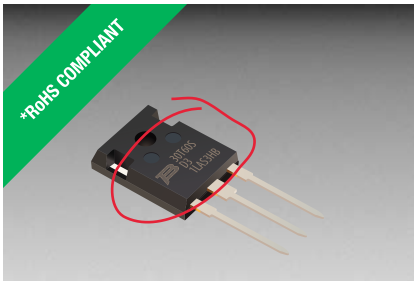
PRELIMINARY



BOURNS®

Features

- 600 V, 50 A, Low Collector-Emitter Saturation Voltage ($V_{CE(sat)}$)
- Novel trench-gate field-stop technology
- Optimized for conduction

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, 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 provides a lower thermal resistance (R_{TH}).

Additional Information

Click these links for more information:

PRODUCT | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

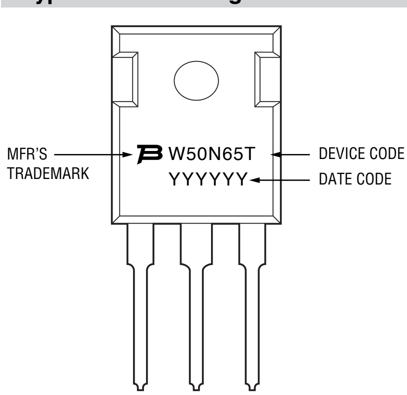
Maximum Electrical Ratings (T_C = 25 °C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Continuous Collector Current (T_C = 25 °C)	I_C	100	A
Continuous Collector Current (T_C = 100 °C)	I_C	50	A
Pulsed Collector Current	I_{CP}	300	A
Gate-Emitter Voltage	V_{GE}	±20	V
Continuous Forward Current (T_C = 25 °C)	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

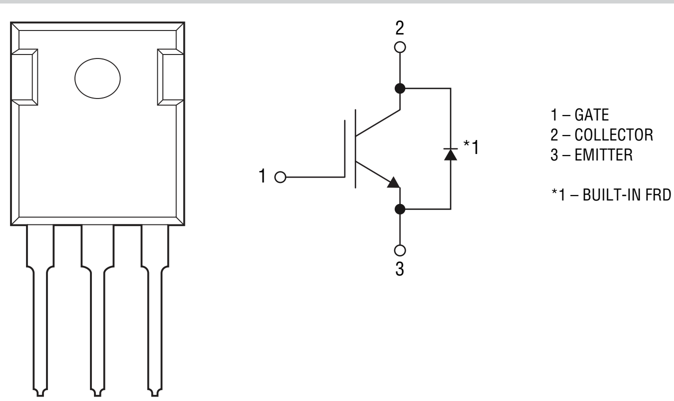
Thermal Resistance

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_{CC} = 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)

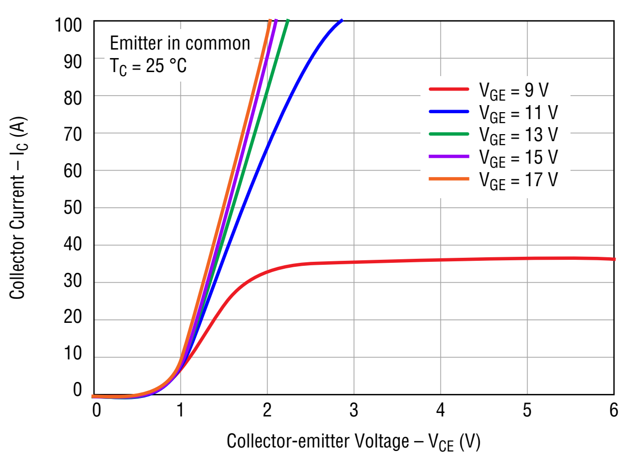
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Turn-on Delay Time	$t_{d(on)}$	V_{CE} = 400 V, V_{GE} = 15 V I_C = 50.0 A, R_G = 10 Ω	—	37	—	ns
Current Rise Time	t_r		—	133	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	125	—	ns
Current Fall Time	t_f		—	121	—	ns
Turn-on Switching Energy	E_{on}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

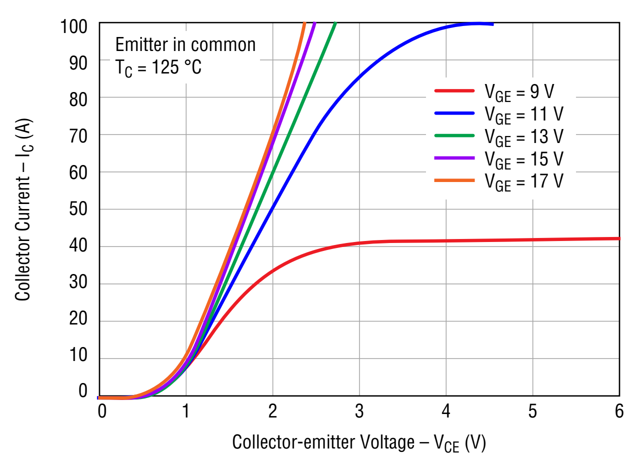
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Reverse Recovery Time	t_{rr}	dI_F/dt = 200 A/μs I_F = 50.0 A	—	37.5	—	ns
Reverse Recovery Charge	Q_{rr}		—	78	—	nC

Electrical Characteristic Performance

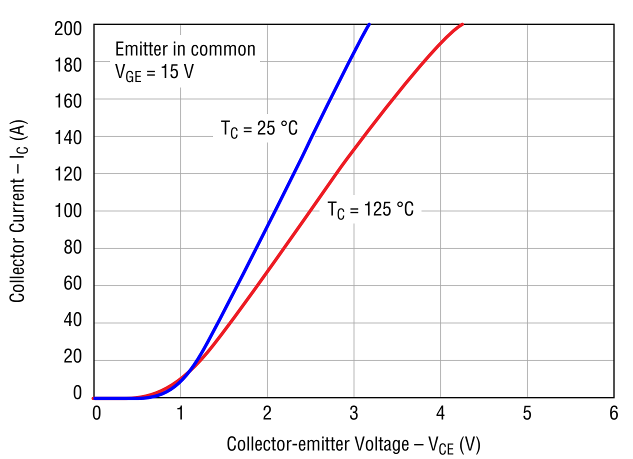
Typical Output Characteristics



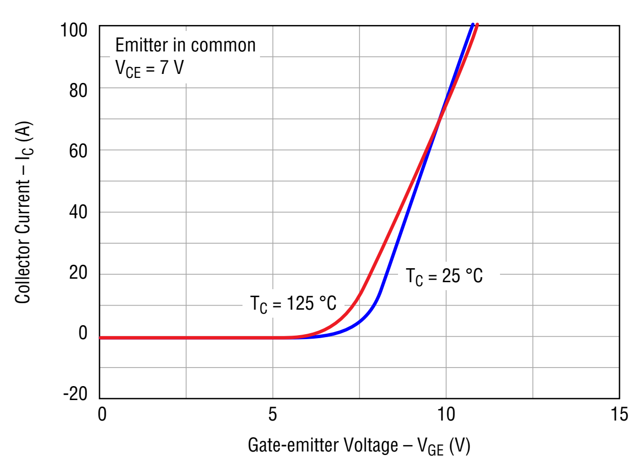
Typical Output Characteristics



Typical Saturation Voltage Characteristics

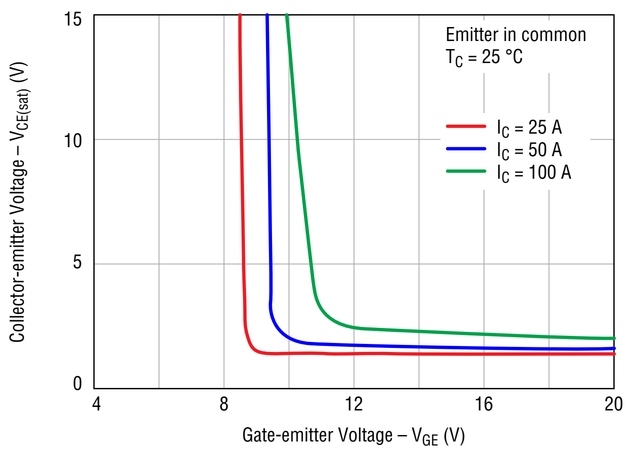


Typical Transfer Characteristics

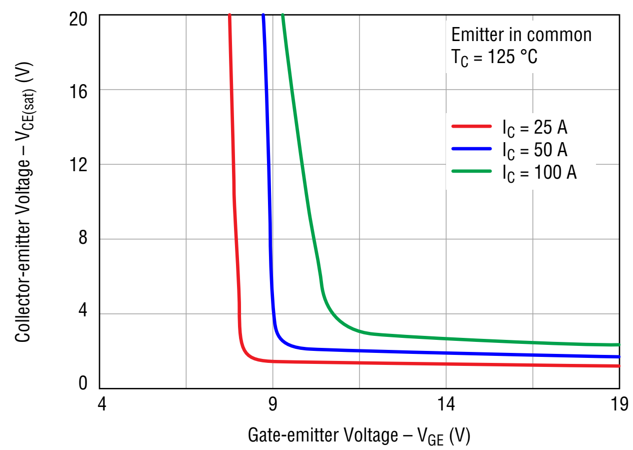


Electrical Characteristic Performance (continued)

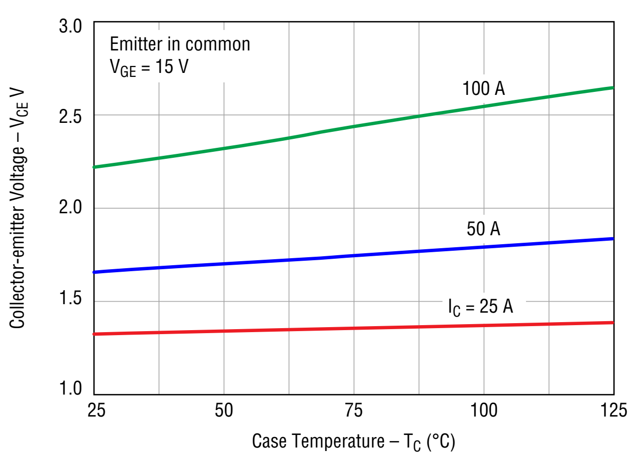
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 25 °C



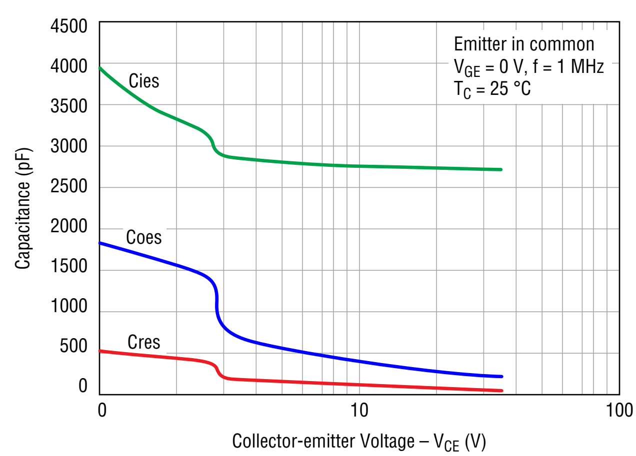
Typical $V_{CE(sat)}$ vs V_{GE} @ T_C = 125 °C



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

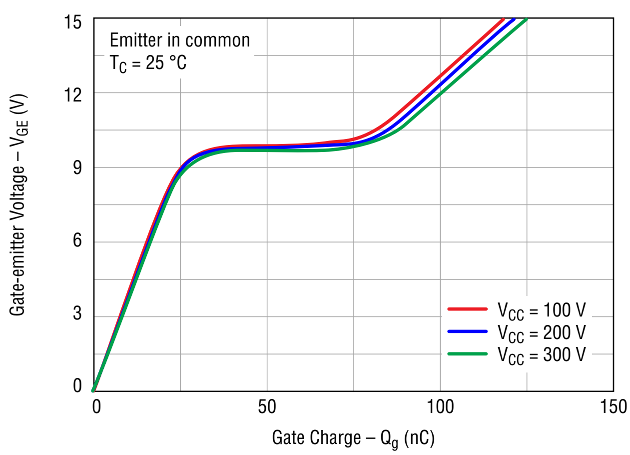


Typical Capacitance Characteristics

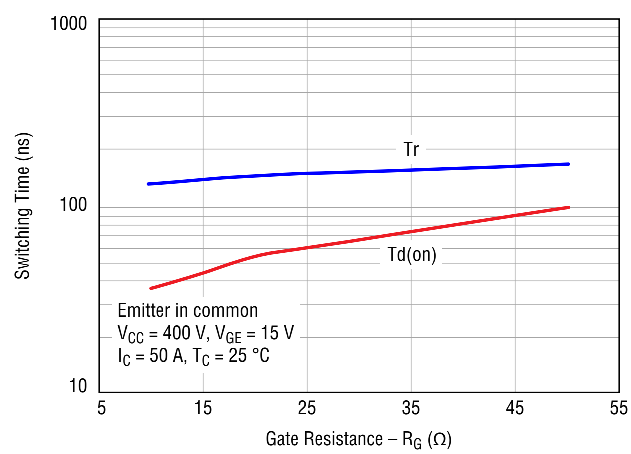


Electrical Characteristic Performance (continued)

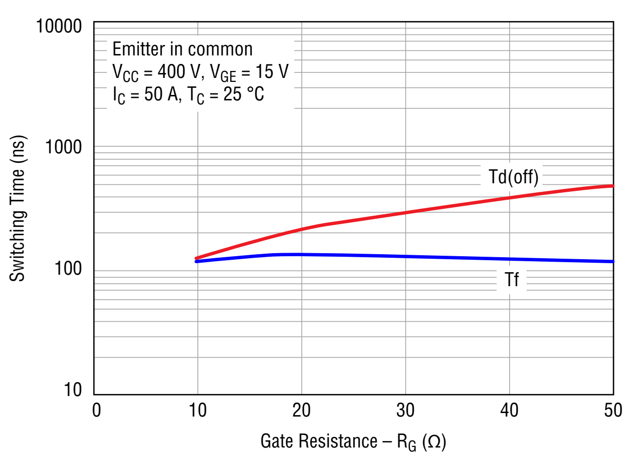
Typical Gate Charge Characteristics



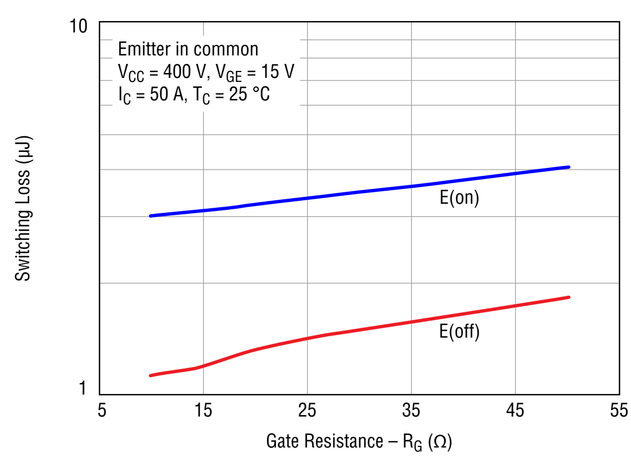
Typical Turn-on Characteristics vs R_G



Typical Turn-off Characteristics vs R_G

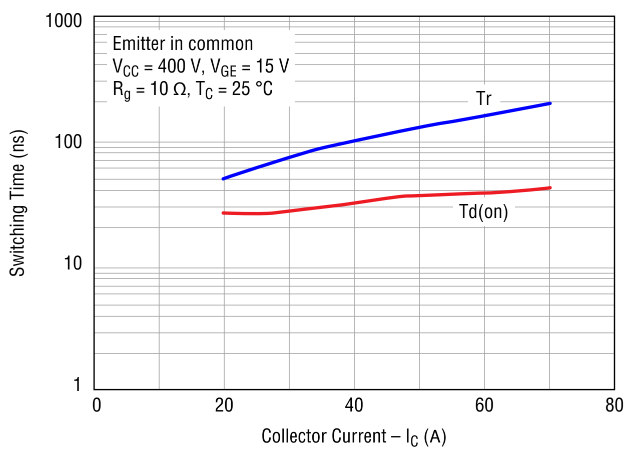


Typical Switching Loss vs R_G

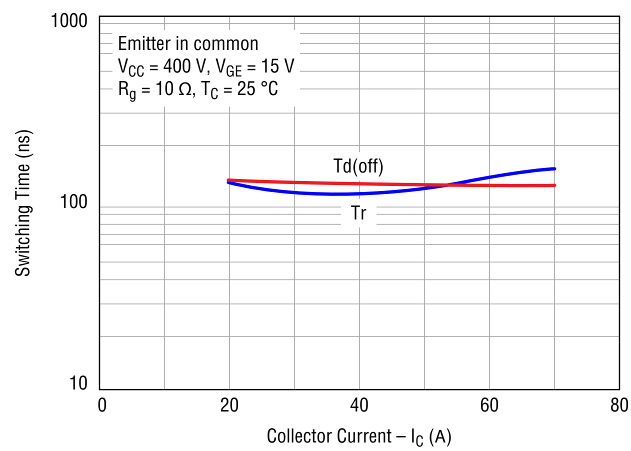


Electrical Characteristic Performance (continued)

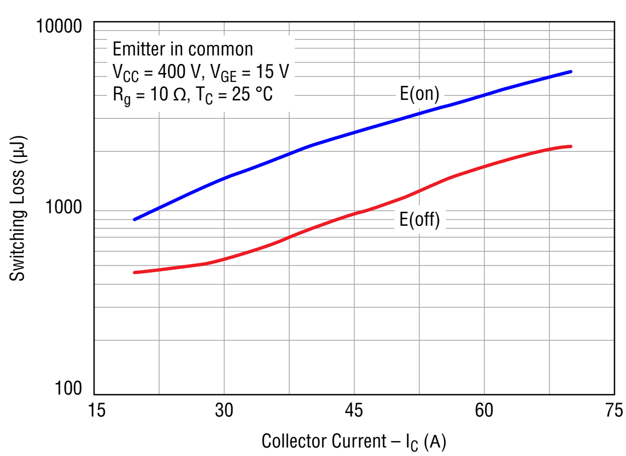
Typical Turn-on Characteristics vs I_C



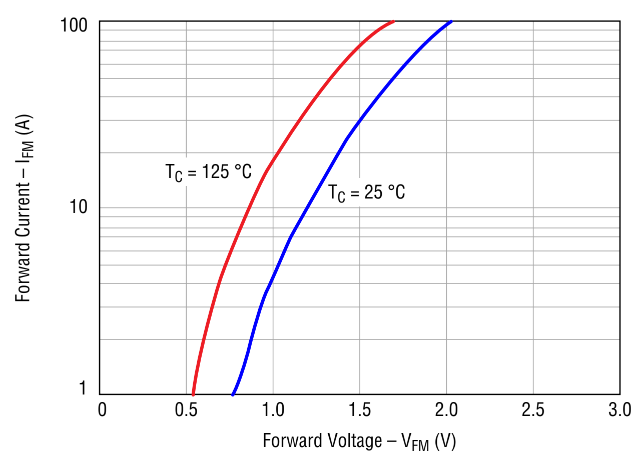
Typical Turn-off Characteristics vs I_C



Typical Switching Loss Characteristics vs I_C

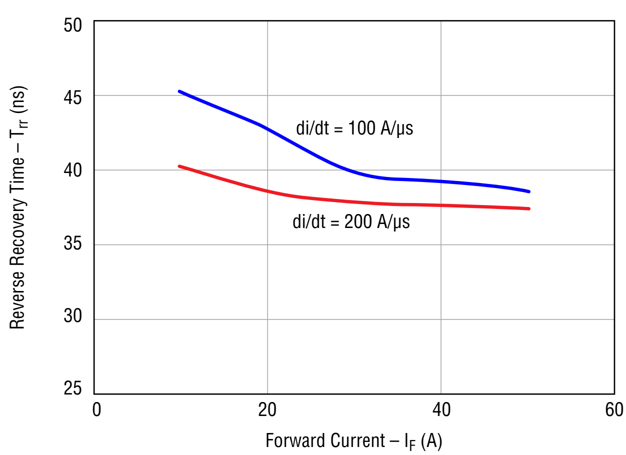


Typical Diode I_F vs V_F

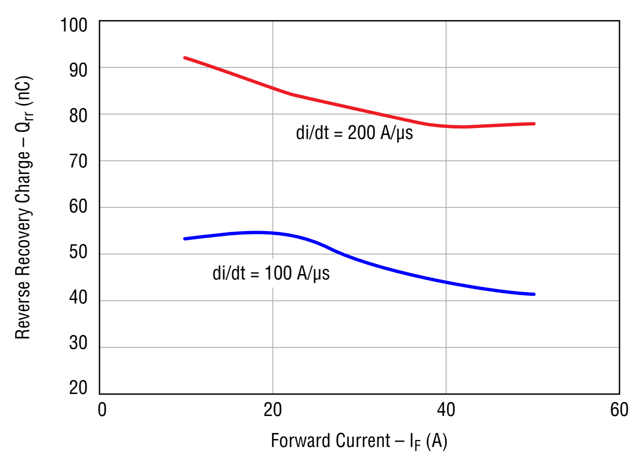


Electrical Characteristic Performance (continued)

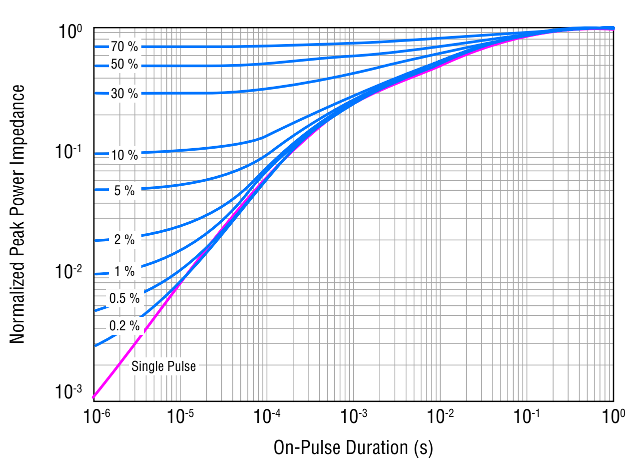
Typical Reverse Recovery Time vs I_F



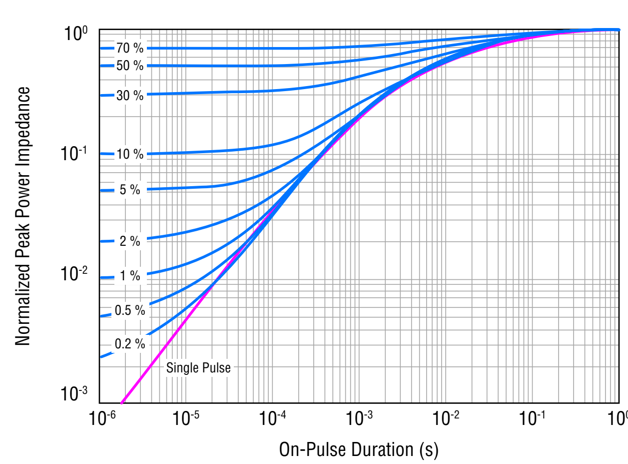
Typical Reverse Recovery Charge vs I_F



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

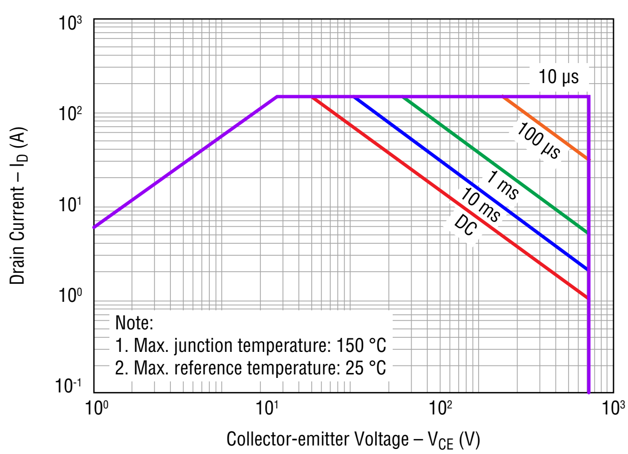


Peak Power Impedance vs $T_{p(on)}$ Duration (Diode)



Electrical Characteristic Performance (continued)

Forward Bias Safe Operating Area



How to Order

B I D W 50 N 65 T

B = Bourns®

I = IGBT

Type
D = Discrete

Package Code
W = TO-247-3L

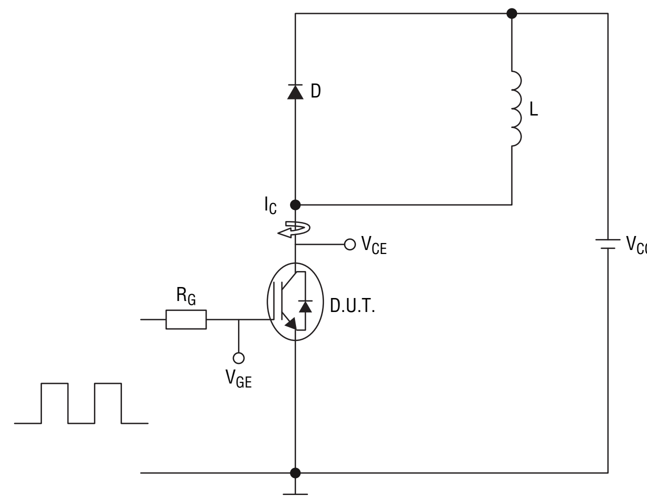
Current Rating
50 = 50 A

Device Type
N = N-channel

Nominal Voltage (divided by 10)
65 = 650 V

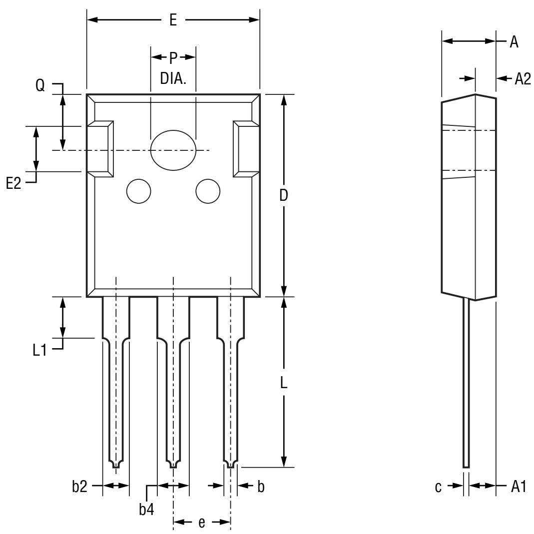
Optimization
T = ???

Inductive Load Test Circuit



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

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)

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