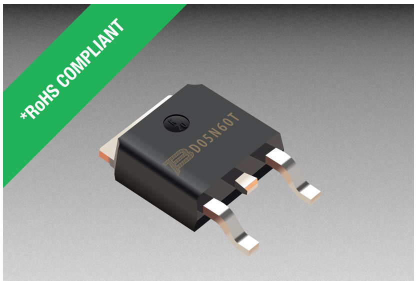


BOURNS®

Features

- 600V, 5A, Low $V_{CE(sat)}$
- Trench-Gate 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 for an optimum component for high voltage and high current applications. This device uses Trench-Gate Field-Stop technology providing greater control of dynamic characteristics with a lower Collector-Emitter Saturation Voltage ($V_{CE(sat)}$) and fewer switching losses. In addition, this structure improves the robustness of the device.

Additional Information

Click these links for more information:

PRODUCT | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

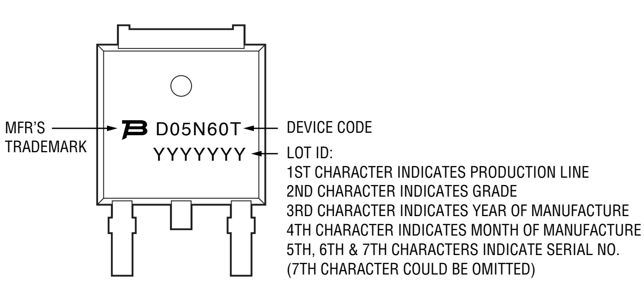
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current (T_C = 25 °C), 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

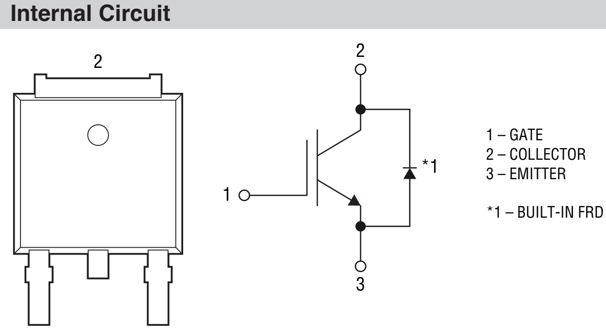
Thermal Resistance

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



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

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)

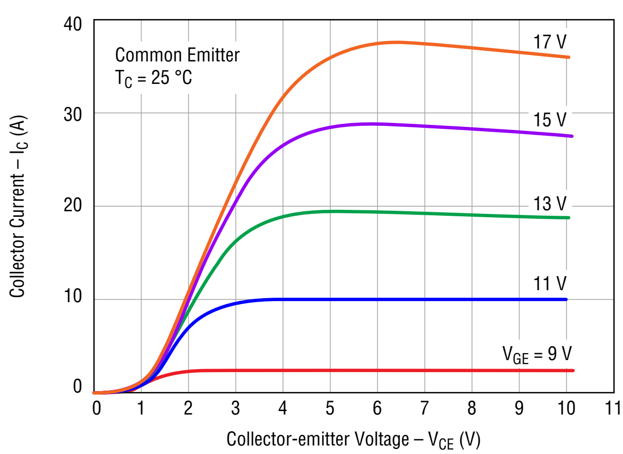
Parameter (T_C = 25 °C)	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 5.0 A, R_G = 10 Ω	—	7	—	ns
Current Rise Time	t_r		—	14	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	18	—	ns
Current Fall Time	t_f		—	145	—	ns
Turn-on Switching Energy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

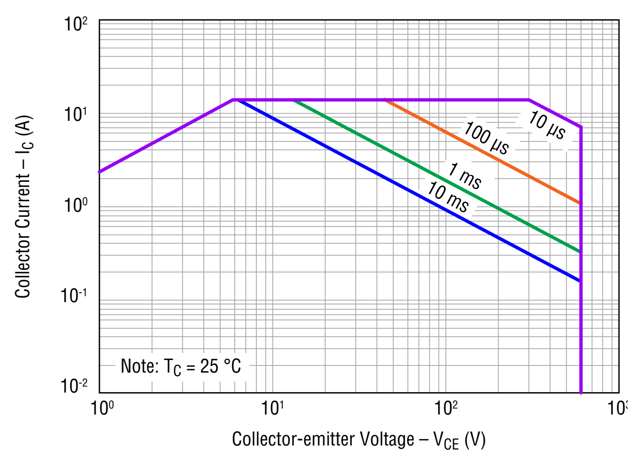
Parameter (T_C = 25 °C)	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/μs I_F = 5.0 A	—	40	—	ns
Reverse Recovery Charge	Q_{rr}		—	80	—	nC

Electrical Characteristic Performance

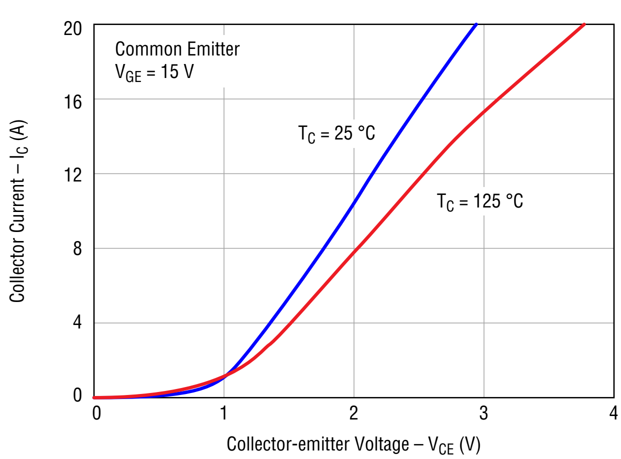
Typical Output Characteristics



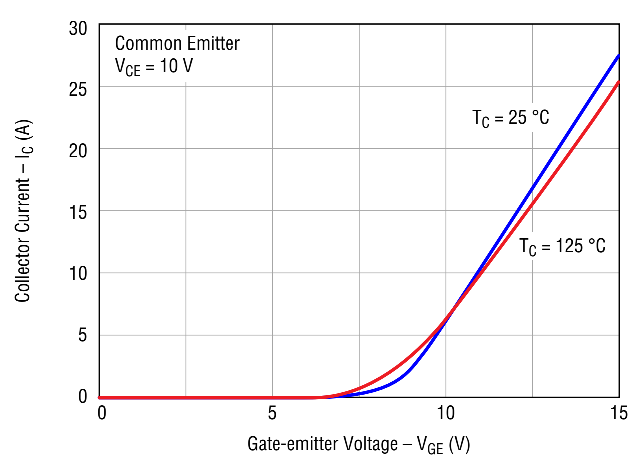
Forward Bias Safe Operating Area



Typical Saturation Voltage Characteristics

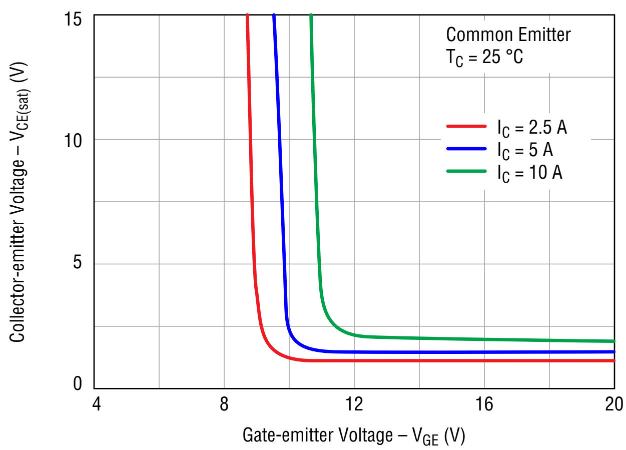


Typical Transfer Characteristics

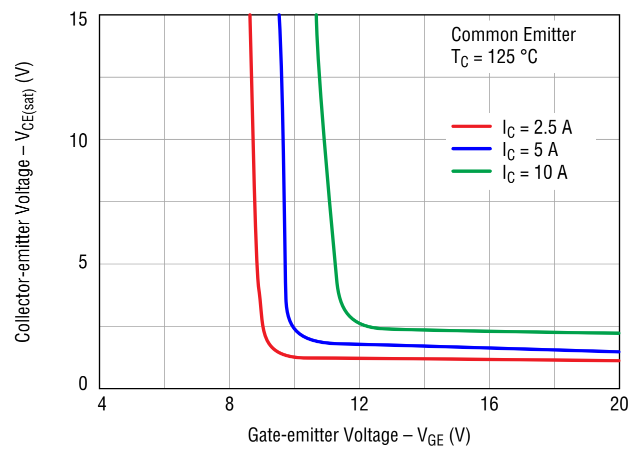


Electrical Characteristic Performance (continued)

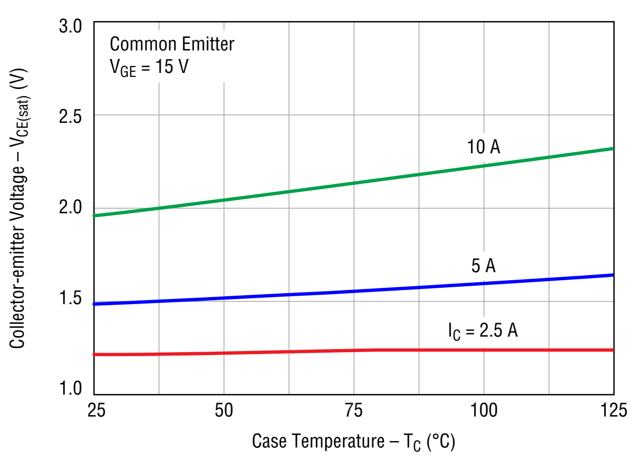
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



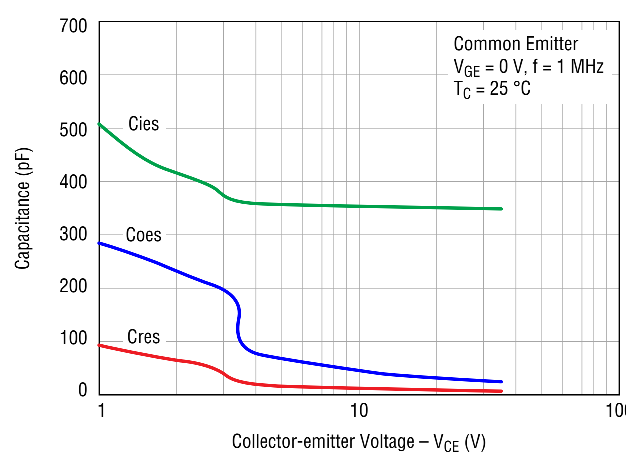
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

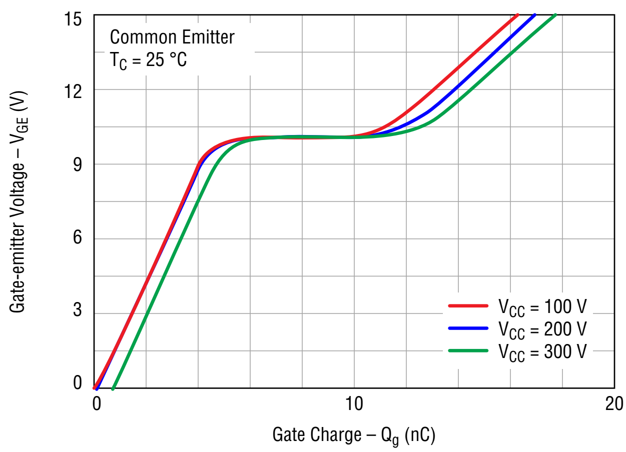


Typical Capacitance Characteristics

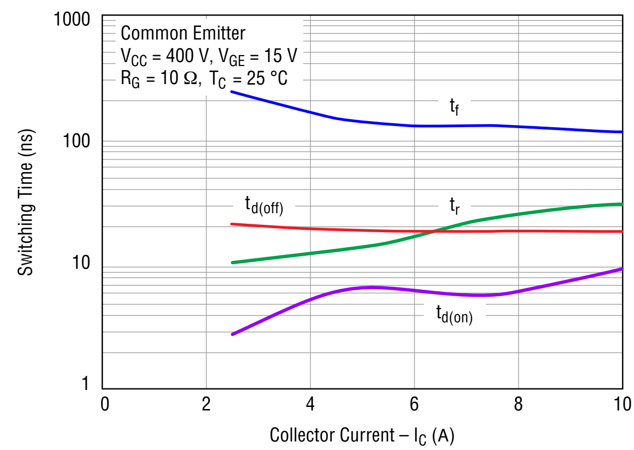


Electrical Characteristic Performance (continued)

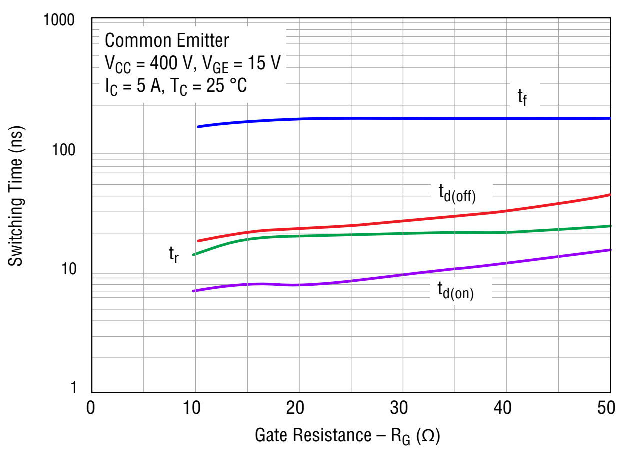
Typical Gate Charge Characteristic



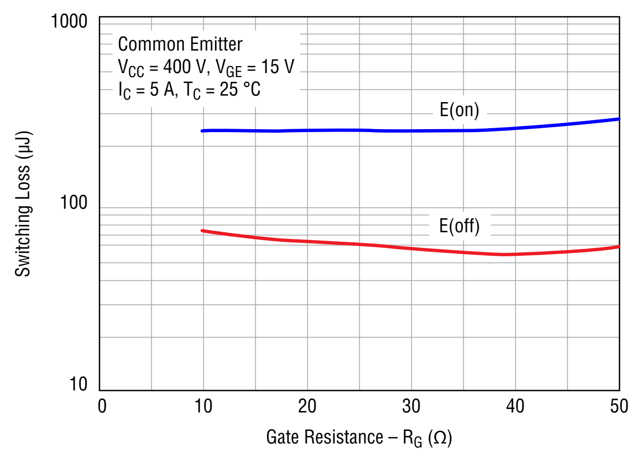
Typical Switching Time Characteristics vs I_C



Typical Switching Time Characteristics vs R_G

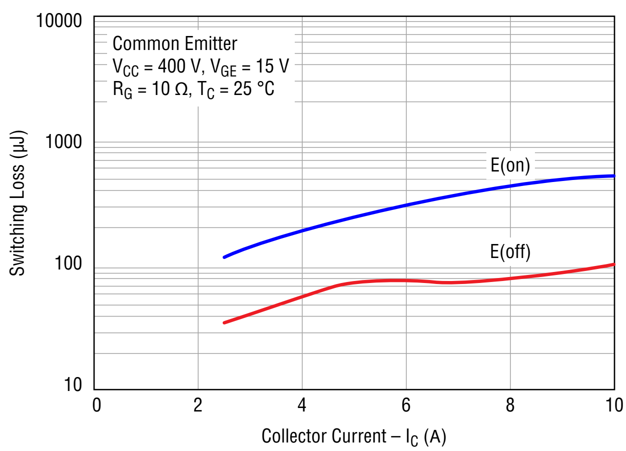


Typical Switching Loss vs R_G

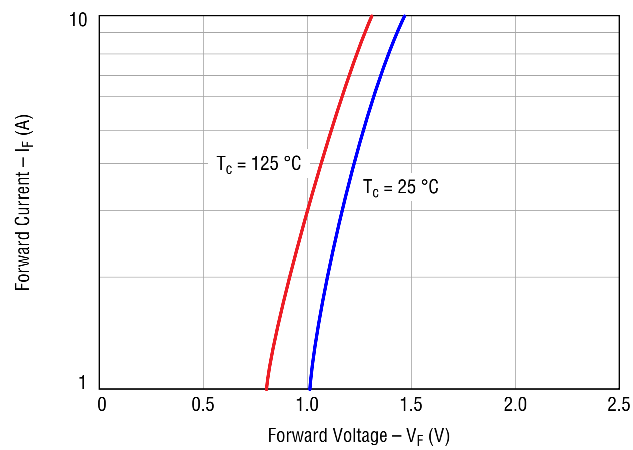


Electrical Characteristic Performance (continued)

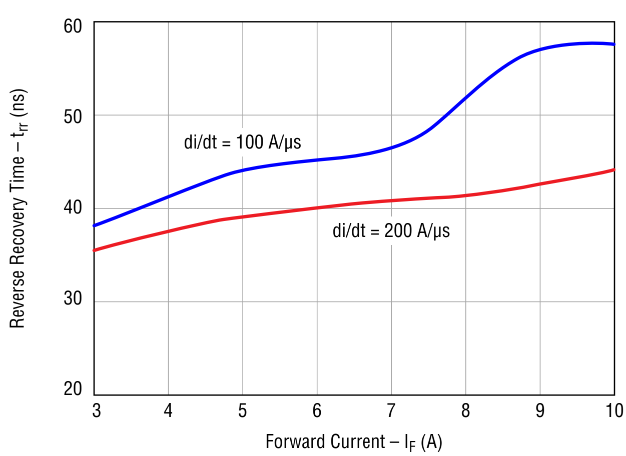
Typical Switching Loss Characteristics vs I_C



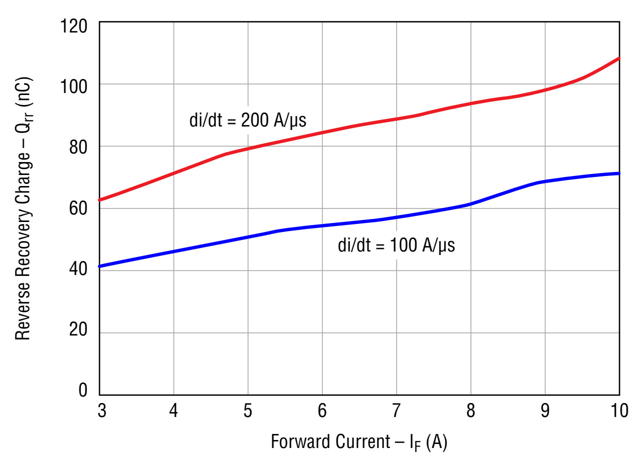
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F

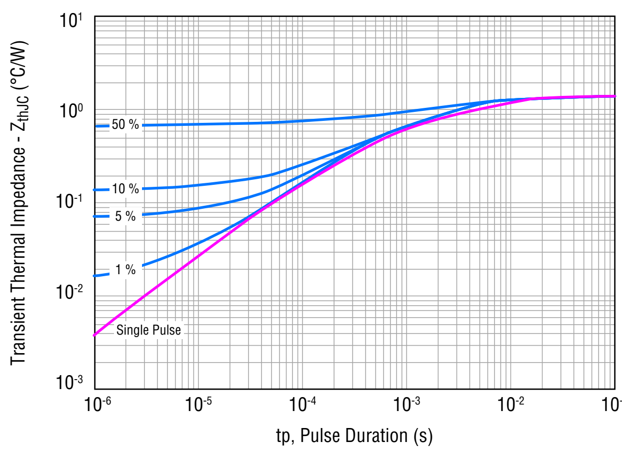


Typical Reverse Recovery Charge vs I_F

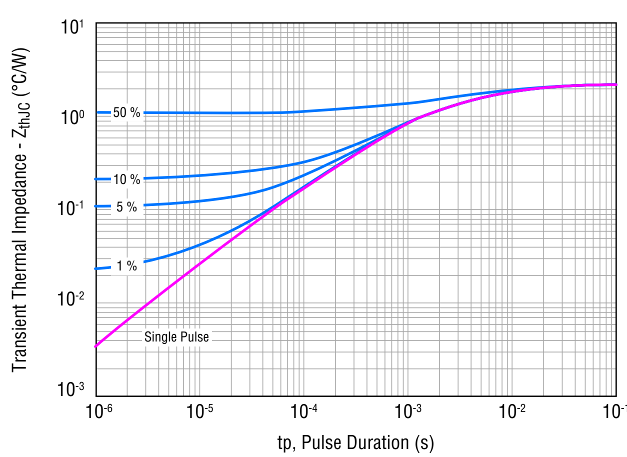


Electrical Characteristic Performance (continued)

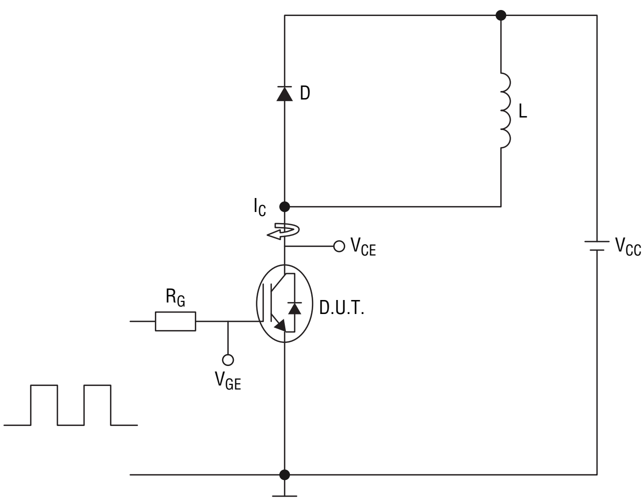
IGBT Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)



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

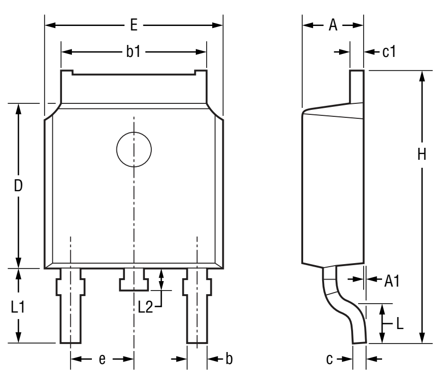
B I D D 05 N 60 T

- 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

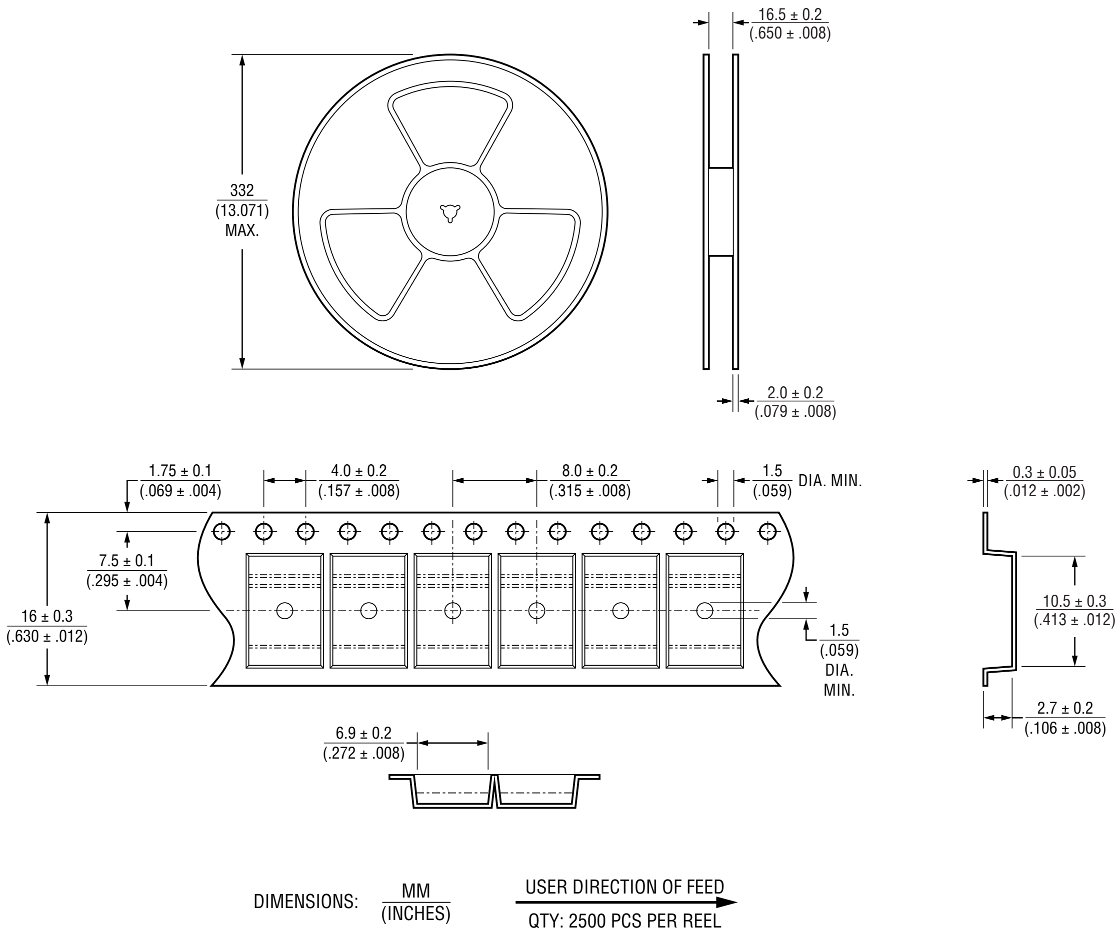
Product Dimensions



DIMENSIONS: 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)

Packaging Specifications



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PDF: http://www.bourns.com/docs/Legal/disclaimer.pdf

BOURNS®

Features

- 600 V, 20 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- Trench-Gate Field-Stop technology
- Optimized for conduction
- Low switching loss
- RoHS compliant*

Applications

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

BIDW20N60T Insulated Gate Bipolar Transistor (IGBT)

General Information

The Bourns® Model BIDW20N60T IGBT device combines technology from a MOS gate and a bipolar transistor for an optimum component for high voltage and high current applications. This device uses Trench-Gate Field-Stop technology providing greater control of dynamic characteristics with a lower conduction loss and fewer switching losses. In addition, this structure provides a positive temperature coefficient.

Additional Information

Click these links for more information:

PRODUCT | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

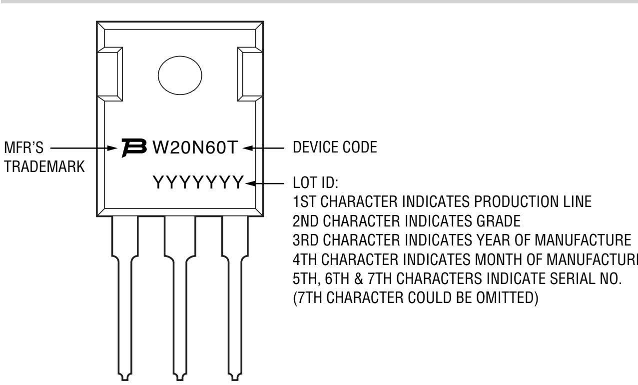
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current (T_C = 25 °C), limited by T_{jmax}	I_C	40	A
Continuous Collector Current (T_C = 100 °C), limited by T_{jmax}	I_C	20	A
Pulsed Collector Current, t_p limited by T_{jmax}	I_{CP}	60	A
Gate-Emitter Voltage	V_{GE}	±20	V
Continuous Forward Current (T_C = 25 °C), limited by T_{jmax}	I_F	40	A
Continuous Forward Current (T_C = 100 °C), limited by T_{jmax}	I_F	20	A
Short-circuit Withstand Time (V_{CE} = 300 V, V_{GE} = 15 V)	T_{SC}	10	µs
Total Power Dissipation	P_{total}	192	W
Storage Temperature	T_{STG}	-55 to +150	°C
Operating Junction Temperature	T_j	-55 to +150	°C

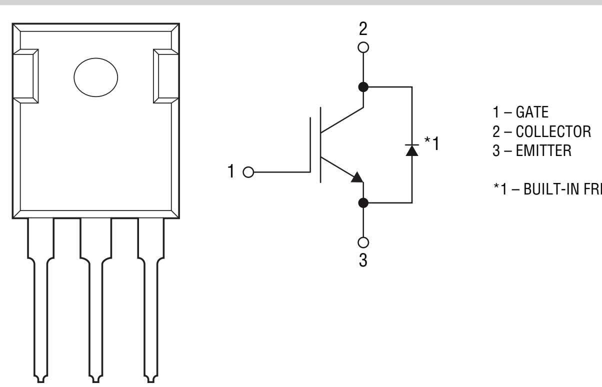
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)\_IGBT}$	0.65	°C/W
Diode Thermal Resistance Junction - Case	$R_{th(j-c)\_Diode}$	1.19	°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 Min.	Value Typ.	Value Max.	Unit
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 = 20 A T_C= 25 °C	—	1.7	2.4	V
		V_{GE} = 15 V, I_C = 20 A T_C= 125 °C	—	1.9	—	
Diode Forward On-Voltage	V_F	I_F = 20 A, T_C = 25 °C	—	1.8	—	V
		I_F = 20 A, T_C = 125 °C	—	1.5	—	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 Min.	Value Typ.	Value Max.	Unit
Input Capacitance	C_{ies}	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	—	1100	—	pF
Output Capacitance	C_{oes}		—	55	—	
Reverse Transfer Capacitance	C_{res}		—	22	—	
Total Gate Charge	Q_g	V_{CE} = 400 V, V_{GE} = 15 V I_C = 20.0 A	—	52	—	nC
Gate-Emitter Charge	Q_{ge}		—	15	—	
Gate-Collector Charge	Q_{gc}		—	22	—	

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

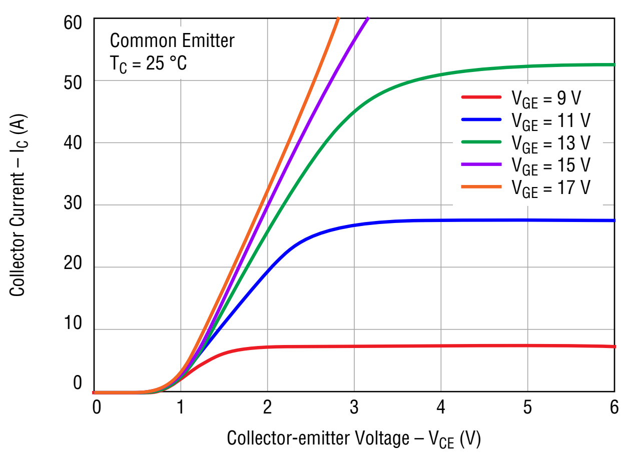
Parameter	Symbol	Conditions	Value Min.	Value Typ.	Value Max.	Unit
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 20.0 A, R_G = 10 Ω	—	19	—	ns
Current Rise Time	t_r		—	55	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	48	—	ns
Current Fall Time	t_f		—	115	—	ns
Turn-on Switching Energy	E_{on}		—	1	—	mJ
Turn-off Switching Energy	E_{off}		—	0.3	—	mJ
Total Switching Energy	E_{ts}		—	1.3	—	mJ

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

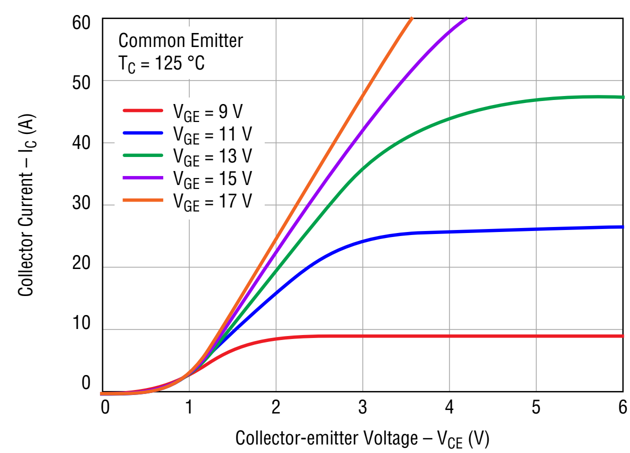
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/μs I_F = 20.0 A	—	33.7	—	ns
Reverse Recovery Charge	Q_{rr}		—	73.3	—	nC

Electrical Characteristic Performance

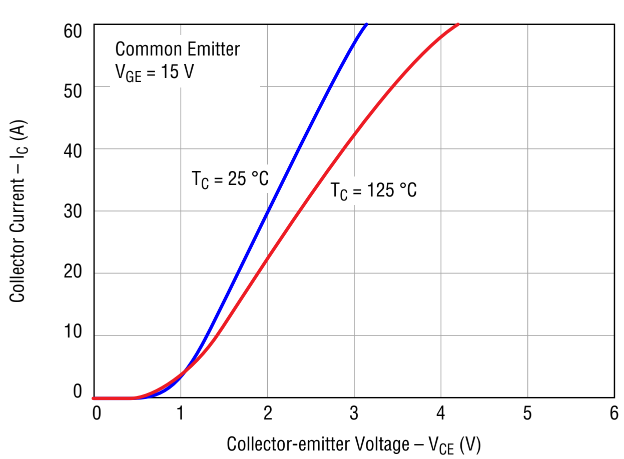
Typical Output Characteristics



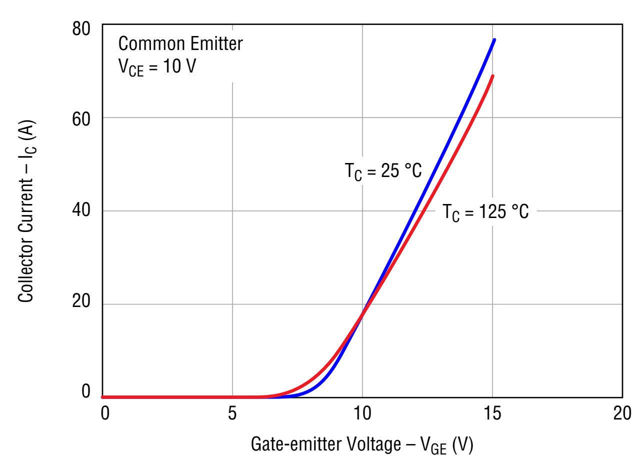
Typical Output Characteristics



Typical Saturation Voltage Characteristics

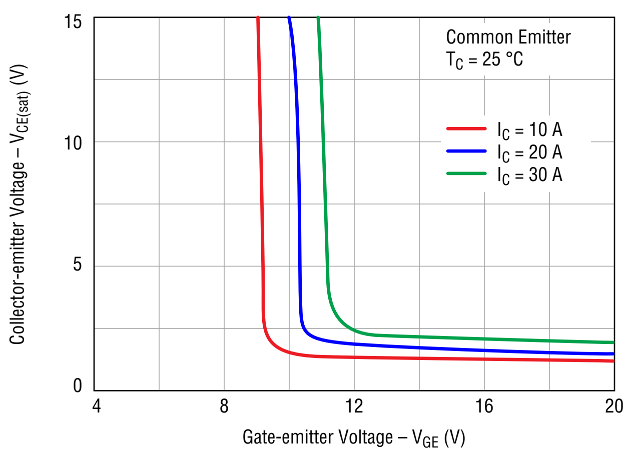


Typical Transfer Characteristics

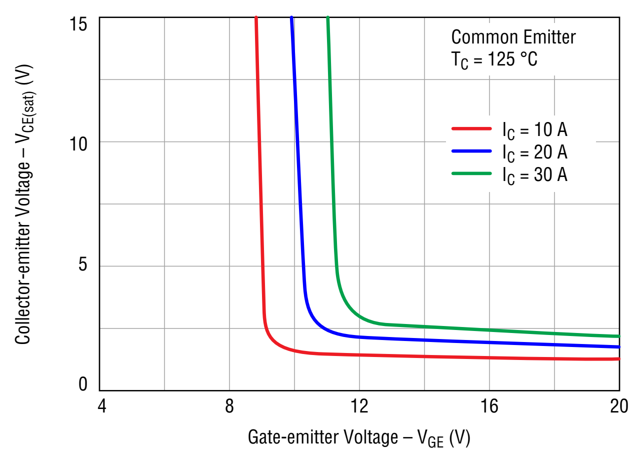


Electrical Characteristic Performance (continued)

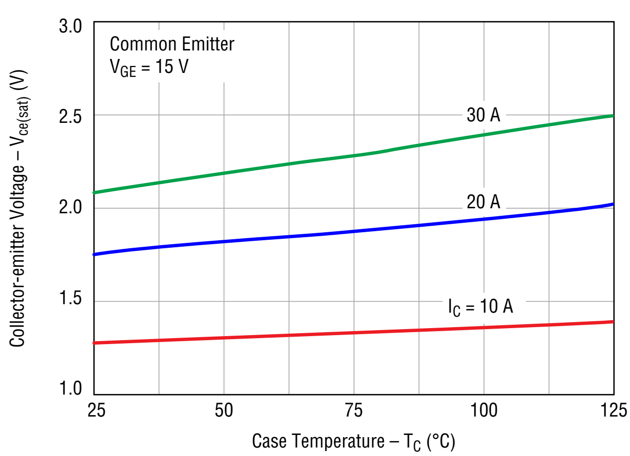
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



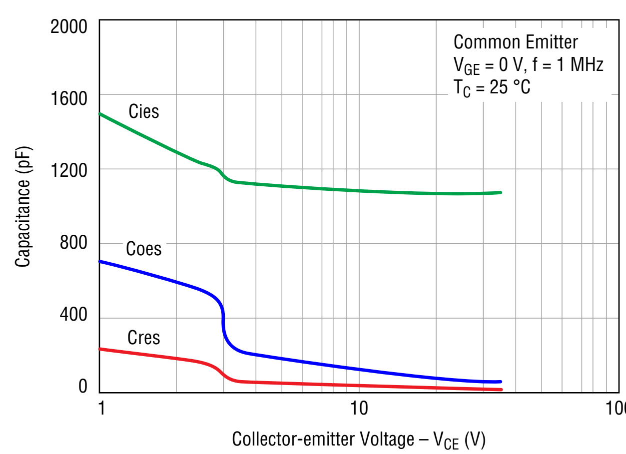
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

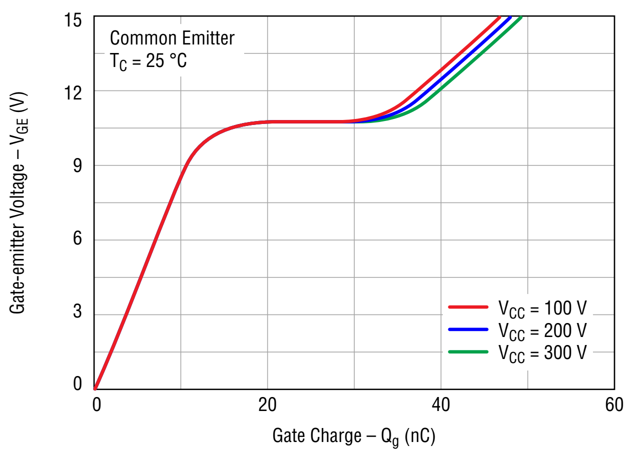


Typical Capacitance Characteristics

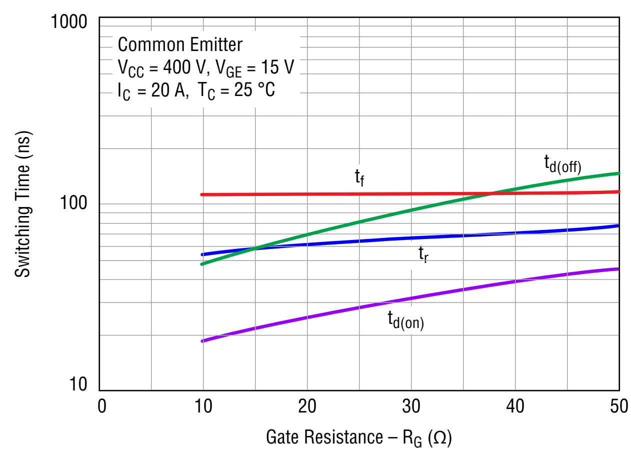


Electrical Characteristic Performance (continued)

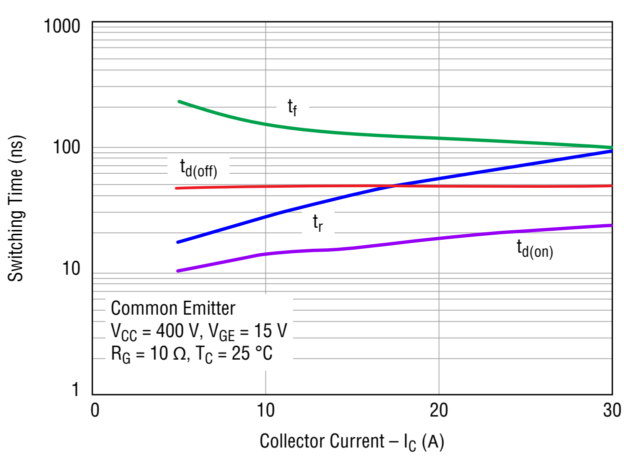
Typical Gate Charge Characteristics



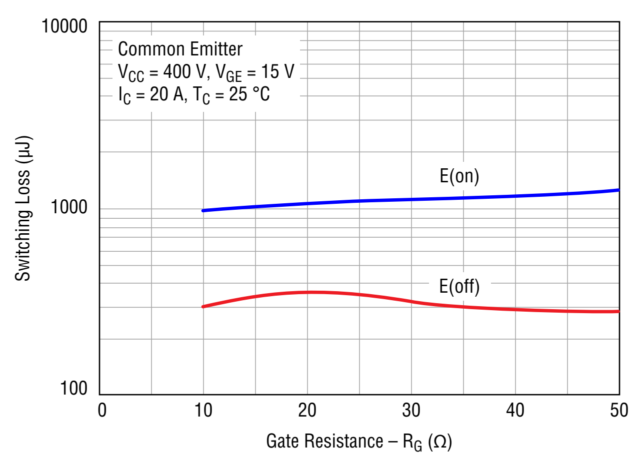
Typical Switching Time Characteristics vs R_G



Typical Switching Time Characteristics vs I_C

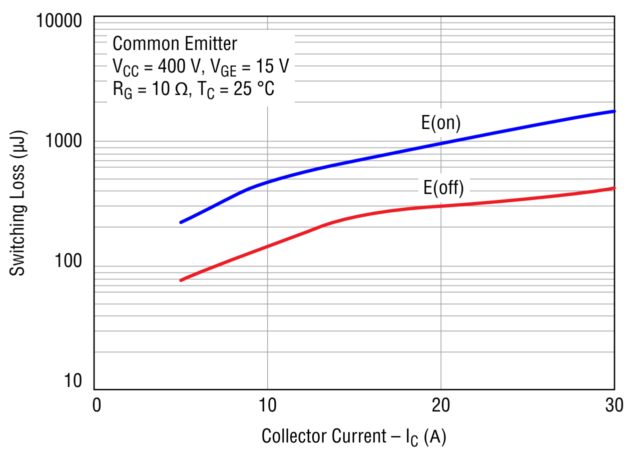


Typical Switching Loss vs R_G

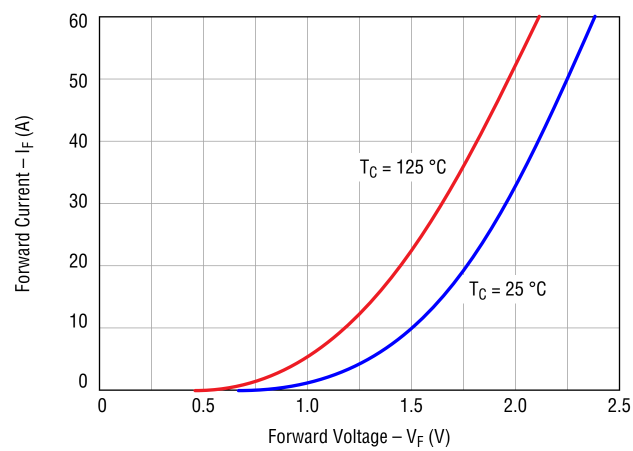


Electrical Characteristic Performance (continued)

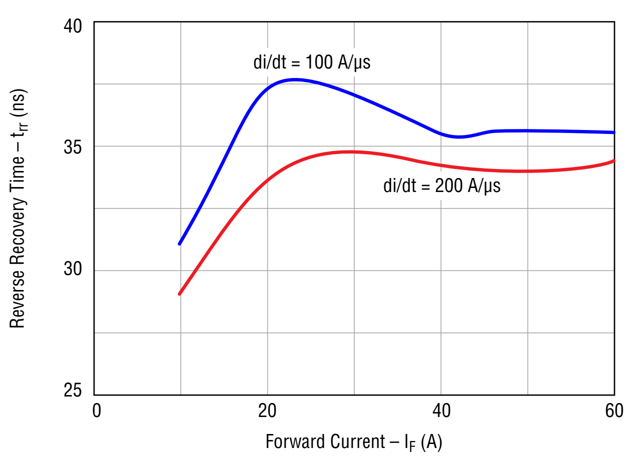
Typical Switching Loss Characteristics vs I_C



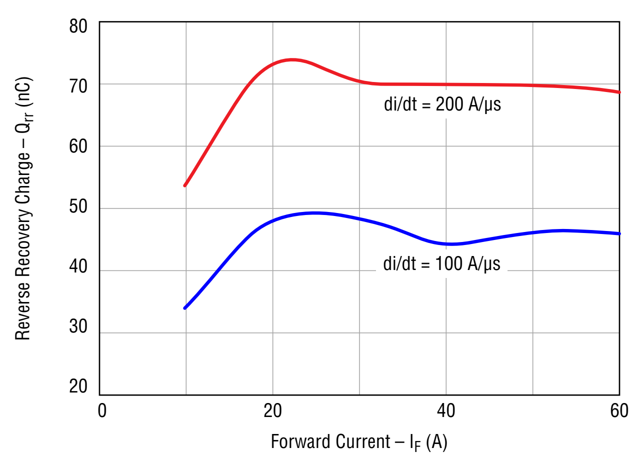
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F

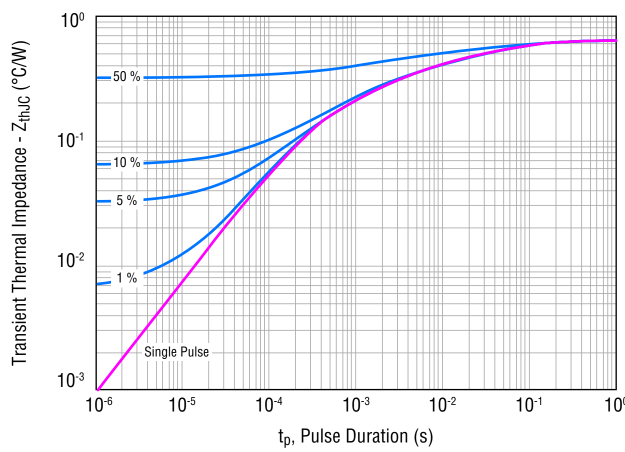


Typical Reverse Recovery Charge vs I_F

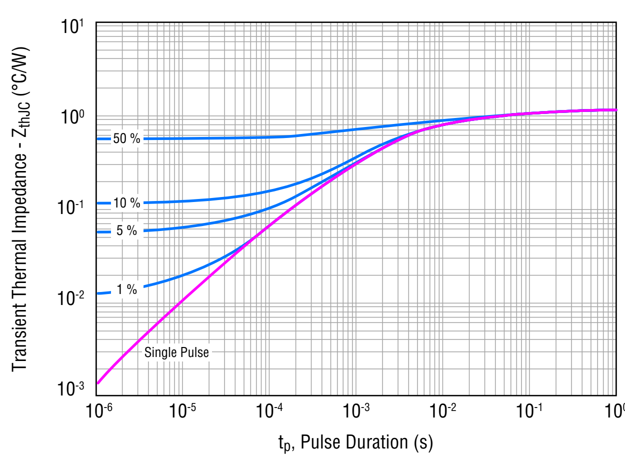


Electrical Characteristic Performance (continued)

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

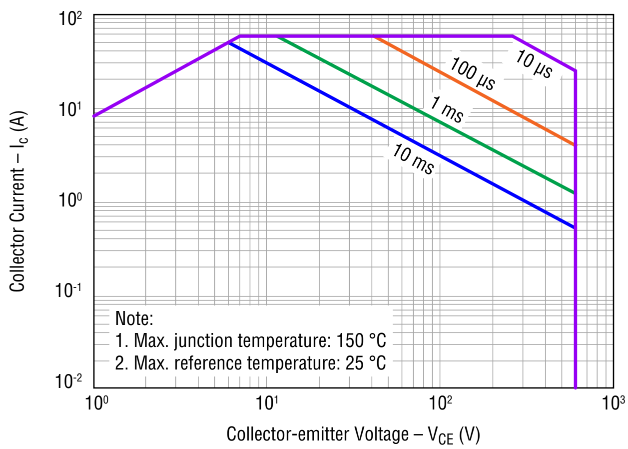


Diode Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)



Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area



How to Order

B I D W 20 N 60 T

B = Bourns®

I = IGBT

Type
D = Discrete

Package Code
W = TO-247

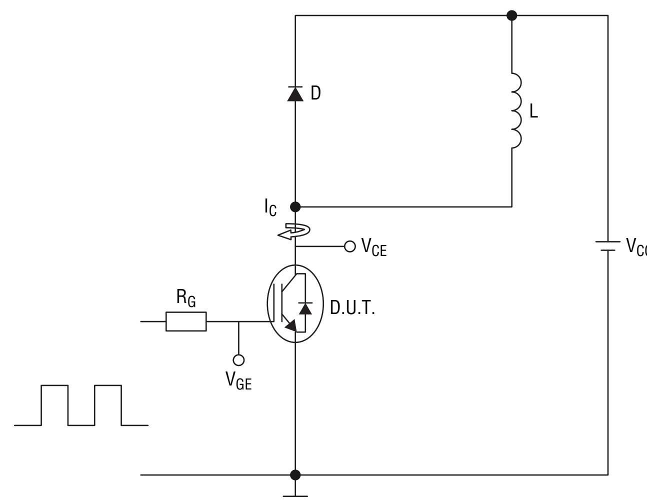
Current Rating
20 = 20 A

Device Type
N = N-channel

Nominal Voltage (divided by 10)
60 = 600 V

Optimization
T = Medium Speed

Inductive Load Test Circuit

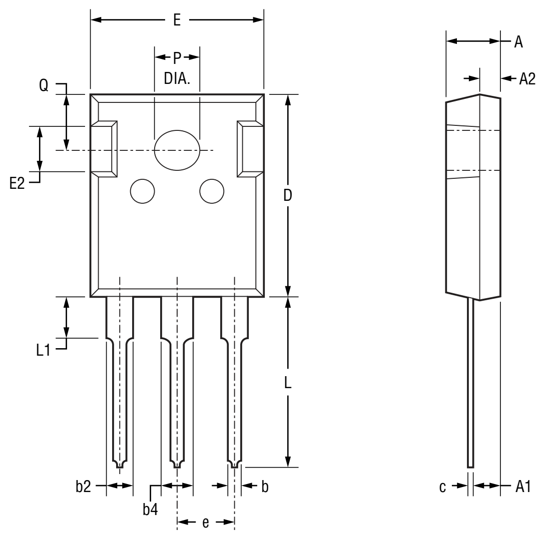


L = 2.8 mH, V_{CE} = 400 V, V_{GE} = 15 V, I_C = 20 A, R_G = 10 Ω

Environmental Characteristics

ESD Class (HBM) 1C

Product Dimensions



DIMENSIONS: MM / (INCHES)

Symbol	Min.	Nom.	Max.
A	4.80 (.189)	5.00 (.197)	5.20 (.205)
A1	2.21 (.087)	2.41 (.095)	2.59 (.102)
A2	1.85 (.073)	2.00 (.079)	2.15 (.085)
b	1.11 (.044)	—	1.36 (.054)
b2	1.91 (.075)	—	2.25 (.089)
b4	2.91 (.115)	—	3.25 (.128)
c	0.51 (.020)	—	0.75 (.030)
D	20.80 (.819)	21.00 (.827)	21.30 (.839)
E	15.50 (.610)	15.80 (.622)	16.10 (.634)
E2	4.40 (.173)	5.00 (.197)	5.20 (.205)
e		5.44 (.214) BSC	
L	19.72 (.776)	19.92 (.784)	20.22 (.796)
L1	—	—	4.30 (.169)
P	3.40 (.134)	—	3.80 (.150)
Q	5.60 (.220)	5.80 (.228)	6.00 (.236)

Packaging Specifications

BIDW20N60T .... 30 pieces per tube

BOURNS®

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EMEA: Tel: +36 88 885 877
Email: eurocus@bourns.com

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Email: americus@bourns.com

www.bourns.com

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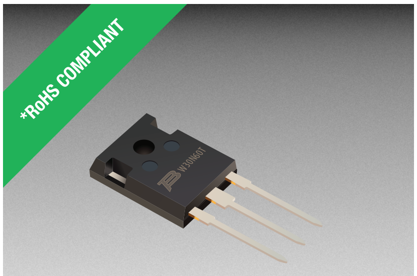
Web Page: http://www.bourns.com/legal/disclaimers-terms-and-policies

PDF: http://www.bourns.com/docs/Legal/disclaimer.pdf



BOURNS®

Features

- 600 V, 30 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- Trench-Gate Field-Stop technology
- Optimized for conduction
- RoHS compliant*

Applications

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

BIDW30N60T Insulated Gate Bipolar Transistor (IGBT)

General Information

The Bourns® Model BIDW30N60T IGBT device combines technology from a MOS gate and a bipolar transistor for an optimum component for high voltage and high current applications. This device uses Trench-Gate Field-Stop technology providing greater control of dynamic characteristics with a lower Collector-Emitter Saturation Voltage ($V_{CE(sat)}$) and fewer switching losses. In addition, this structure gives a lower thermal resistance $R_{(th)}$.

Additional Information

Click these links for more information:

PRODUCT | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

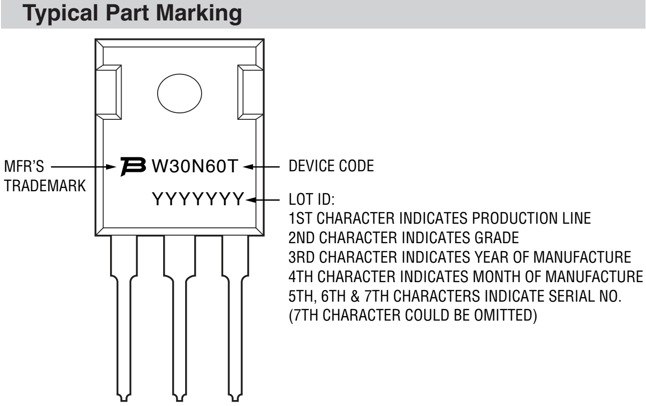
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current (T_C = 25 °C), limited by T_{jmax}	I_C	60	A
Continuous Collector Current (T_C = 100 °C), limited by T_{jmax}	I_C	30	A
Pulsed Collector Current, t_p limited by T_{jmax}	I_{CP}	90	A
Gate-Emitter Voltage	V_{GE}	±20	V
Continuous Forward Current (T_C = 25 °C), limited by T_{jmax}	I_F	60	A
Continuous Forward Current (T_C = 100 °C), limited by T_{jmax}	I_F	30	A
Short-circuit Withstand Time (V_{CE} = 300 V, V_{GE} = 15 V)	T_{SC}	10	µs
Total Power Dissipation	P_{total}	230	W
Storage Temperature	T_{STG}	-55 to +150	°C
Operating Junction Temperature	T_j	-55 to +150	°C

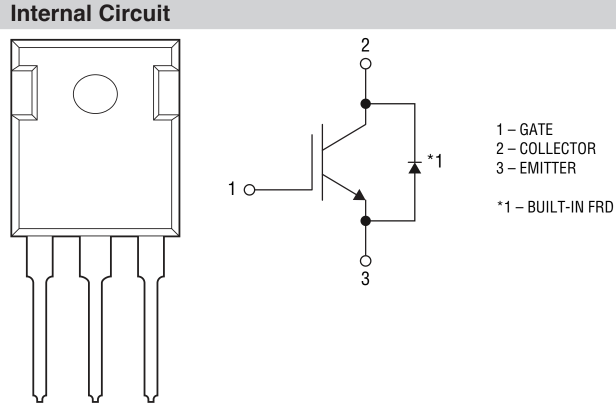
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)\_IGBT}$	0.54	°C/W
Diode Thermal Resistance Junction - Case	$R_{th(j-c)\_Diode}$	1.2	°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.
The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

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	—	V
		V_{GE} = 15 V, I_C = 30 A T_C= 125 °C	—	1.9	—	
Diode Forward On-Voltage	V_F	I_F = 30 A, T_C = 25 °C	—	1.8	—	V
		I_F = 30 A, T_C = 125 °C	—	1.5	—	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	—	1650	—	pF
Output Capacitance	C_{oes}		—	130	—	
Reverse Transfer Capacitance	C_{res}		—	35	—	
Total Gate Charge	Q_g	V_{CE} = 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)

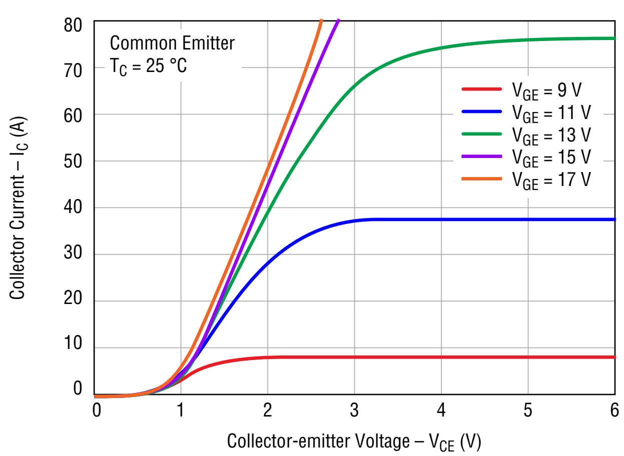
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 30.0 A, R_G = 10 Ω	—	30	—	ns
Current Rise Time	t_r		—	105	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	67	—	ns
Current Fall Time	t_f		—	100	—	ns
Turn-on Switching Energy	E_{on}	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

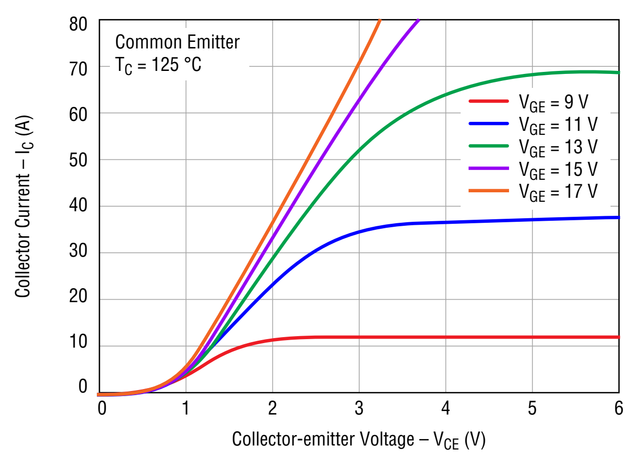
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/µs I_F = 30.0 A	—	40	—	ns
Reverse Recovery Charge	Q_{rr}		—	90	—	nC

Electrical Characteristic Performance

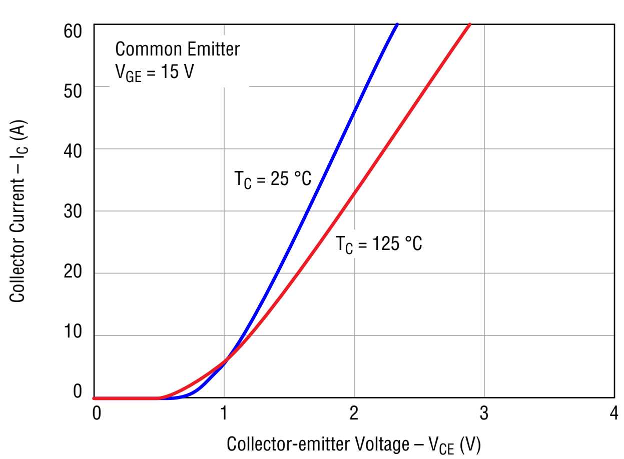
Typical Output Characteristics



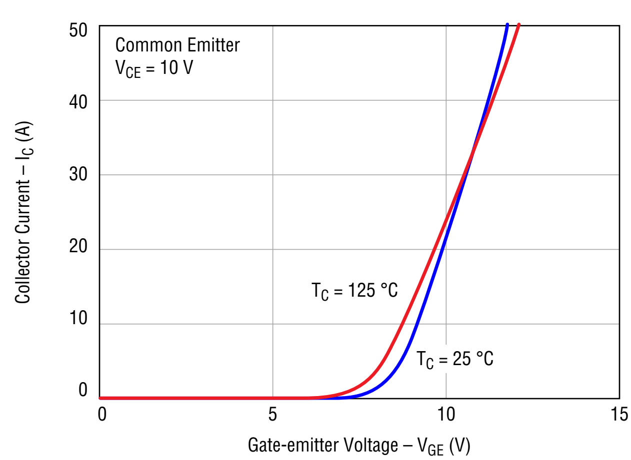
Typical Output Characteristics



Typical Saturation Voltage Characteristics

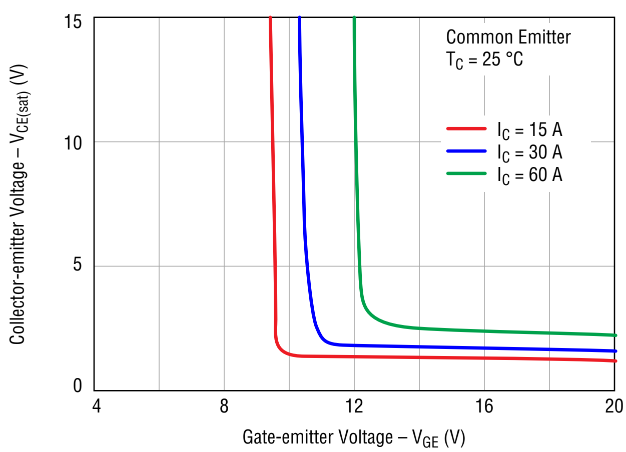


Typical Transfer Characteristics

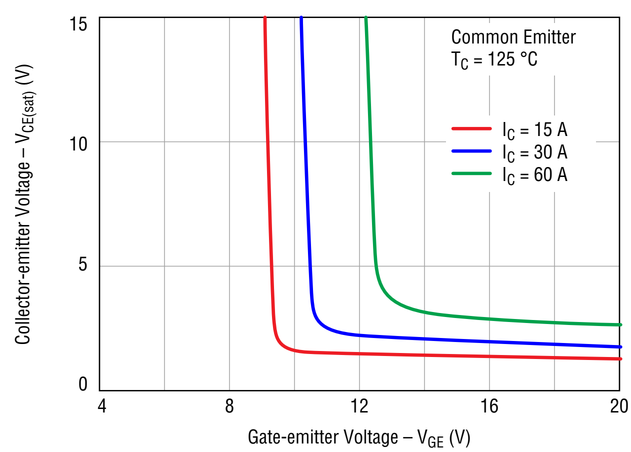


Electrical Characteristic Performance (continued)

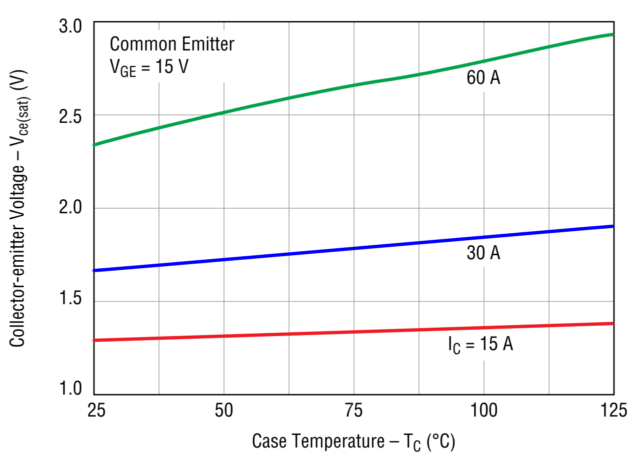
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



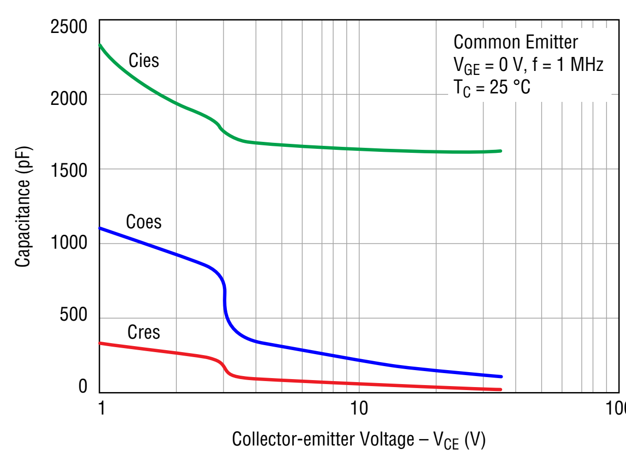
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

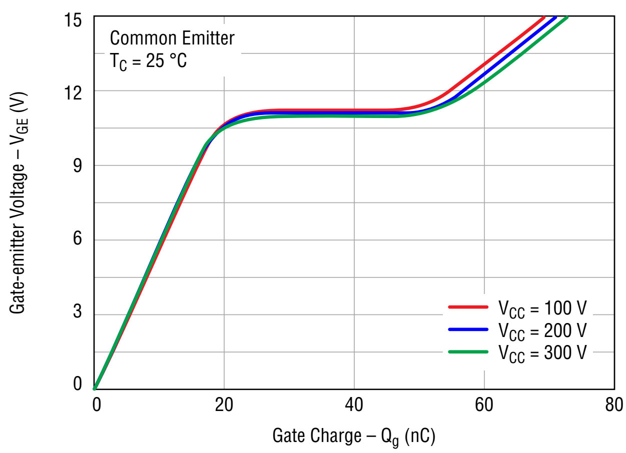


Typical Capacitance Characteristics

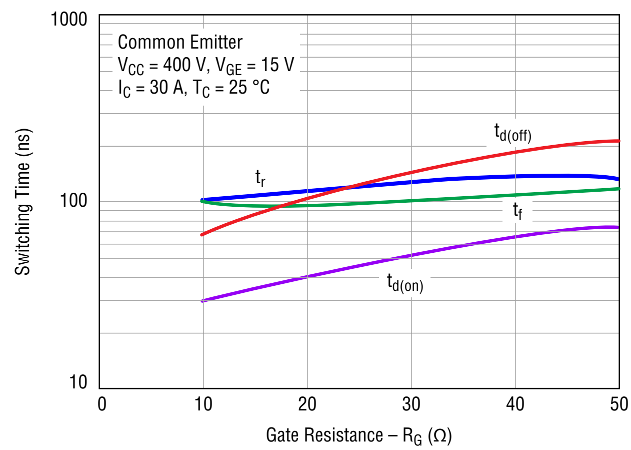


Electrical Characteristic Performance (continued)

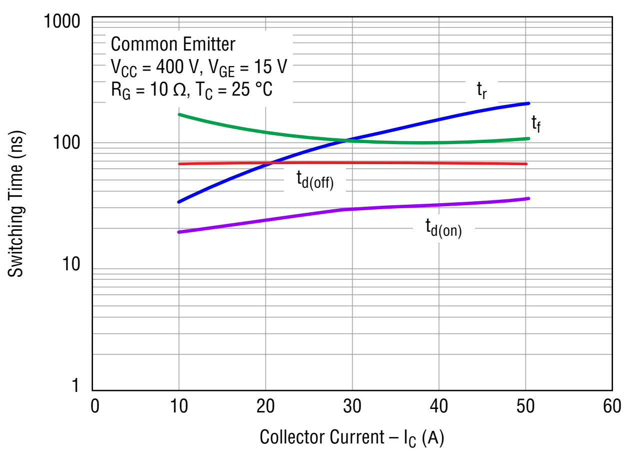
Typical Gate Charge Characteristics



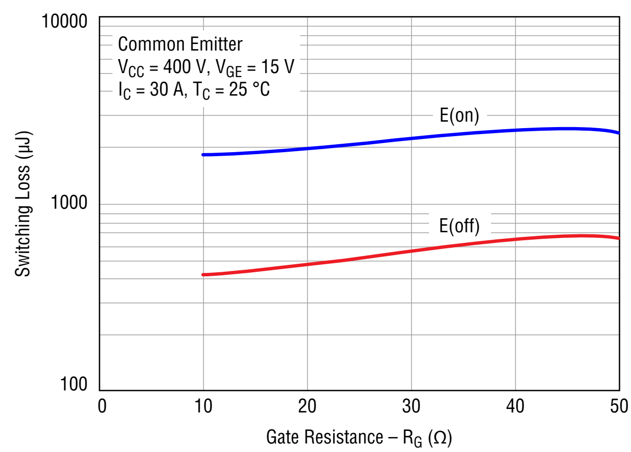
Typical Switching Time Characteristics vs R_G



Typical Switching Time Characteristics vs I_C

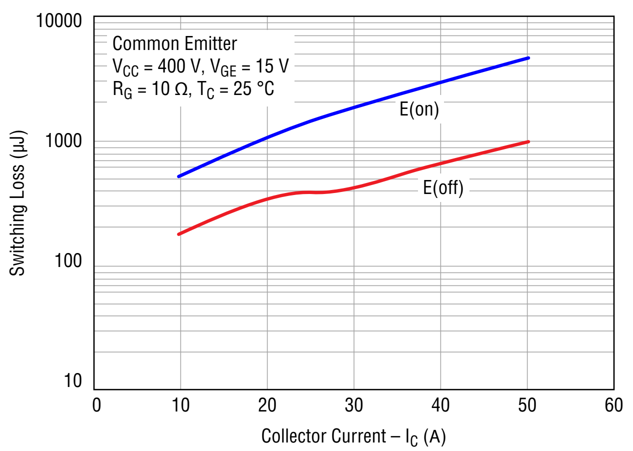


Typical Switching Loss vs R_G

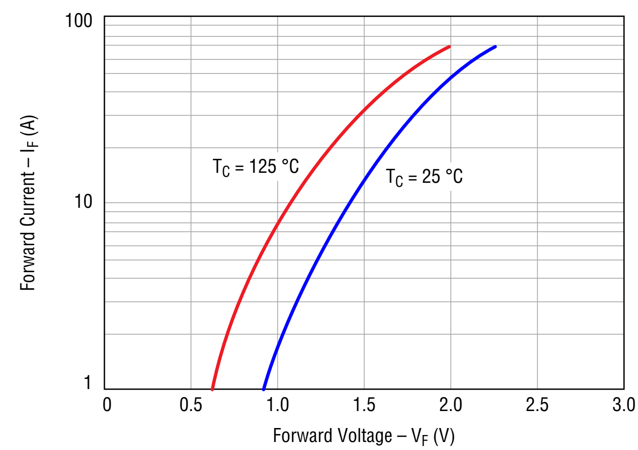


Electrical Characteristic Performance (continued)

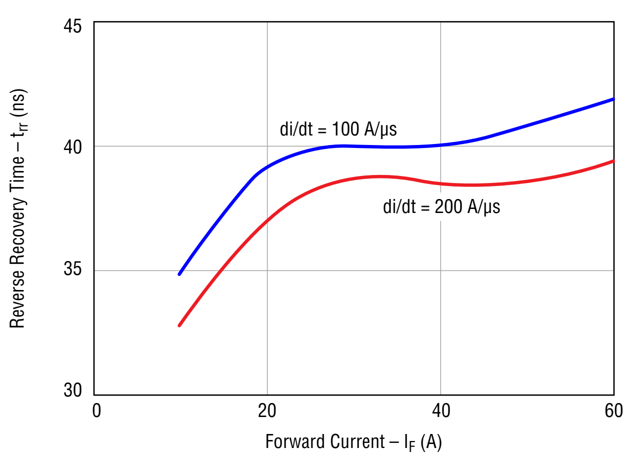
Typical Switching Loss Characteristics vs I_C



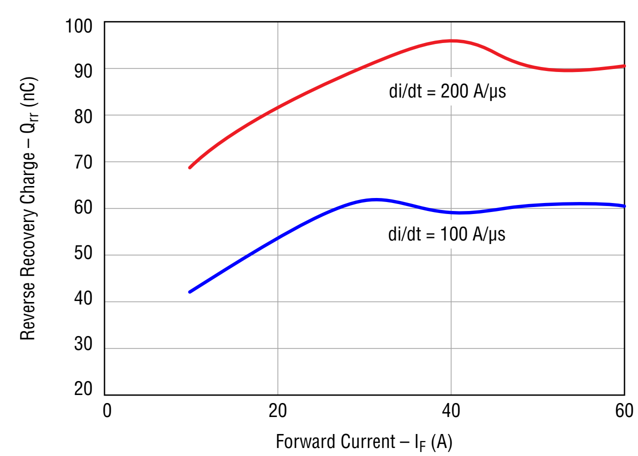
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F

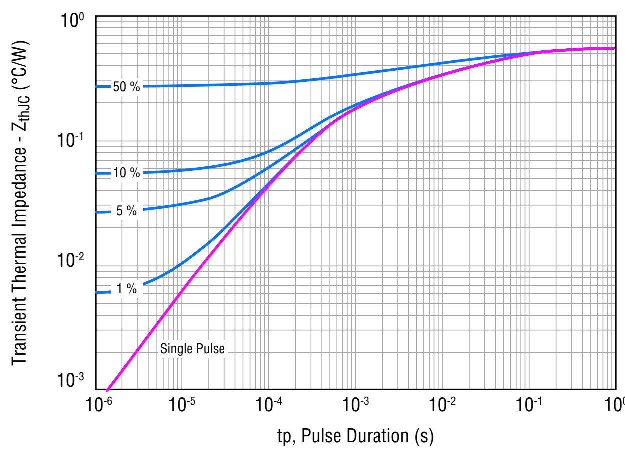


Typical Reverse Recovery Charge vs I_F

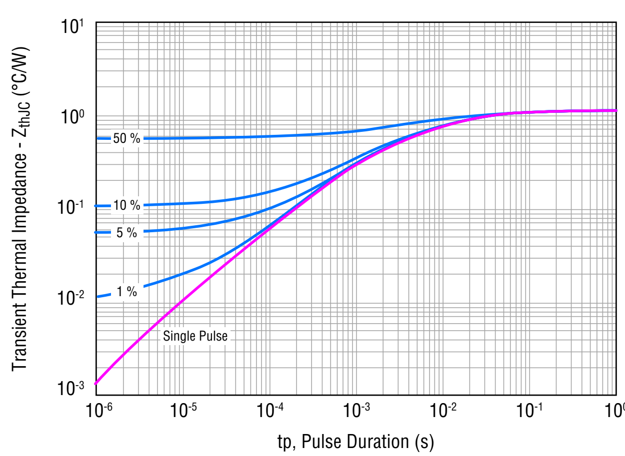


Electrical Characteristic Performance (continued)

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

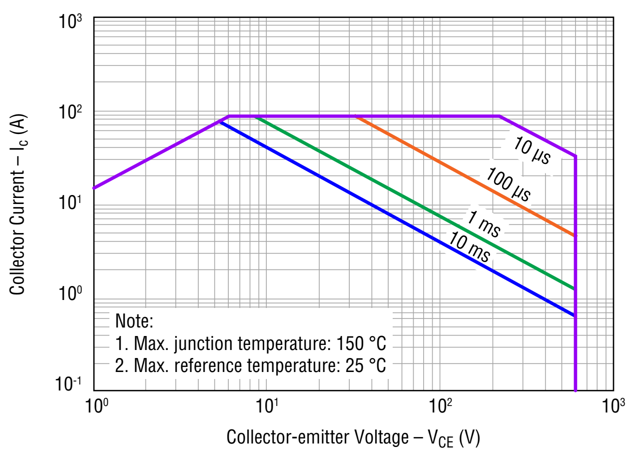


Diode Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)



Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area



How to Order

B I D W 30 N 60 T

B = Bourns®

I = IGBT

Type
D = Discrete

Package Code
W = TO-247

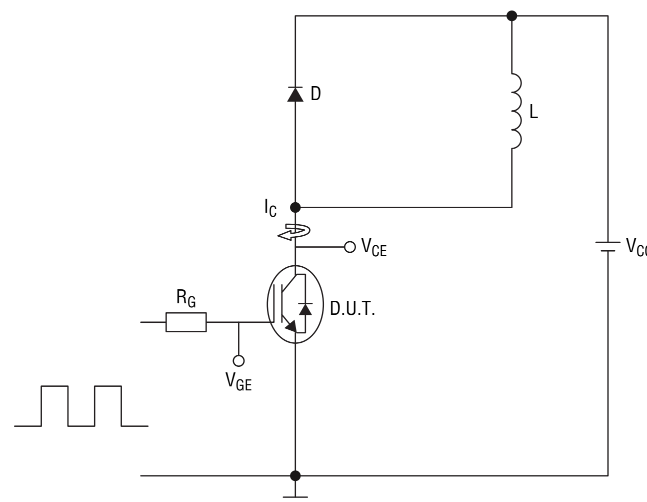
Current Rating
30 = 30 A

Device Type
N = N-channel

Nominal Voltage (divided by 10)
60 = 600 V

Optimization
T = Medium Speed

Inductive Load Test Circuit

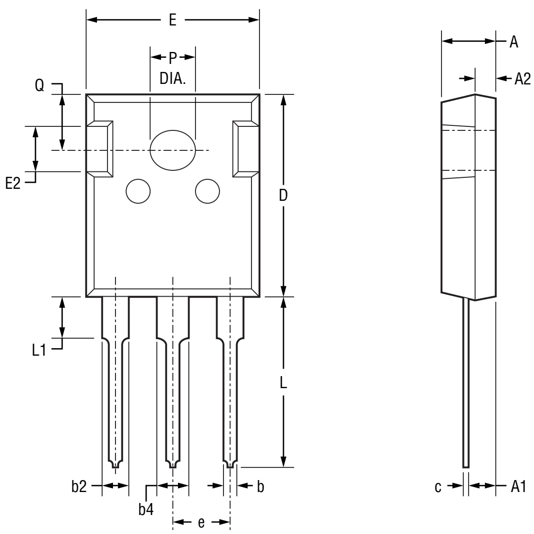


L = 1.87 mH, V_{CE} = 400 V, V_{GE} = 15 V, I_C = 30 A, R_G = 10 Ω

Environmental Characteristics

ESD Class (HBM)..2

Product Dimensions



Symbol	Min.	Nom.	Max.
A	4.80 (.189)	5.00 (.197)	5.20 (.205)
A1	2.21 (.087)	2.41 (.095)	2.59 (.102)
A2	1.85 (.073)	2.00 (.079)	2.15 (.085)
b	1.11 (.044)	—	1.36 (.054)
b2	1.91 (.075)	—	2.25 (.089)
b4	2.91 (.115)	—	3.25 (.128)
c	0.51 (.020)	—	0.75 (.030)
D	20.80 (.819)	21.00 (.827)	21.30 (.839)
E	15.50 (.610)	15.80 (.622)	16.10 (.634)
E2	4.40 (.173)	5.00 (.197)	5.20 (.205)
e	5.44 (.214) BSC		
L	19.72 (.776)	19.92 (.784)	20.22 (.796)
L1	—	—	4.30 (.169)
P	3.40 (.134)	—	3.80 (.150)
Q	5.60 (.220)	5.80 (.228)	6.00 (.236)

Packaging Specifications

BIDW30N60T .... 30 pieces per tube

BOURNS®

Asia-Pacific: Tel: +886-2 2562-4117
Email: asiacus@bourns.com

EMEA: Tel: +36 88 885 877
Email: eurocus@bourns.com

The Americas: Tel: +1-951 781-5500
Email: americus@bourns.com

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07/22

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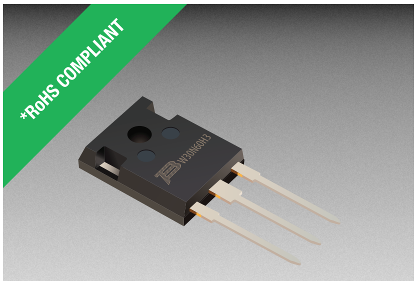
Web Page: http://www.bourns.com/legal/disclaimers-terms-and-policies

PDF: http://www.bourns.com/docs/Legal/disclaimer.pdf



BOURNS®

Features

- 600 V, 30 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- 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 for an optimum component for high voltage and high current applications. This device uses Trench-Gate Field-Stop technology providing greater control of dynamic characteristics with 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

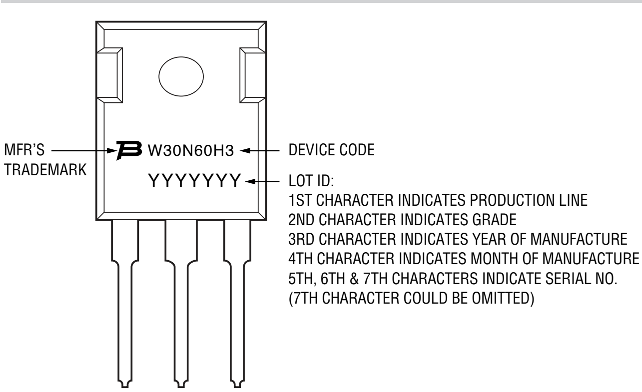
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current (T_C = 25 °C), limited by T_{jmax}	I_C	60	A
Continuous Collector Current (T_C = 100 °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}	±20	V
Continuous Forward Current (T_C = 100 °C), limited by T_{jmax}	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

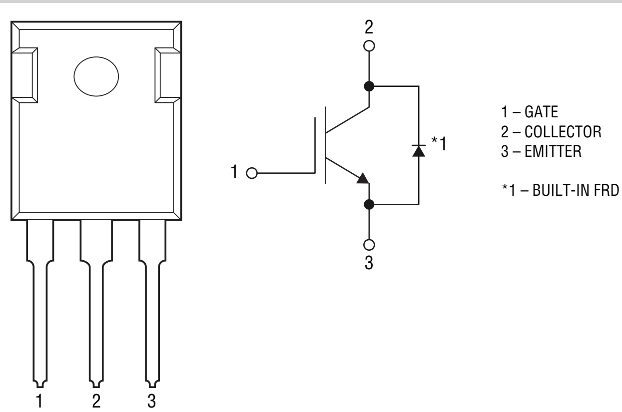
Thermal Resistance

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



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_{CE} = 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)

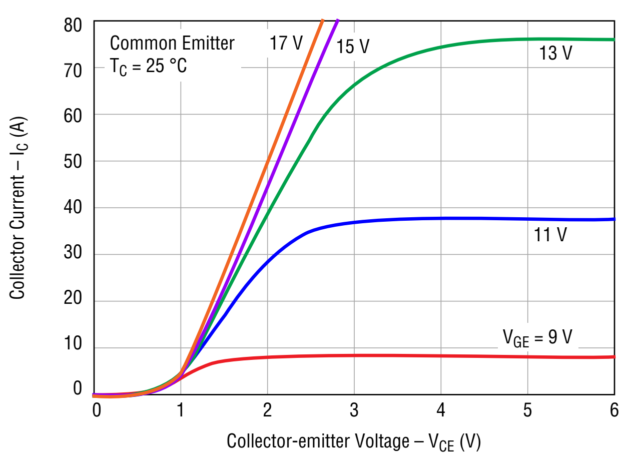
Parameter (T_C = 25 °C)	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 30.0 A, R_G = 10 Ω	—	30	—	ns
Current Rise Time	t_r		—	105	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	67	—	ns
Current Fall Time	t_f		—	100	—	ns
Turn-on Switching Energy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

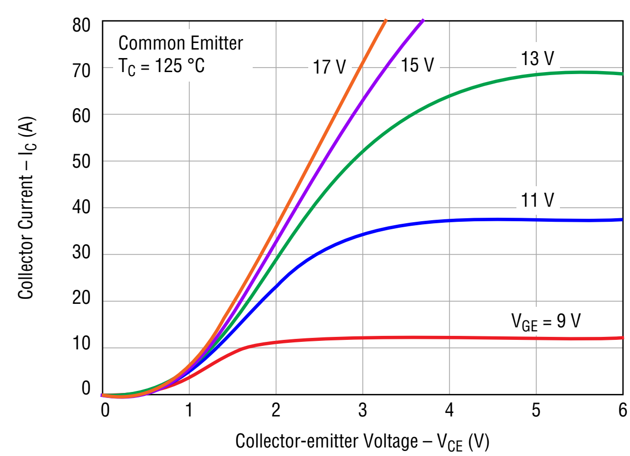
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/μs I_F = 12.0 A	—	28	—	ns
Reverse Recovery Charge	Q_{rr}		—	55	—	nC

Electrical Characteristic Performance

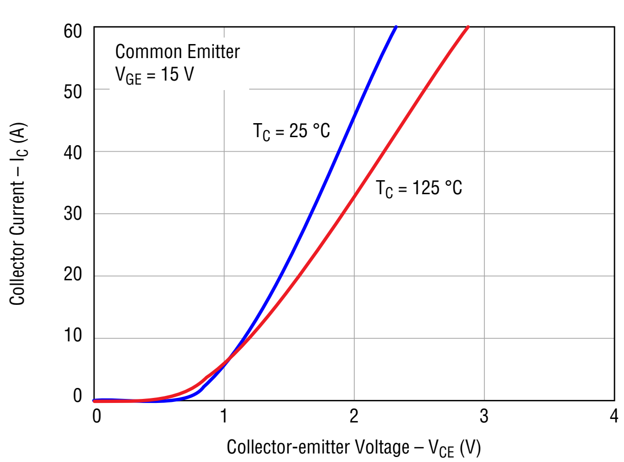
Typical Output Characteristics



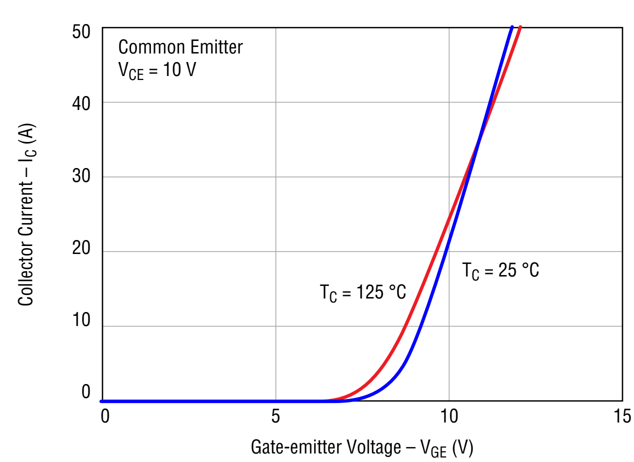
Typical Output Characteristics



Typical Saturation Voltage Characteristics

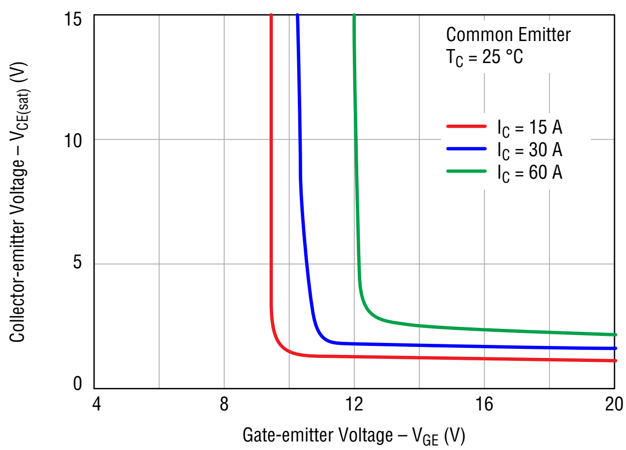


Typical Transfer Characteristics

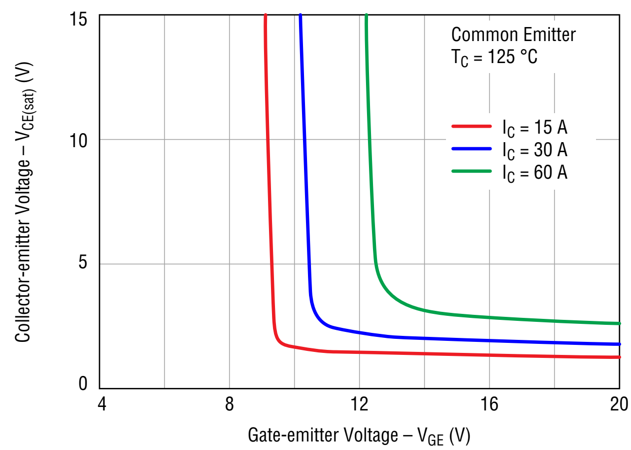


Electrical Characteristic Performance (continued)

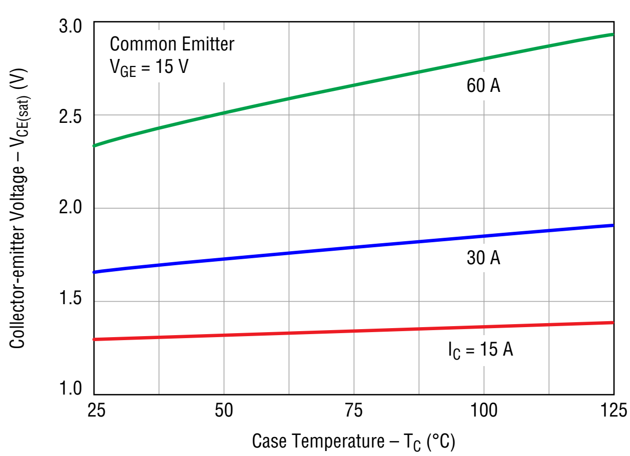
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



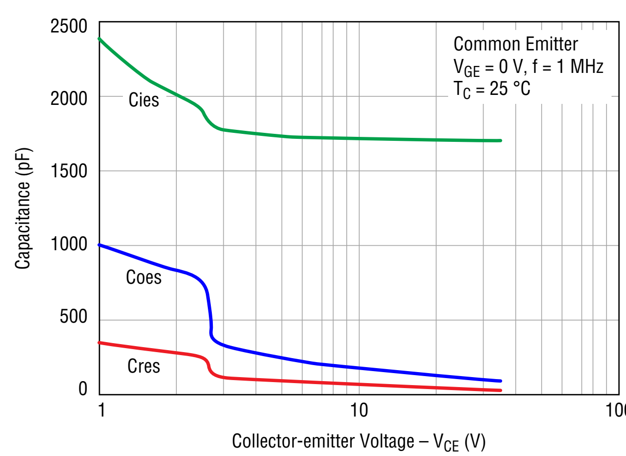
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

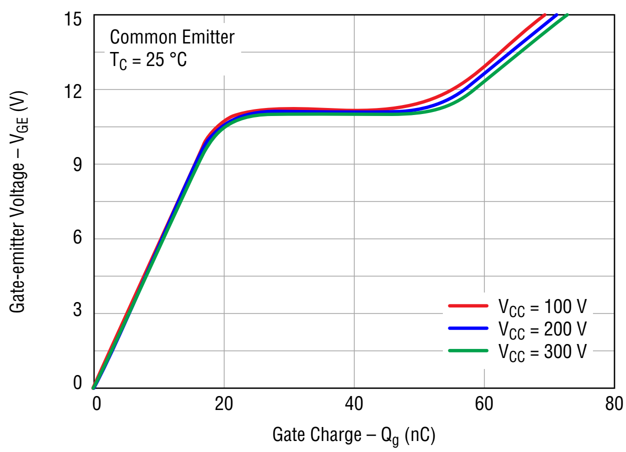


Typical Capacitance Characteristics

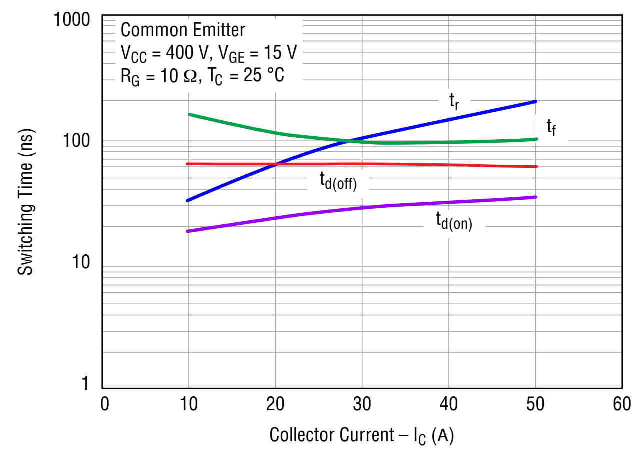


Electrical Characteristic Performance (continued)

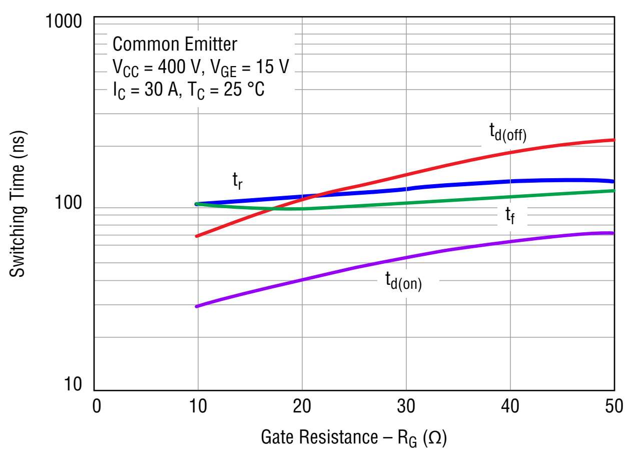
Typical Gate Charge Characteristic



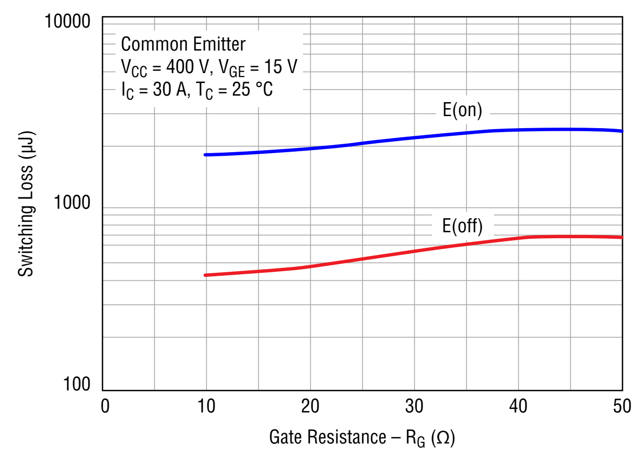
Typical Switching Time Characteristics vs I_C



Typical Switching Time Characteristics vs R_G

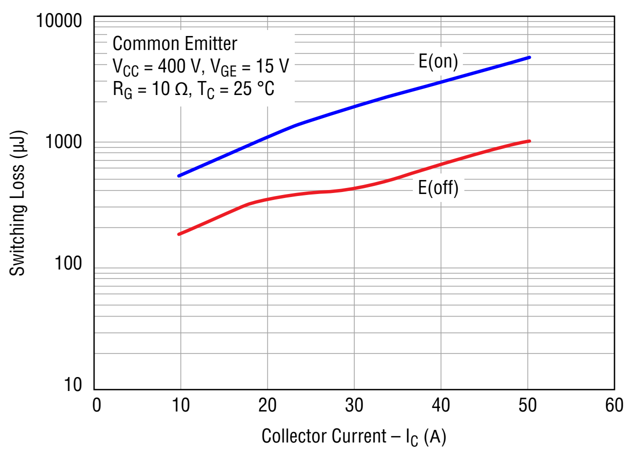


Typical Switching Loss vs R_G

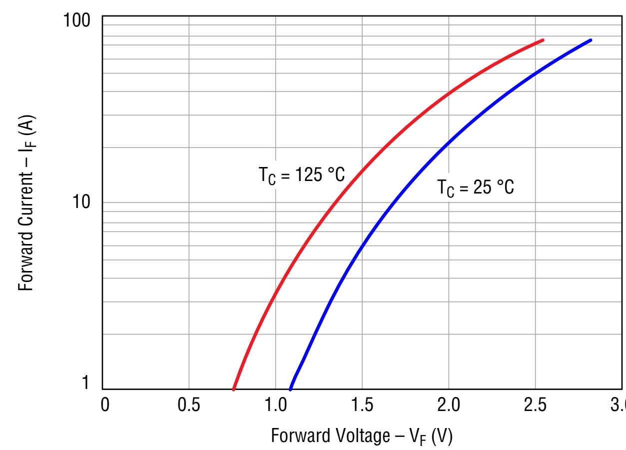


Electrical Characteristic Performance (continued)

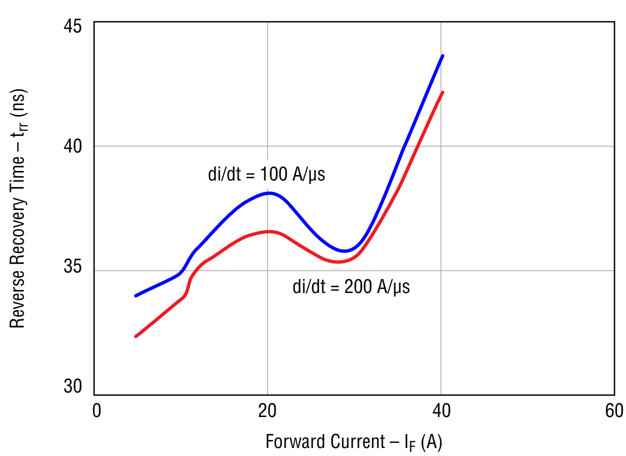
Typical Switching Loss Characteristics vs I_C



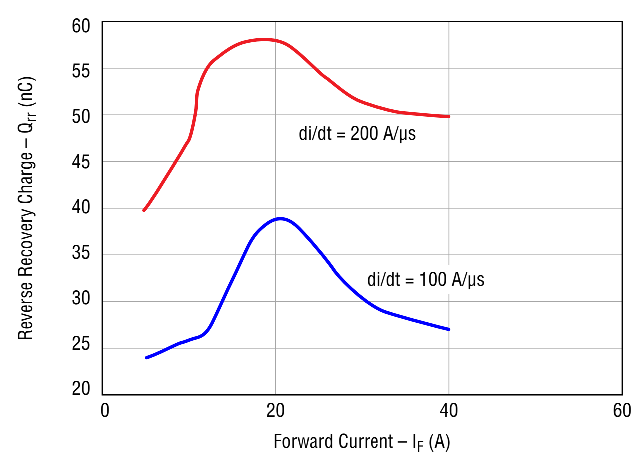
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F

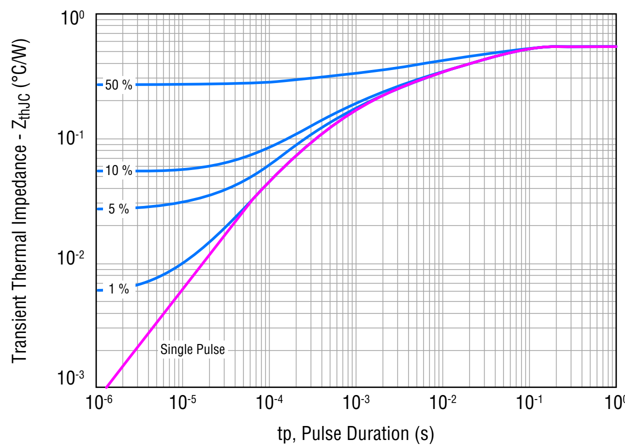


Typical Reverse Recovery Charge vs I_F

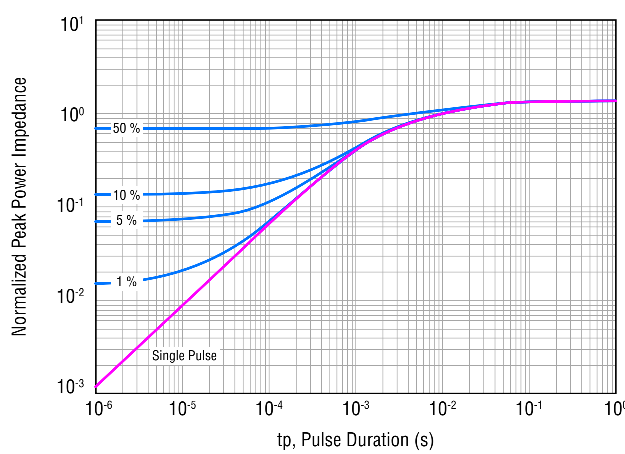


Electrical Characteristic Performance (continued)

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

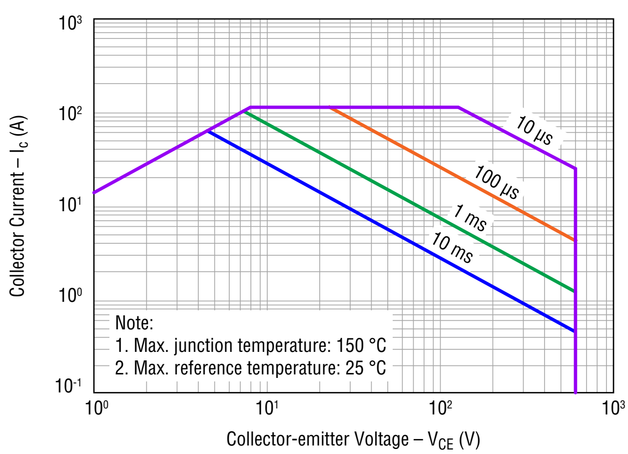


Diode Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)

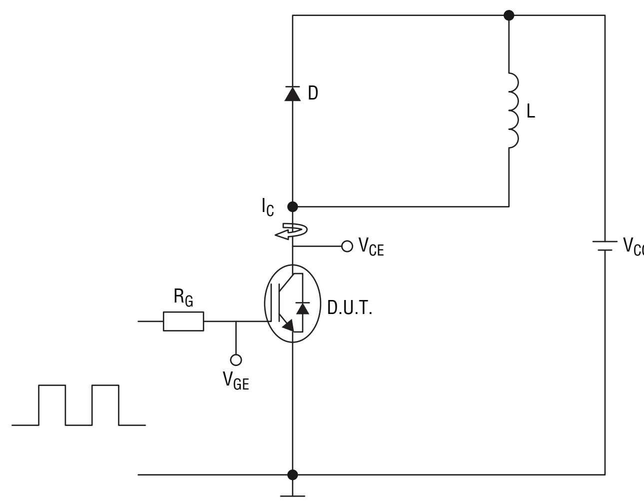


Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area



Inductive Load Test Circuit



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

How to Order

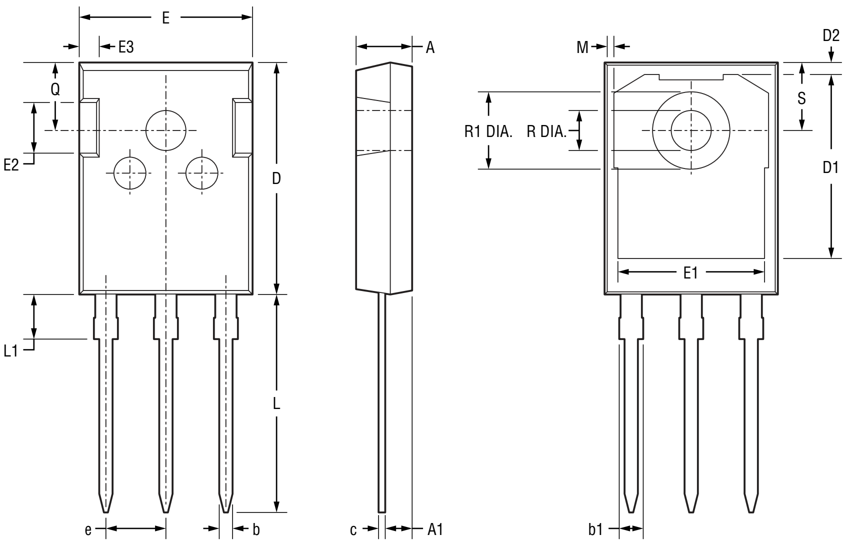
B I D NW 30 N 60 H 3

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 = High Speed
Version Number

Environmental Characteristics

ESD Class (HBM)..2

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

Asia-Pacific: Tel: +886-2 2562-4117 • Email: asiacus@bourns.com
EMEA: Tel: +36 88 885 877 • Email: eurocus@bourns.com
The Americas: Tel: +1-951 781-5500 • Email: americus@bourns.com
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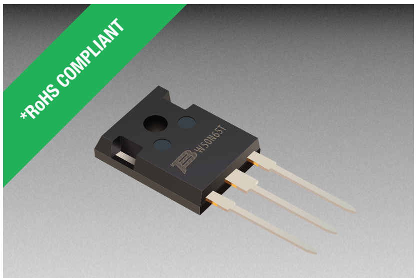
Web Page: http://www.bourns.com/legal/disclaimers-terms-and-policies

PDF: http://www.bourns.com/docs/Legal/disclaimer.pdf



BOURNS®

Features

- 650 V, 50 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- Trench-Gate Field-Stop technology
- Optimized for conduction
- RoHS compliant*

Applications

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

BIDW50N65T Insulated Gate Bipolar Transistor (IGBT)

General Information

The Bourns® Model BIDW50N65T IGBT device combines technology from a MOS gate and a bipolar transistor for an optimum component for high voltage and high current applications. This device uses Trench-Gate Field-Stop technology providing greater control of dynamic characteristics with a lower Collector-Emitter Saturation Voltage ($V_{CE(sat)}$) and fewer switching losses. In addition, this structure provides a lower thermal resistance $R_{(th)}$.

Additional Information

Click these links for more information:

PRODUCT | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

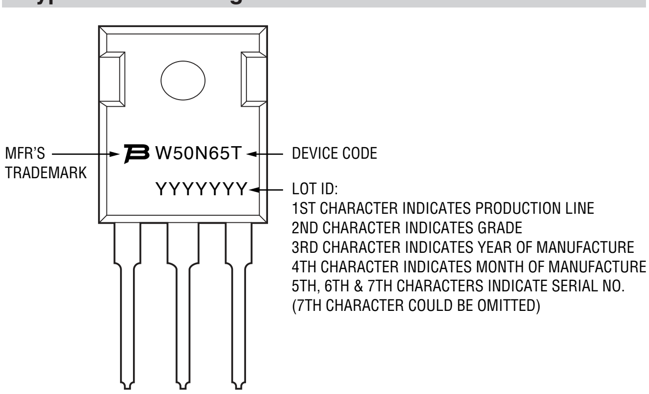
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Continuous Collector Current (T_C = 25 °C), limited by T_{jmax}	I_C	100	A
Continuous Collector Current (T_C = 100 °C), limited by T_{jmax}	I_C	50	A
Pulsed Collector Current, t_p limited by T_{jmax}	I_{CP}	150	A
Gate-Emitter Voltage	V_{GE}	±20	V
Continuous Forward Current (T_C = 100 °C), limited by T_{jmax}	I_F	50	A
Short-circuit Withstand Time (V_{CE} = 300 V, V_{GE} = 15 V)	T_{SC}	10	μs
Total Power Dissipation	P_{total}	416	W
Storage Temperature	T_{STG}	-55 to +150	°C
Operating Junction Temperature	T_j	-55 to +150	°C

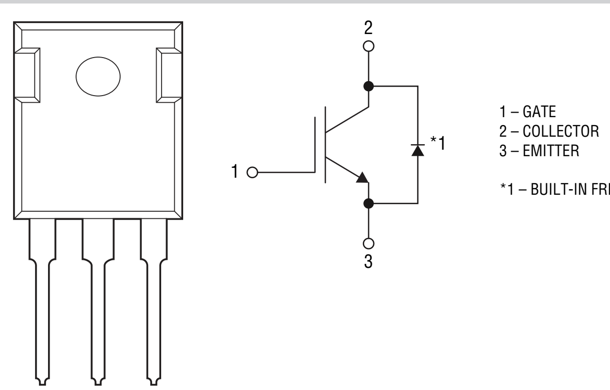
Thermal Resistance

Parameter	Symbol	Max	Unit
IGBT Thermal Resistance Junction - Case	$R_{th(j-c)\_IGBT}$	0.3	°C/W
Diode Thermal Resistance Junction - Case	$R_{th(j-c)\_Diode}$	0.65	°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	650	—	—	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 50 A T_C= 25 °C	—	1.65	2.2	V
		V_{GE} = 15 V, I_C = 50 A T_C= 125 °C	—	1.9	—	
Diode Forward On-Voltage	V_F	I_F = 50 A, T_C = 25 °C	—	1.7	2.5	V
		I_F = 50 A, T_C = 125 °C	—	1.3	—	V
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 μA	4.0	5.0	7.0	V
Collector Cut-off Current	I_{CES}	V_{GE} = 0 V, V_{CE} = 650 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	—	2723	—	pF
Output Capacitance	C_{oes}		—	230	—	
Reverse Transfer Capacitance	C_{res}		—	55	—	
Total Gate Charge	Q_g	V_{CE} = 400 V, V_{GE} = 15 V I_C = 50.0 A	—	123	—	nC
Gate-Emitter Charge	Q_{ge}		—	31	—	
Gate-Collector Charge	Q_{gc}		—	48	—	

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

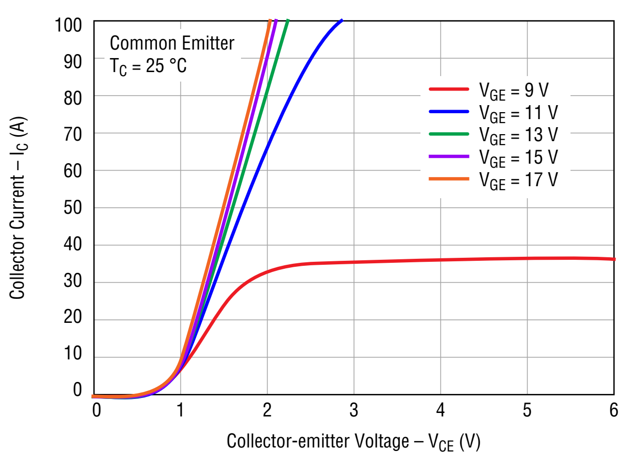
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 50.0 A, R_G = 10 Ω	—	37	—	ns
Current Rise Time	t_r		—	133	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	125	—	ns
Current Fall Time	t_f		—	121	—	ns
Turn-on Switching Energy	E_{on}		—	3.0	—	mJ
Turn-off Switching Energy	E_{off}		—	1.1	—	mJ
Total Switching Energy	E_{ts}		—	4.1	—	mJ

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

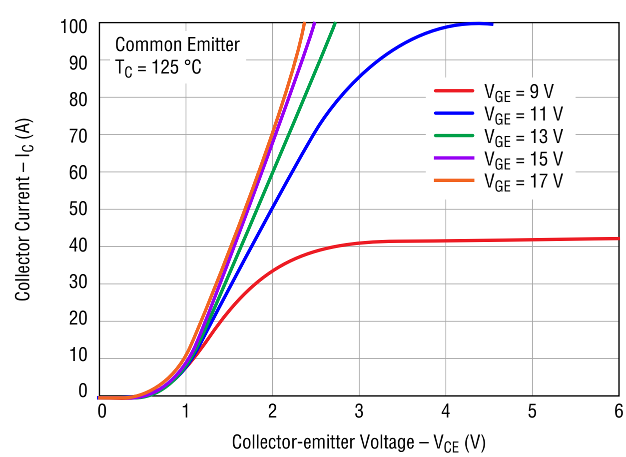
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/µs, I_F = 50.0 A	—	37.5	—	ns
Reverse Recovery Charge	Q_{rr}		—	78	—	nC

Electrical Characteristic Performance

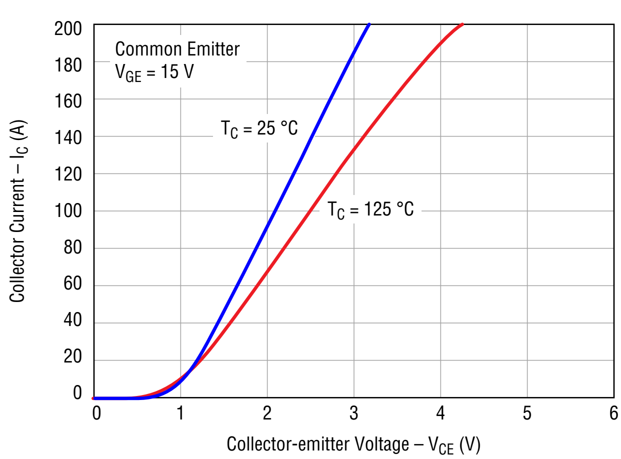
Typical Output Characteristics



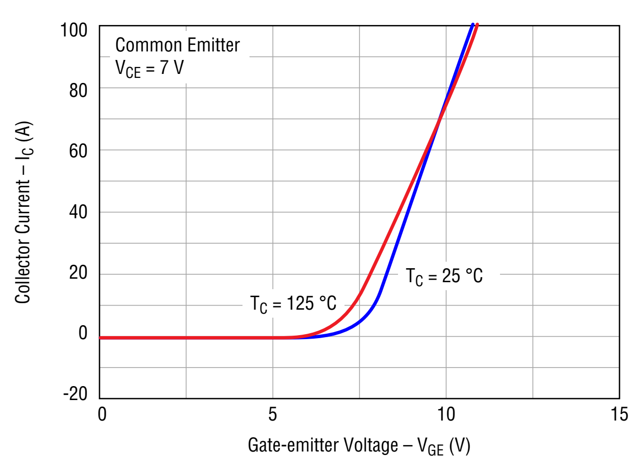
Typical Output Characteristics



Typical Saturation Voltage Characteristics

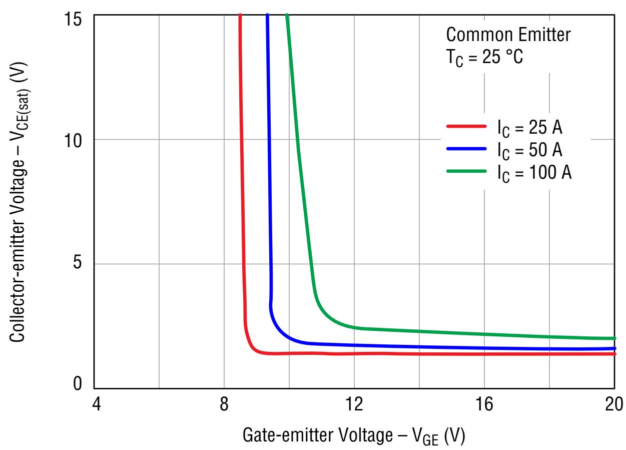


Typical Transfer Characteristics

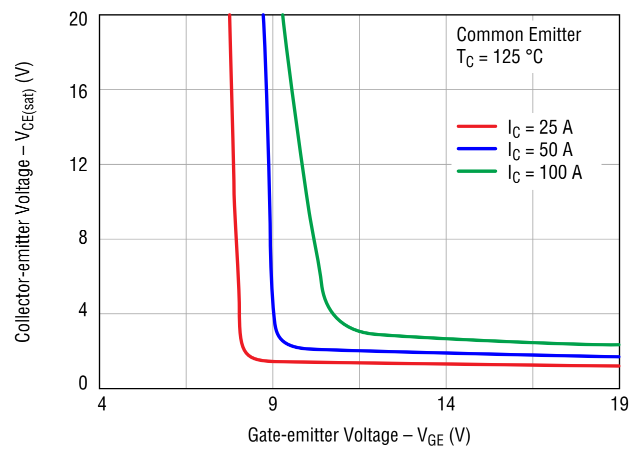


Electrical Characteristic Performance (continued)

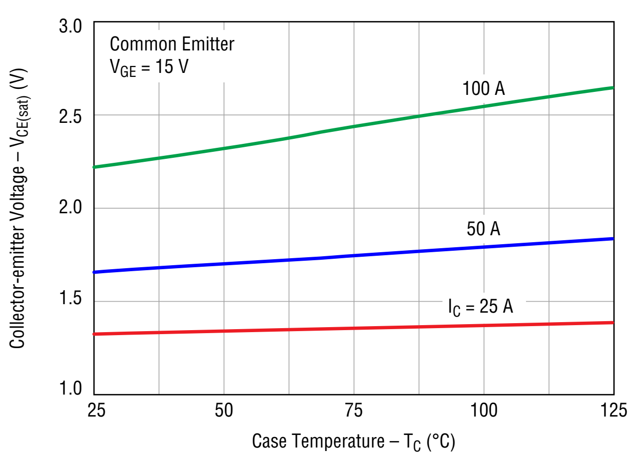
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



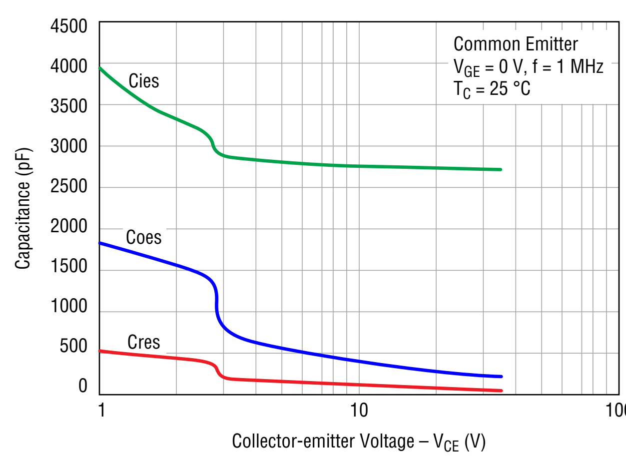
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

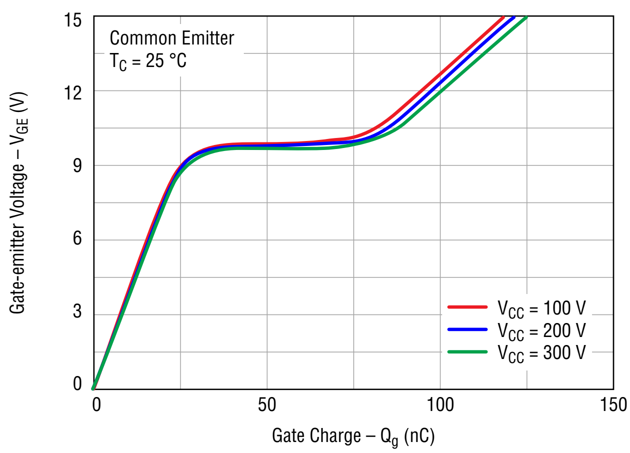


Typical Capacitance Characteristics

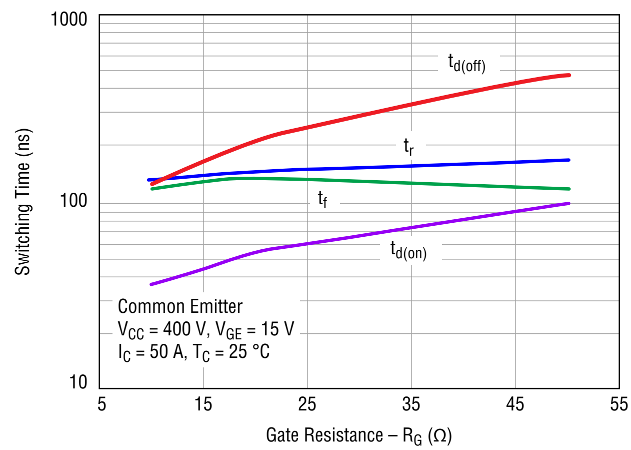


Electrical Characteristic Performance (continued)

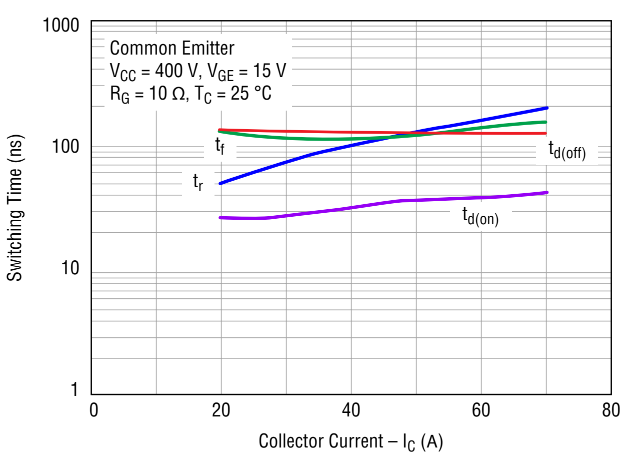
Typical Gate Charge Characteristics



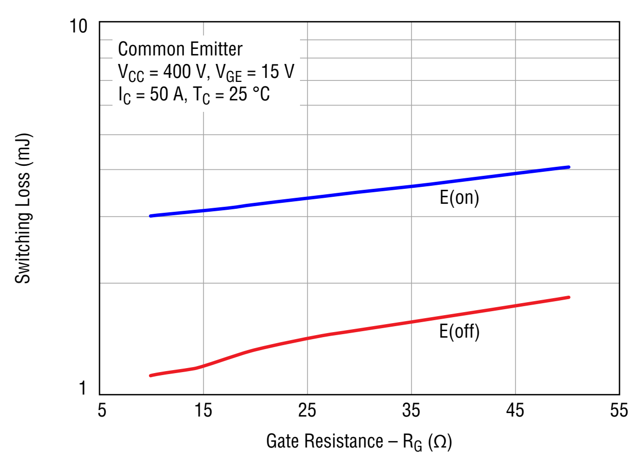
Typical Switching Time Characteristics vs R_G



Typical Switching Time Characteristics vs I_C

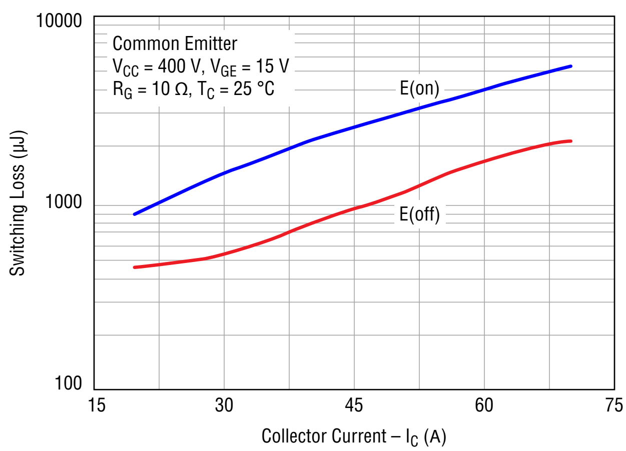


Typical Switching Loss vs R_G

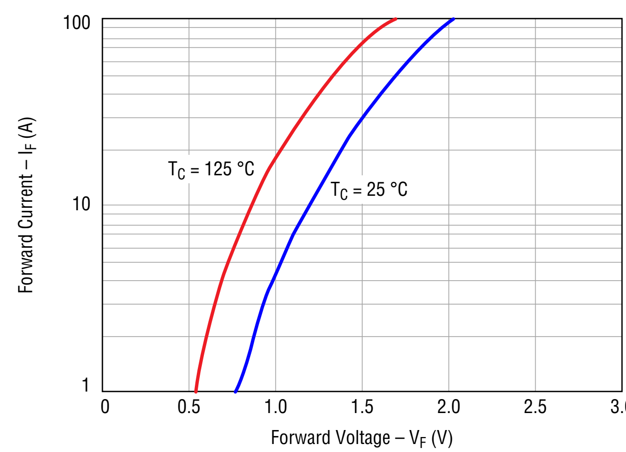


Electrical Characteristic Performance (continued)

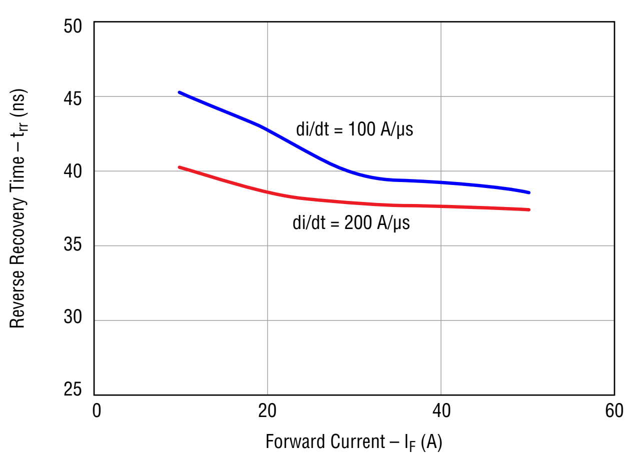
Typical Switching Loss Characteristics vs I_C



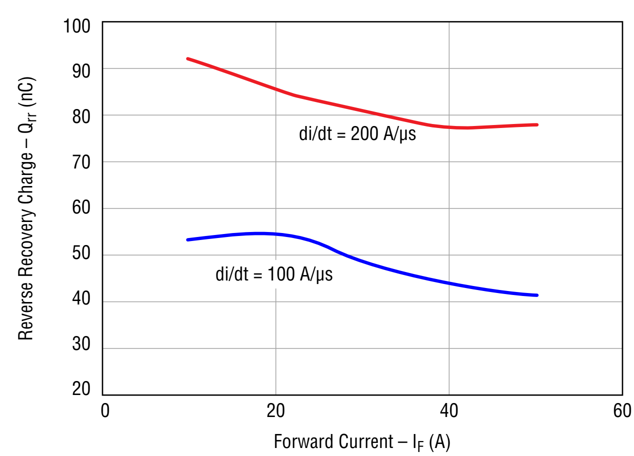
Typical Diode I_F vs V_F



Typical Reverse Recovery Time vs I_F

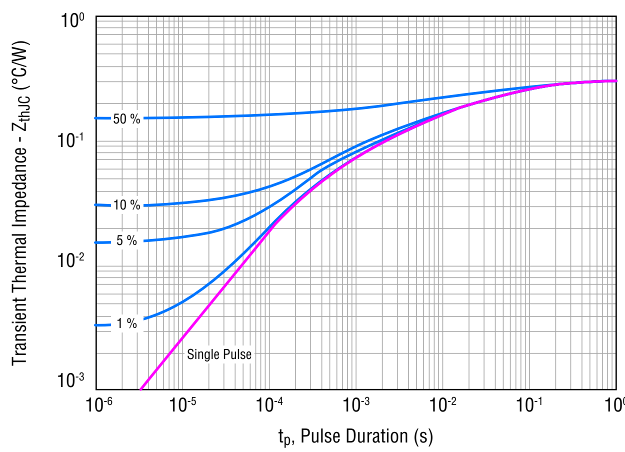


Typical Reverse Recovery Charge vs I_F

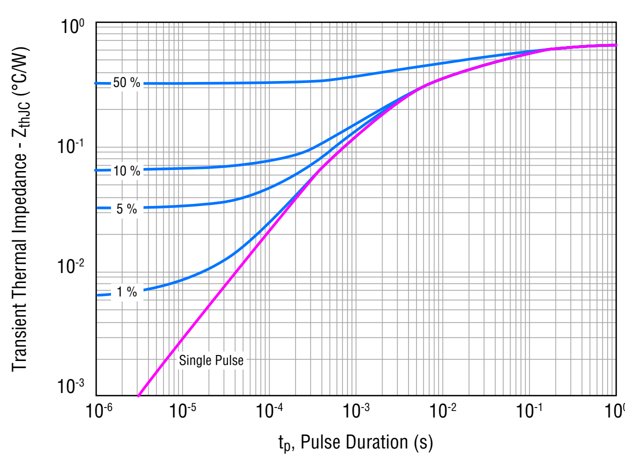


Electrical Characteristic Performance (continued)

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

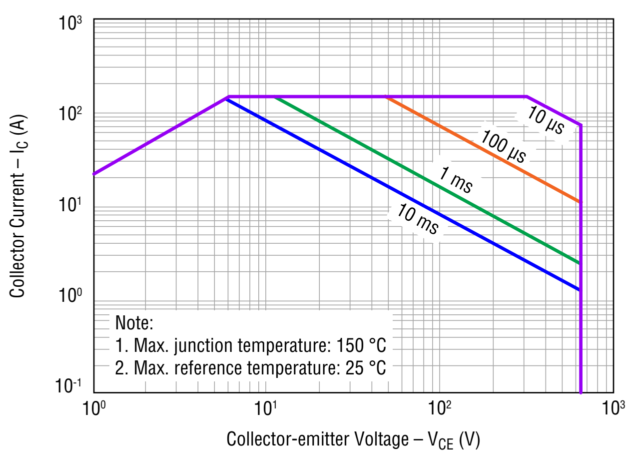


Diode Transient Thermal Impedance vs $t_{p(on)}$ Duration ($D=t_p/T$)



Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area

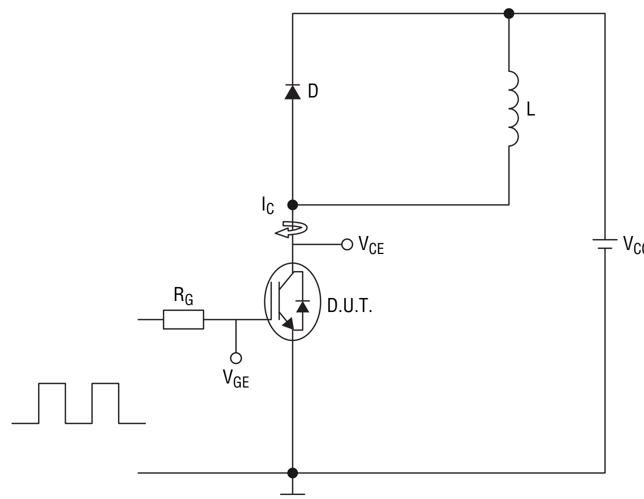


How to Order

B I D W 50 N 65 T

B = Bourns®
I = IGBT
Type
  D = Discrete
Package Code
  W = TO-247-3L
Current Rating
  50 = 50 A
Device Type
  N = N-channel
Nominal Voltage (divided by 10)
  65 = 650 V
Optimization
  T = Medium Speed

Inductive Load Test Circuit

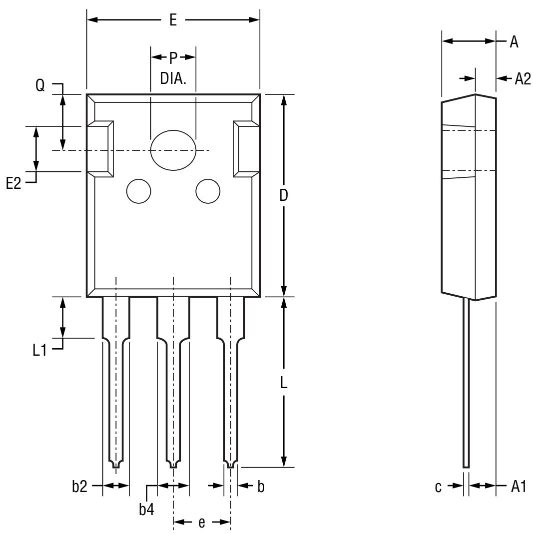


L = 1.12 mH, V_{CE} = 400 V, V_{GE} = 15 V, I_C = 50 A, R_G = 10 Ω

Environmental Characteristics

ESD Class (HBM)..2

Product Dimensions



DIMENSIONS: MM / (INCHES)

Symbol	Min.	Nom.	Max.
A	4.80 (.189)	5.00 (.197)	5.20 (.205)
A1	2.21 (.087)	2.41 (.095)	2.59 (.102)
A2	1.85 (.073)	2.00 (.079)	2.15 (.085)
b	1.11 (.044)	—	1.36 (.054)
b2	1.91 (.075)	—	2.25 (.089)
b4	2.91 (.115)	—	3.25 (.128)
c	0.51 (.020)	—	0.75 (.030)
D	20.80 (.819)	21.00 (.827)	21.30 (.839)
E	15.50 (.610)	15.80 (.622)	16.10 (.634)
E2	4.40 (.173)	5.00 (.197)	5.20 (.205)
e		5.44 (.214) BSC	
L	19.72 (.776)	19.92 (.784)	20.22 (.796)
L1	—	—	4.30 (.169)
P	3.40 (.134)	—	3.80 (.150)
Q	5.60 (.220)	5.80 (.228)	6.00 (.236)

Packaging Specifications

BIDW50N65T .... 30 pieces per tube

BOURNS®

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Email: asiacus@bourns.com
EMEA: Tel: +36 88 885 877
Email: eurocus@bourns.com
The Americas: Tel: +1-951 781-5500
Email: americus@bourns.com
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PDF: http://www.bourns.com/docs/Legal/disclaimer.pdf