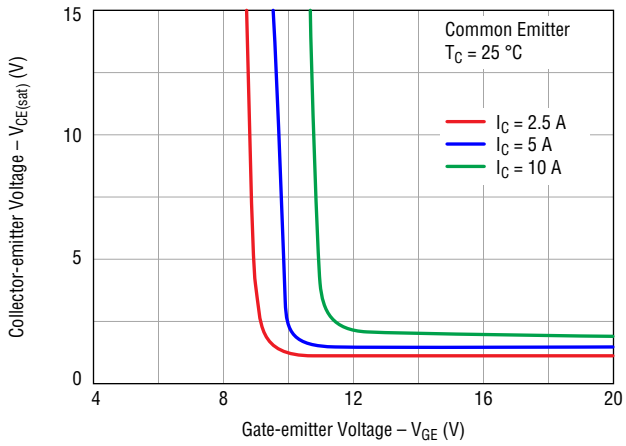


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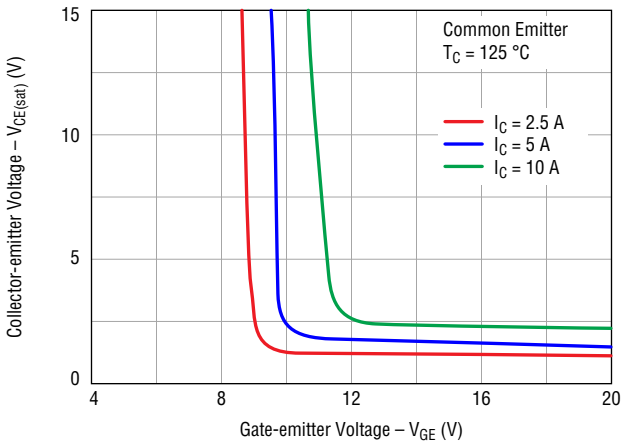
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Electrical Characteristic Performance (continued)

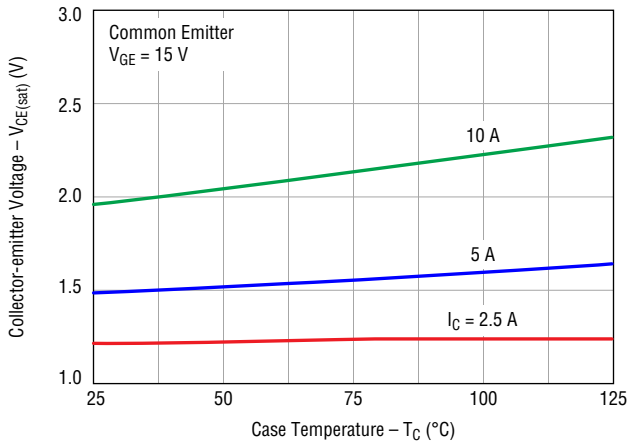
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



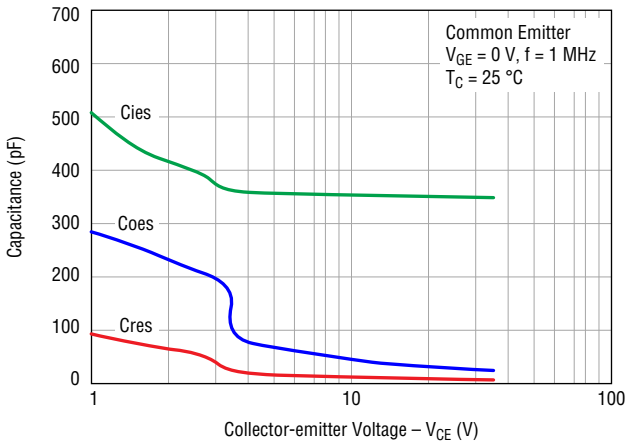
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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



Typical Capacitance Characteristics

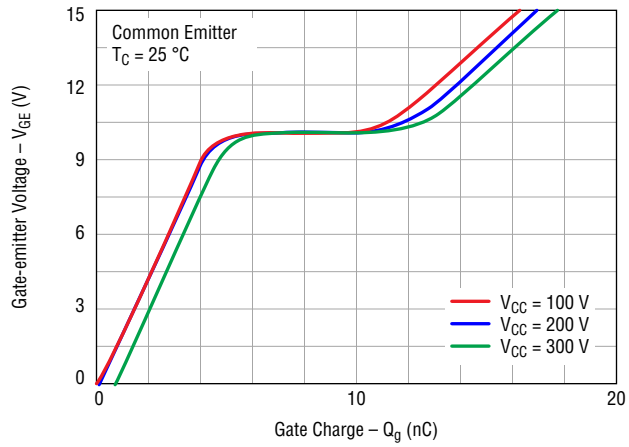


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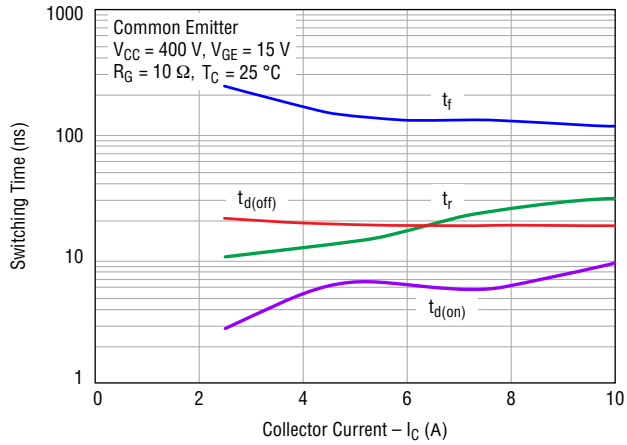
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Electrical Characteristic Performance (continued)

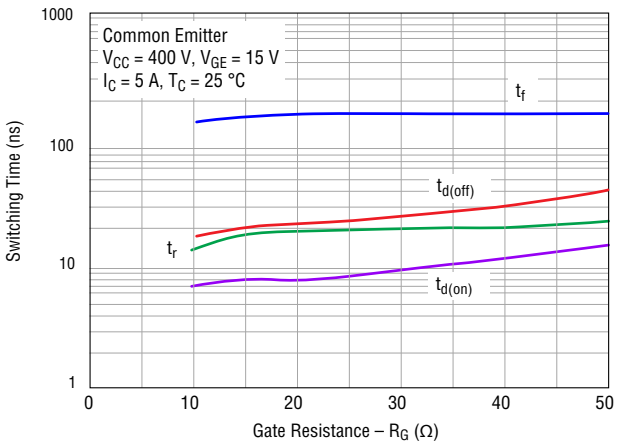
Typical Gate Charge Characteristic



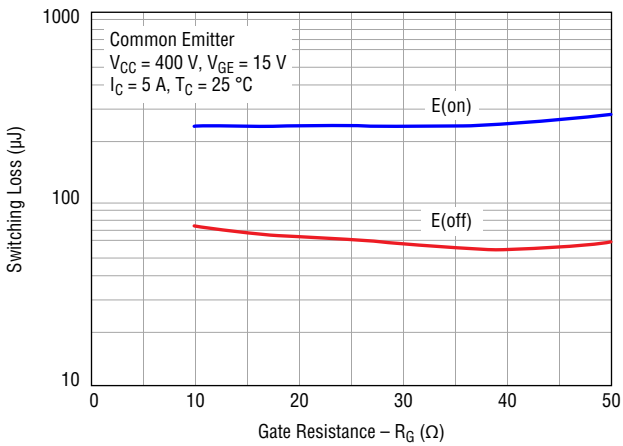
Typical Switching Time Characteristics vs I_C



Typical Switching Time Characteristics vs R_G



Typical Switching Loss vs R_G

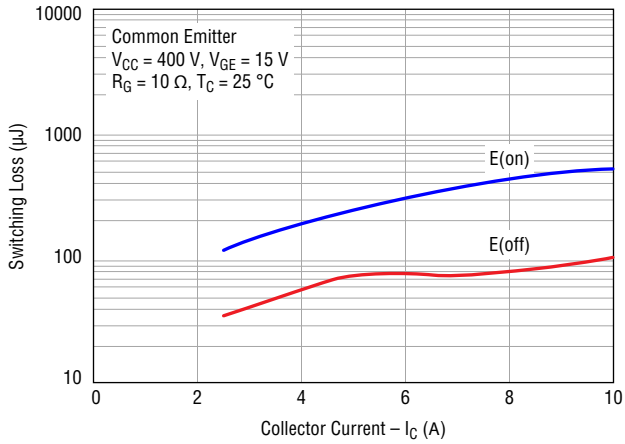


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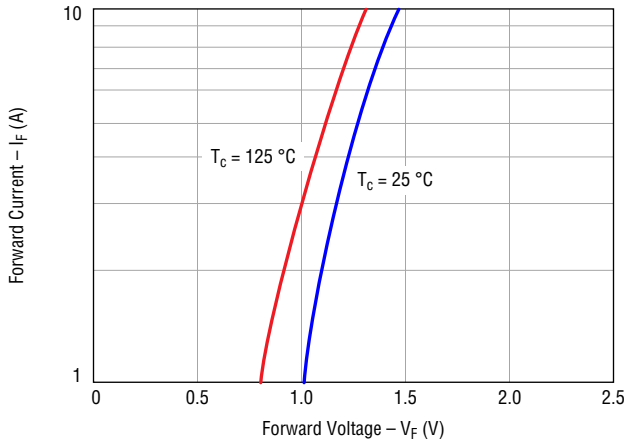
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Electrical Characteristic Performance (continued)

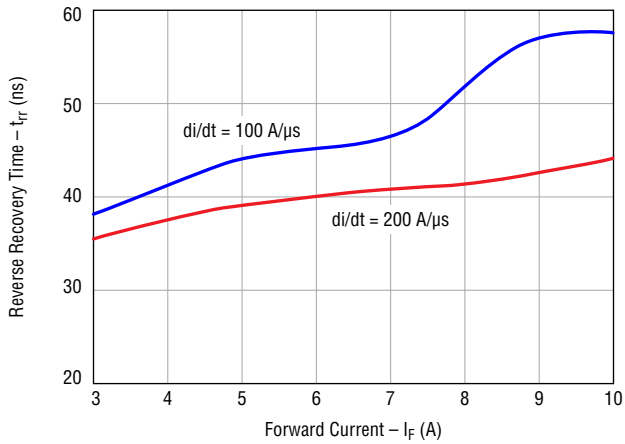
Typical Switching Loss Characteristics vs I_C



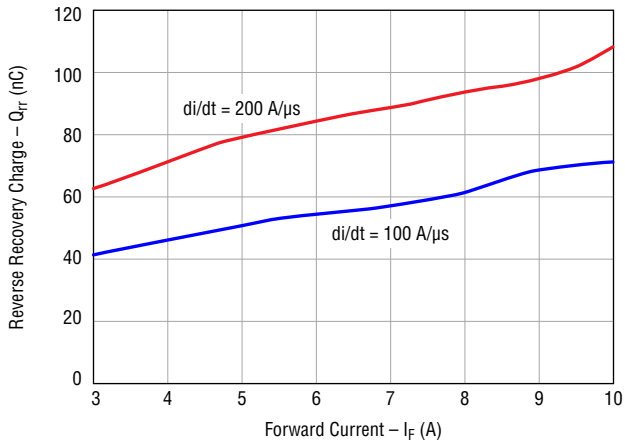
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F



Typical Reverse Recovery Charge vs I_F

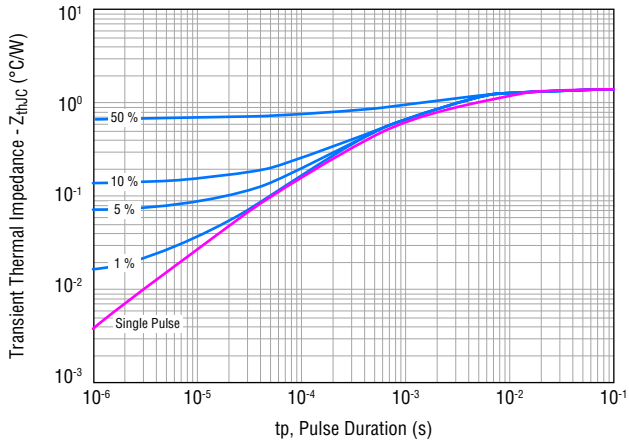


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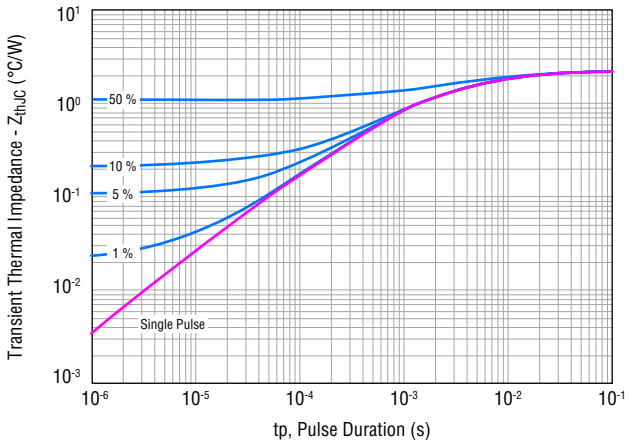
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Electrical Characteristic Performance (continued)

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



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



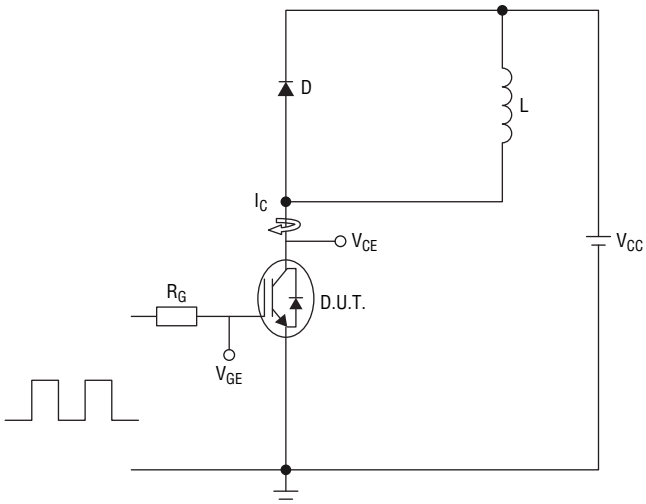
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BIDD05N60T Insulated Gate Bipolar Transistor (IGBT)

BOURNS®

Inductive Load Test Circuit



L = 11.2 mH, V_{CE} = 400 V, V_{GE} = 15 V, I_C = 5 A, R_G = 10 Ω

How to Order

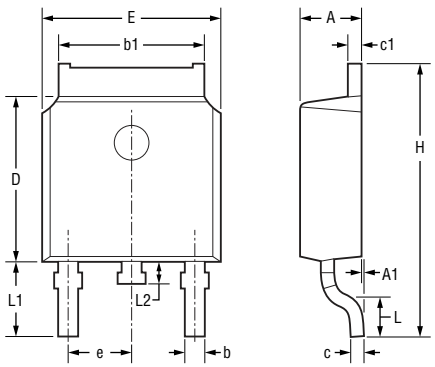
B I D D 05 N 60 T

- B = Bourns®
- I = IGBT
- Type
  - D = Discrete
- Packaging Code
  - D = TO-252 (DPAK)
- Current Rating
  - 05 = 5 A
- Device Type
  - N = N-channel
- Nominal Voltage (divided by 10)
  - 60 = 600 V
- Optimization
  - T = Medium Speed

Environmental Characteristics

Moisture Sensitivity Level.....3
ESD Class (HBM)..... 1B

Product Dimensions



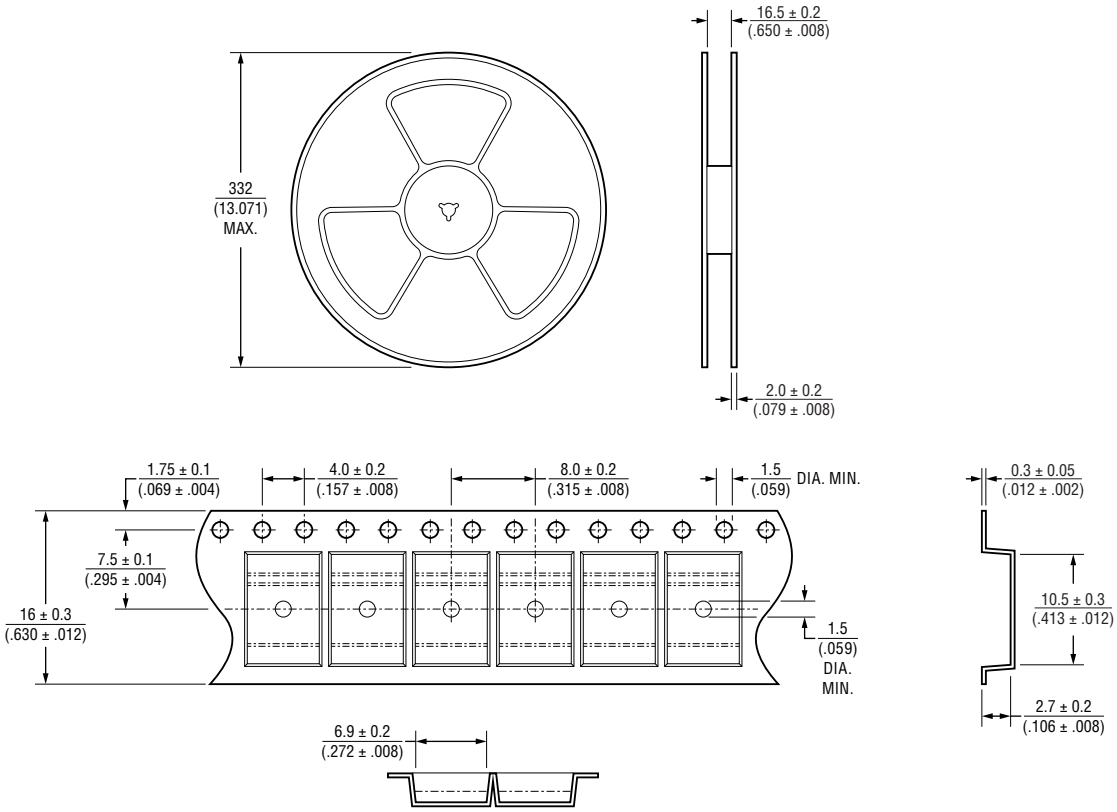
DIMENSIONS: MM / (INCHES)

Symbol	Min.	Nom.	Max.
A	2.10 (.083)	2.30 (.091)	2.50 (.098)
A1	0	—	0.127 (.005)
b	0.66 (.026)	0.76 (.030)	0.89 (.035)
b1	5.10 (.201)	5.33 (.210)	5.46 (.215)
c	0.45 (.018)	—	0.65 (.026)
c1	0.45 (.018)	—	0.65 (.026)
D	5.80 (.228)	6.10 (.240)	6.40 (.252)
E	6.30 (.248)	6.60 (.260)	6.90 (.272)
e		2.30 (.091) TYP	
H	9.60 (.378)	10.10 (.398)	10.60 (.417)
L	1.40 (.055)	1.50 (.059)	1.70 (.067)
L1		2.90 (.114) REF	
L2	0.60 (.024)	0.80 (.031)	1.00 (.039)

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Packaging Specifications



DIMENSIONS: MM / (INCHES)

USER DIRECTION OF FEED

QTY: 2500 PCS PER REEL

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REV. 07/22

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The characteristics and parameters of a Bourns® product set forth in its data sheet are based on laboratory conditions, and statements regarding the suitability of products for certain "typical" applications are based on Bourns' knowledge of typical requirements in generic applications. Bourns assumes that "typical" applications include failsafe/backup features to address critical risks to users and are designed to allow rework of Bourns® product to avoid scrap of a device solely due to malfunctioning Bourns® product. The characteristics and parameters of a Bourns® product in a user application may vary from the data sheet characteristics and parameters due to (i) the combination of the Bourns® product with other components in the user's application, or (ii) the environment of the user application itself. The characteristics and parameters of a Bourns® product also can and do vary in different applications and actual performance may vary over time. Thus, users should always verify the actual performance of the Bourns® product in their specific devices and applications and make their own independent judgments regarding the suitability of Bourns® product and the amount of additional test margin to design into their device or application to compensate for differences between laboratory and real-world conditions.

Unless Bourns has explicitly designated an individual Bourns® product as meeting the requirements of a particular industry standard (e.g., IATF 16949) or a particular qualification (e.g., UL listed or recognized), Bourns is not responsible for any failure of an individual Bourns® product to meet the requirements of such industry standard or particular qualification even if such industry standard or qualification is a "state of art". Users of Bourns® products are responsible for ensuring compliance with safety-related requirements and standards applicable to their devices or applications.

Bourns® products are not recommended, authorized or intended for use in applications where failure or malfunction may result in personal injury, death, or severe property or environmental damage, such as without limitation nuclear, life-critical medical and certain automotive and aviation applications. Except as set forth in the bullet points below or unless expressly and specifically approved in writing on a case-by-case basis by an authorized Bourns' representative, use of any Bourns® products in such unauthorized high-risk applications is at the user's sole risk.

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