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

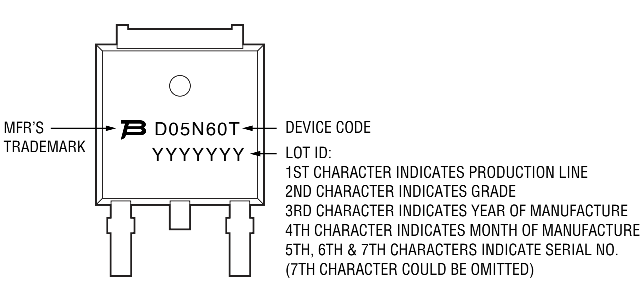
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

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

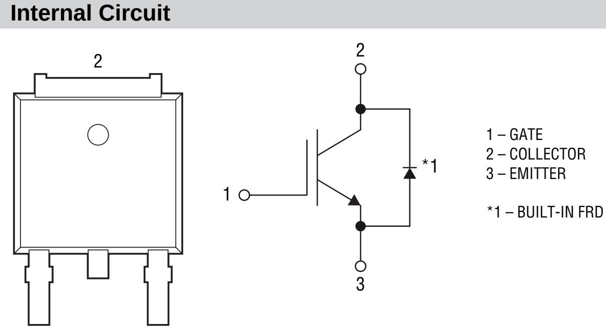
Thermal Resistance

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.
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 = 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)

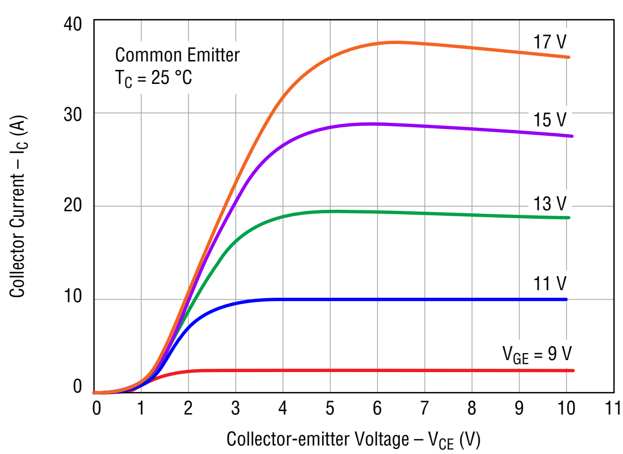
Parameter (T_C = 25 °C)	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 5.0 A, R_G = 10 Ω	—	7	—	ns
Current Rise Time	t_r		—	14	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	18	—	ns
Current Fall Time	t_f		—	145	—	ns
Turn-on Switching Energy	E_{on}		—	0.2	—	mJ
Turn-off Switching Energy	E_{off}		—	0.07	—	mJ
Total Switching Energy	E_{ts}		—	0.27	—	mJ

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

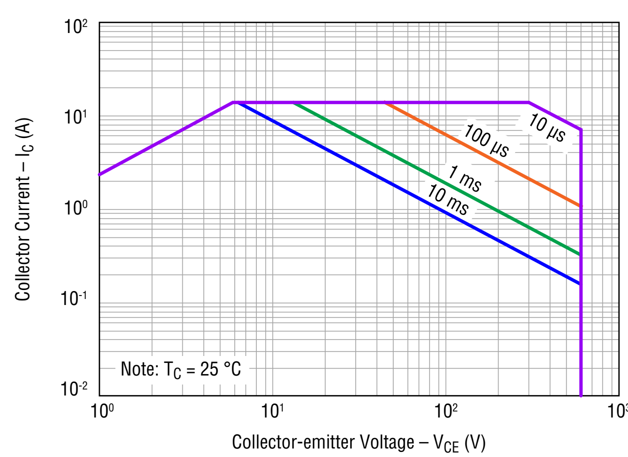
Parameter (T_C = 25 °C)	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/μs I_F = 5.0 A	—	40	—	ns
Reverse Recovery Charge	Q_{rr}		—	80	—	nC

Electrical Characteristic Performance

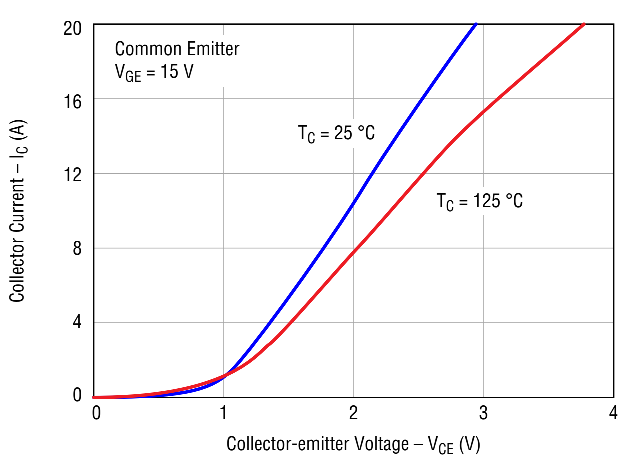
Typical Output Characteristics



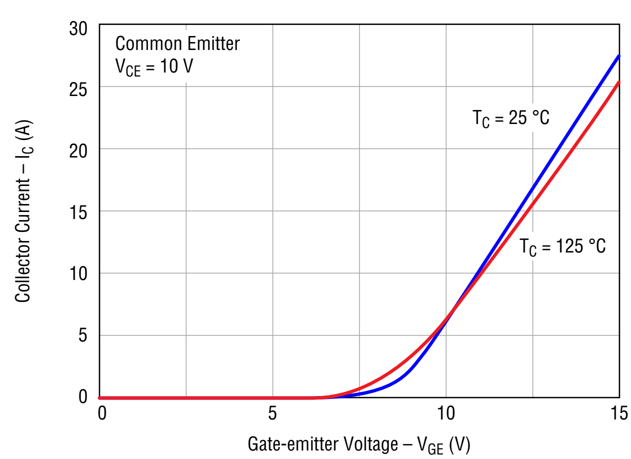
Forward Bias Safe Operating Area



Typical Saturation Voltage Characteristics

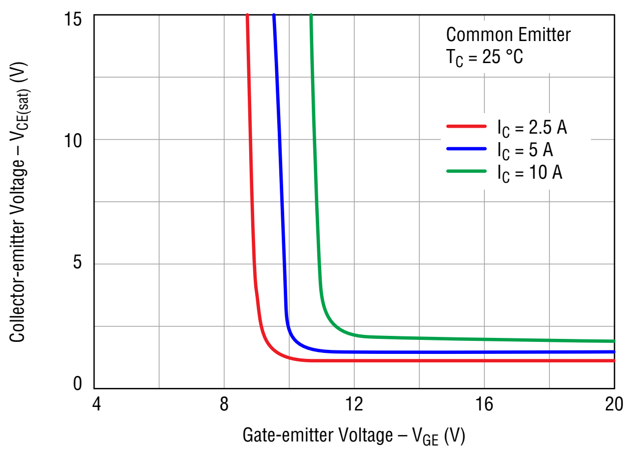


Typical Transfer Characteristics

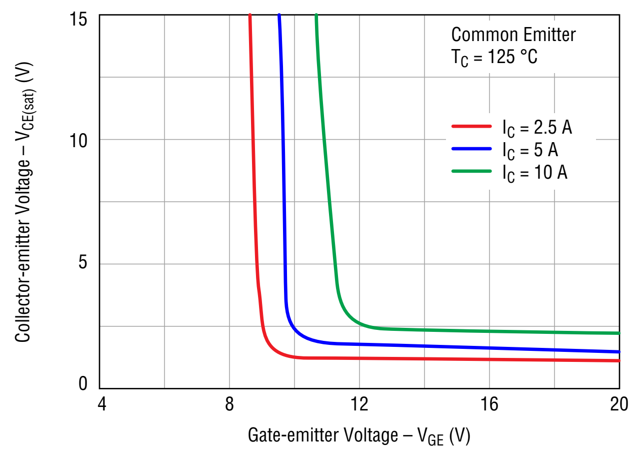


Electrical Characteristic Performance (continued)

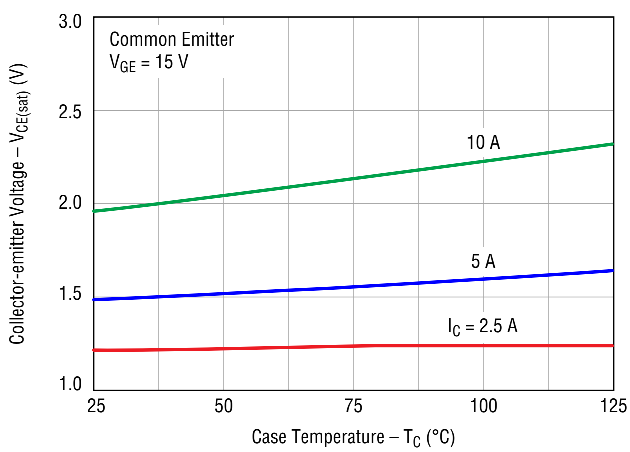
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



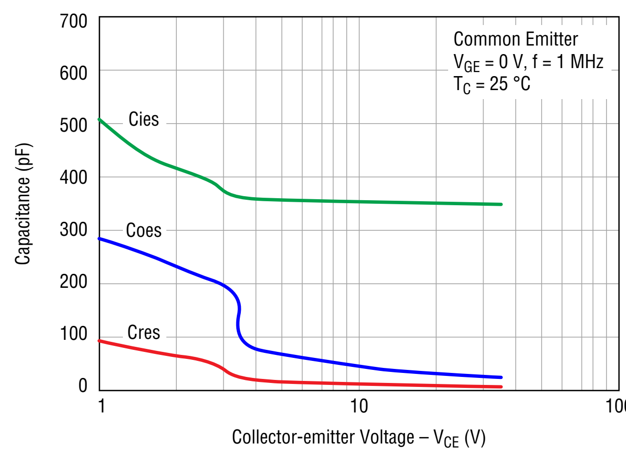
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

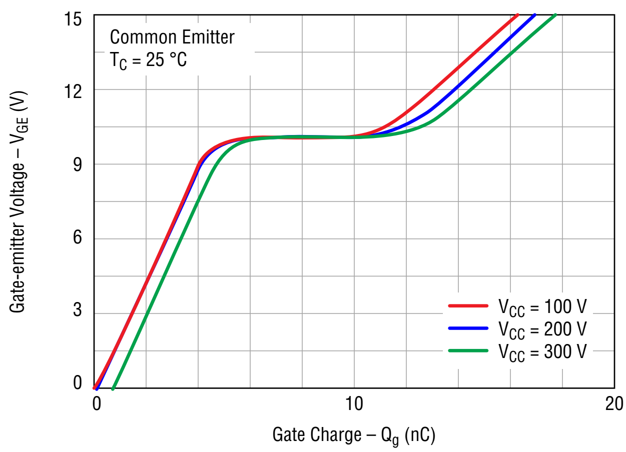


Typical Capacitance Characteristics

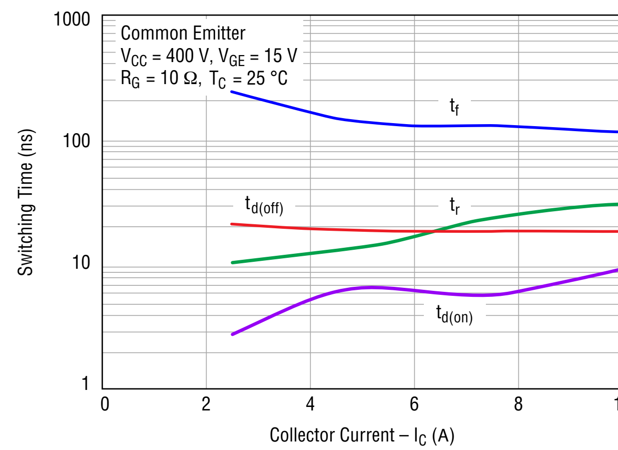


Electrical Characteristic Performance (continued)

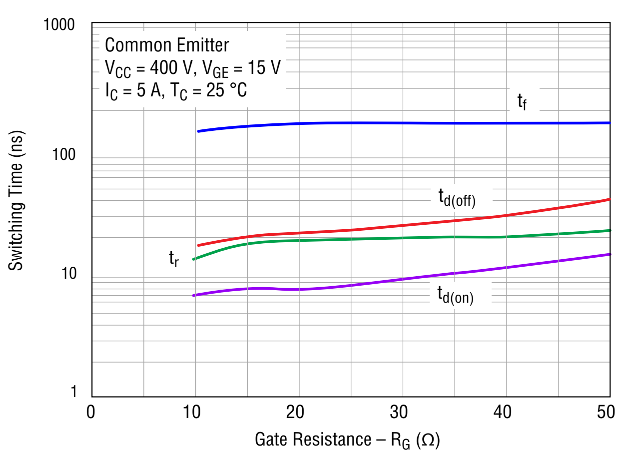
Typical Gate Charge Characteristic



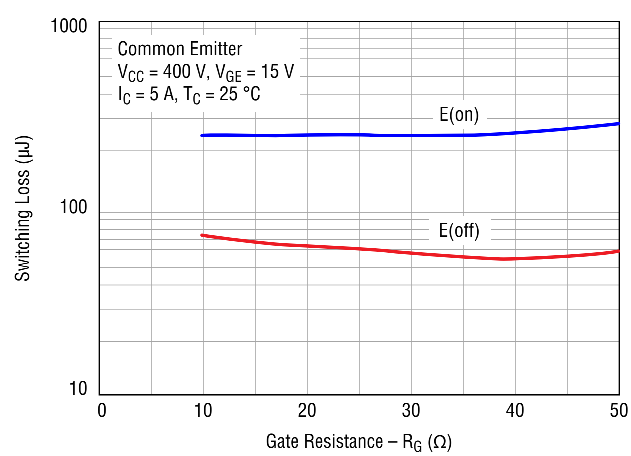
Typical Switching Time Characteristics vs I_C



Typical Switching Time Characteristics vs R_G

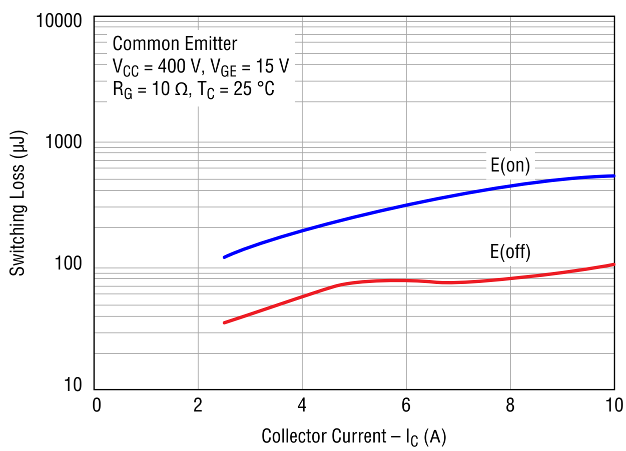


Typical Switching Loss vs R_G

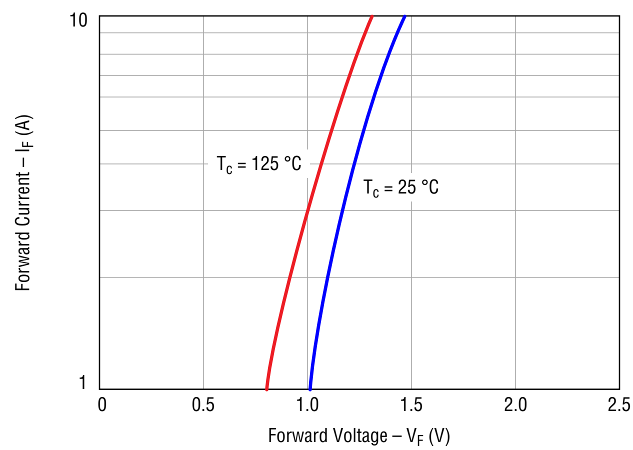


Electrical Characteristic Performance (continued)

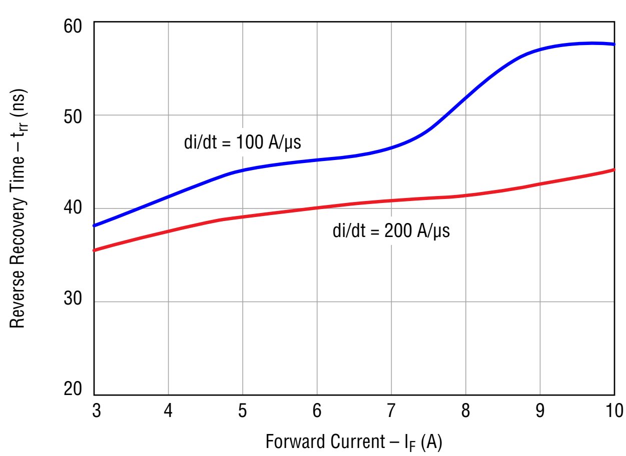
Typical Switching Loss Characteristics vs I_C



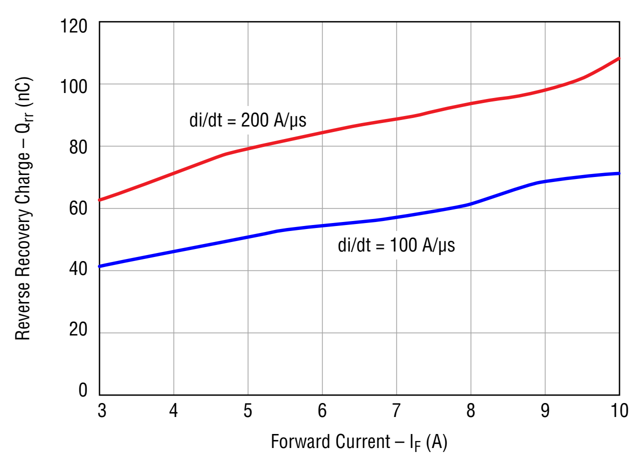
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F

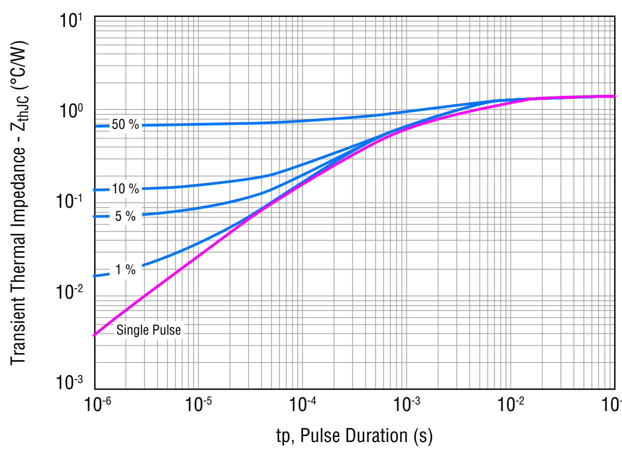


Typical Reverse Recovery Charge vs I_F

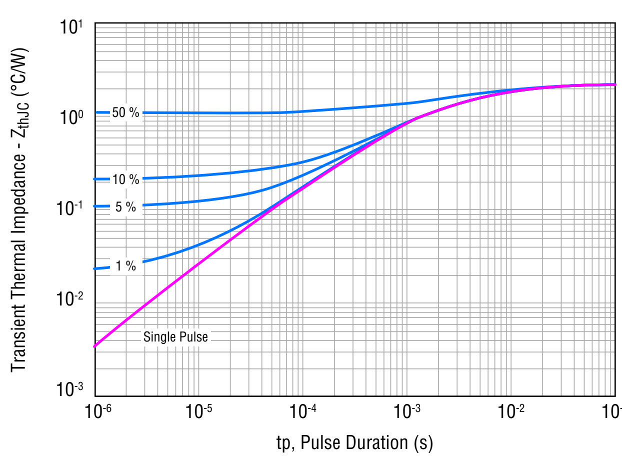


Electrical Characteristic Performance (continued)

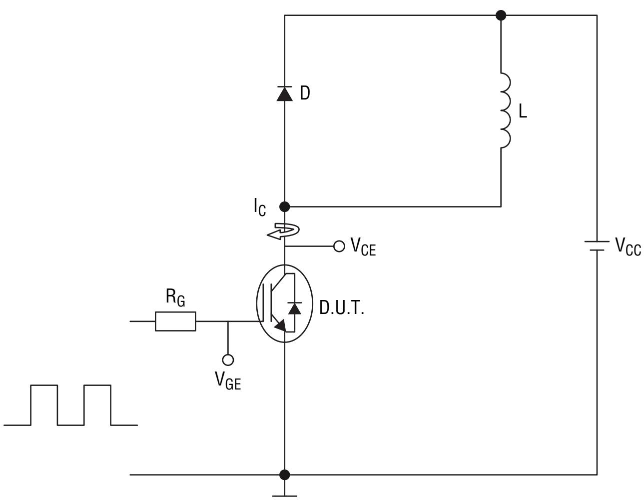
IGBT Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)



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



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

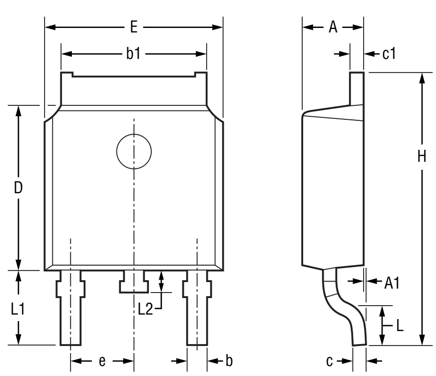
B I D D 05 N 60 T

- 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

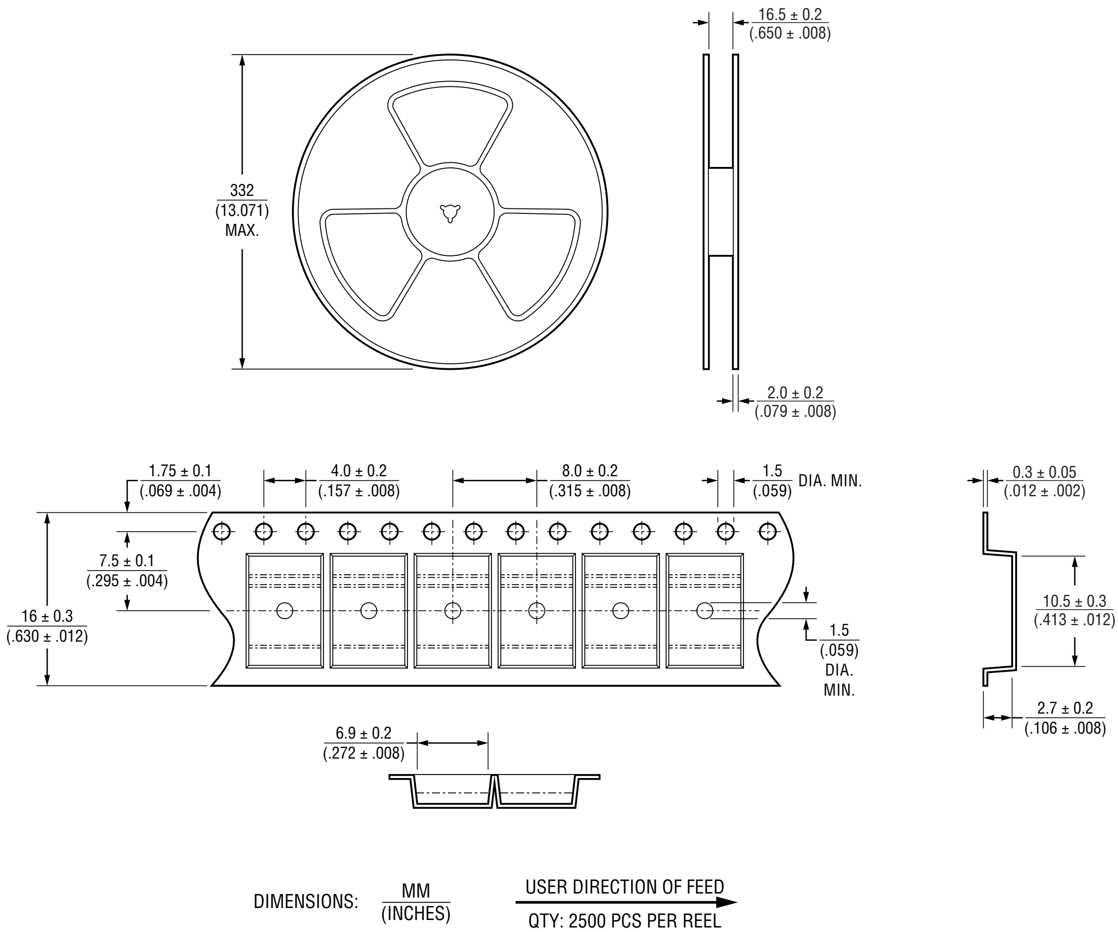
Product Dimensions



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

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)

Packaging Specifications



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