DIM50HST12-B000

Trench Gate IGBT Module

Preliminary Information

DS5351-2.0 June 2000

FEATURES

- Trench Gate
- Enhancement Mode n-Channel Device
- Non Punch Through Structure
- High Switching Speed
- Low On-state Saturation Voltage
- High Input Impedance Simplifies Gate Drive
- Latch-Free Operation
- Fully Short Circuit Rated To 10µs
- Wide RBSOA

APPLICATIONS

- High Frequency Inverters
- Motor Control
- Switched Mode Power Supplies
- High Frequency Welding
- UPS Systems
- PWM Drives

The DIM50HST12-B000 is a robust non punch through trench gate n-channel, enhancement mode insulated gate bipolar transistor (IGBT) module designed for low power dissipation in a wide range of low to medium voltage applications such as power supplies and motor drives. Trench Gate technology offers significant improvements when compared with conventional planar IGBTs. The high impedance gate simplifies gate drive considerations, allowing operation directly from low power control circuitry.

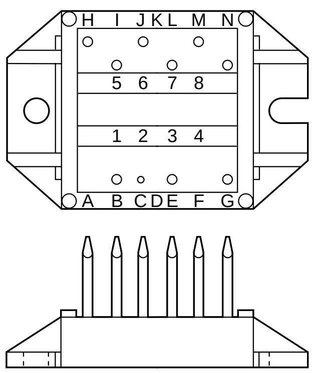
Low saturation voltages minimise power dissipation, thereby reducing the running cost of the overall system in which they are used.

The DIM50HST12-B000 is fully short circuit rated making it especially suited for motor control and other arduous applications.

Typical applications include high frequency inverters for motor control, PWM, welding and heating apparatus. The Powerline range of IGBTs is also applicable to switched mode and uninterruptible power supplies.

KEY PARAMETERS

V_{CES}	**(max)**	**1200V**
$V_{CE(sat)}$	**(typ)**	**1.9V**
I_{C25}	**(max)**	**72A**
I_{C75}	**(max)**	**50A**
I_{CM}	**(max)**	**150A**
t_{sc}	**(max)**	**10µs**



Outline type code: H (ECO-PAC)

(See Package Details for further information)

Fig.1 Pin connections - top view (not to scale)

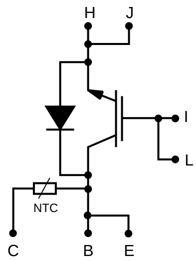


Fig.2 DIM50HST12-B000 **circuit**

ORDERING INFORMATION

Order as:
DIM50HST12-B000

Note: When ordering use complete part number.

ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to Absolute Maximum Ratings for extended periods may affect device reliability.

T_{case} = 25˚C unless stated otherwise.

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	V_{GE} = 0V	1200	V
V_{GES}	Gate-emitter voltage	-	±20	V
I_{C25}	Continuous collector current	T_{case} = 25˚C	72	A
I_{C75}	Continuous collector current	T_{case} = 75˚C	50	A
I_{CM}	Pulsed collector current	1ms, T_{case} = 75˚C	150	A
P_{tot}	Power dissipation	T_{case} = 75˚C	90	W
V_{isol}	Isolating voltage	I_{isol} ≤ 1mA, 50/60Hz, t = 1 min	3000	V_{ac}

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - IGBT	DC junction to case	-	0.83	˚C/W
$R_{th(j-c)}$	Thermal resistance - Diode	DC junction to case	-	2.0	˚C/W
T_j	Operating junction temperature range	-	–40	150	˚C
T_{stg}	Storage temperature range	-	–40	150	˚C
-	Mounting torque	M4 Screw	1.5	2.0	Nm

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

DC ELECTRICAL CHARACTERISTICS

T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_{CES}	Collector cut-off current	V_{GE} = 0V, V_{CE} = 1200V	-	-	0.4	mA
		V_{GE} = 0V, V_{CE} = 1200V, T_c = 125°C	-	-	2	mA
I_{GES}	Gate leakage current	V_{GE} = 20V, V_{CE} = 0V	-	-	1	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 1mA, V_{CE} = V_{GE}	-	7	-	V
$V_{CE(SAT)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 50A	-	1.9	2.3	V
		V_{GE} = 15V, I_C = 50A, T_c = 125°C	-	2.1	-	V

AC ELECTRICAL CHARACTERISTICS

T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
C_{ies}	Input capacitance	V_{CE} = 75V, V_{GE} = 15V, f = 1MHz	-	8000	-	pF
C_{oes}	Output capacitance	V_{CE} = 75V, V_{GE} = 15V, f = 1MHz	-	340	-	pF
C_{res}	Reverse transfer capacitance	V_{CE} = 75V, V_{GE} = 15V, f = 1MHz	-	50	-	pF

SHORT CIRCUIT RATING

T_{case} = 125°C unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
t_{sc}	Short circuit withstand time	V_{GE} = 15V, V_{CE} = 80% V_{CES}	-	-	10	µs

INDUCTIVE SWITCHING CHARACTERISTICS

T_{case} = 25˚C unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{d(ON)}$	Turn-on delay time	I_C = 50A V_{GE} = ±15V, V_{CE} = 50%V_{ces} R_G = 2.5Ω	-	160	-	ns
t_r	Rise time		-	15	-	ns
E_{ON}	Turn-on energy loss - per cycle		-	3	-	mJ
$t_{d(OFF)}$	Turn-off delay time		-	270	-	ns
t_f	Fall time		-	40	-	ns
E_{OFF}	Turn-off energy loss - per cycle		-	5	-	mJ

T_{case} = 125˚C unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{d(ON)}$	Turn-on delay time	I_C = 50A V_{GE} = ±15V, V_{CE} = 50%V_{ces} R_G = 2.5Ω	-	170	-	ns
t_r	Rise time		-	17	-	ns
E_{ON}	Turn-on energy loss - per cycle		-	4	-	mJ
$t_{d(OFF)}$	Turn-off delay time		-	340	-	ns
t_f	Fall time		-	60	-	ns
E_{OFF}	Turn-off energy loss - per cycle		-	7	-	mJ

DIODE CHARACTERISTICS

T_c = 25˚C unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{FM}	Forward voltage	At I_F = 25A peak	-	1.9	-	V
		At I_F = 25A peak, T_{case} = 125˚C	-	1.92	-	V
t_{rr}	Reverse recovery time	I_F = 25A, di_{RR}/dt = 200A/µs V_R = 50%V_{RRM}	-	90	-	ns
I_{RRM}	Reverse recovery current		-	12	-	A

BASIC TEST CIRCUIT

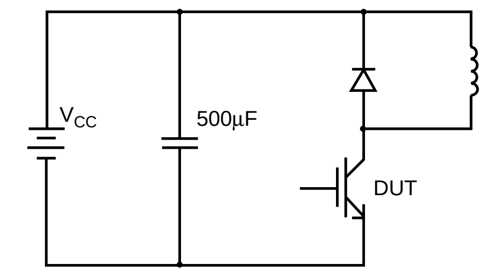


Fig.3 Basic d.c. chopper circuit

SWITCHING DEFINITIONS

$t_r = t_3 - t_2$

$t_{d(on)} = t_2 - t_1$

$E_{on} = \int_{t_1}^{t_3 + 1\mu s} V_{CE} . I_C \, dt$

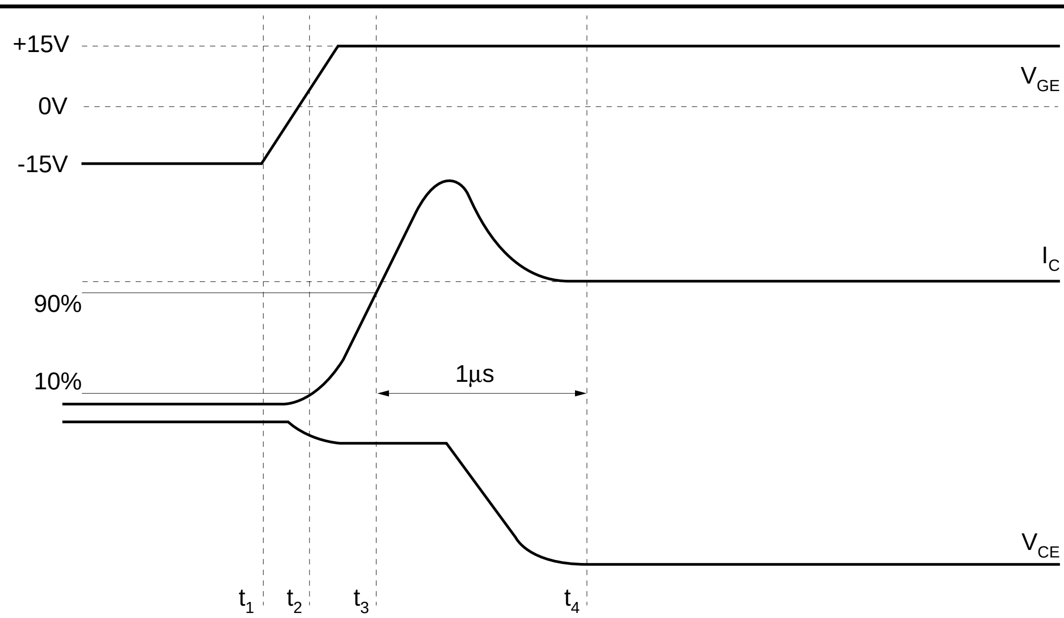


Fig.4 Turn-on characteristics

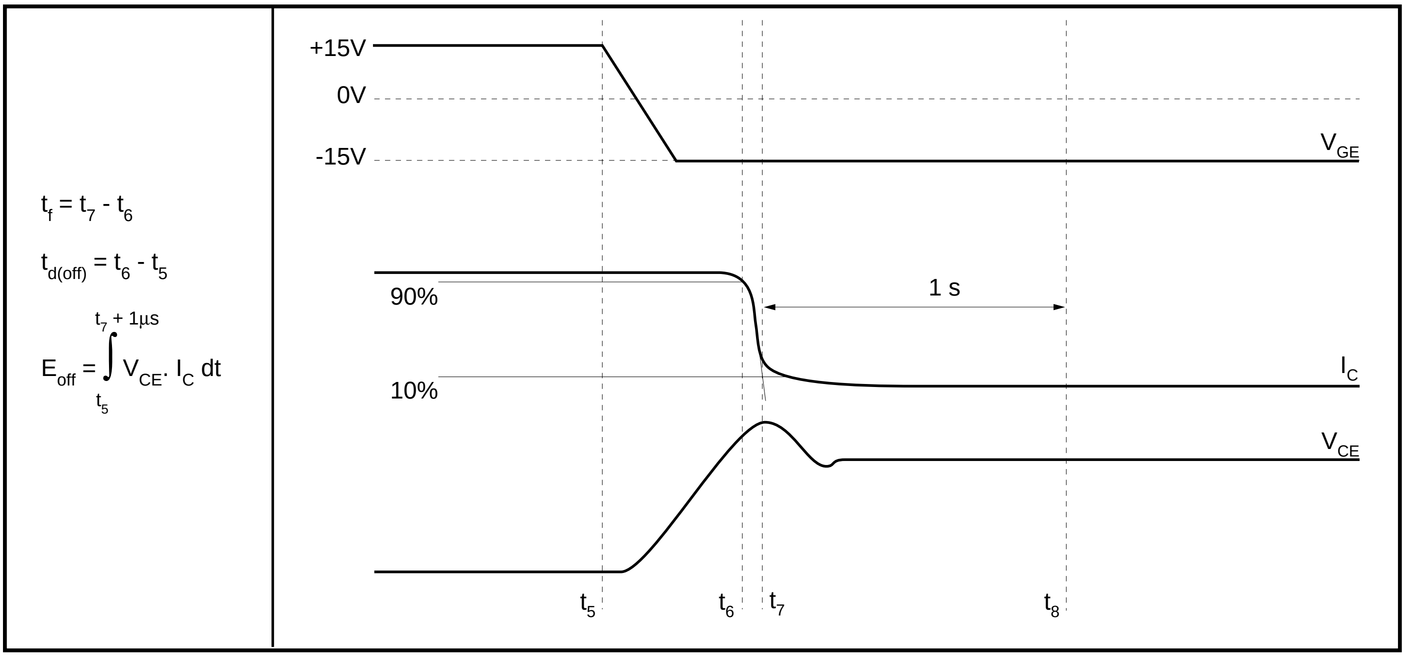


Fig.5 Turn-off characteristics

CURVES

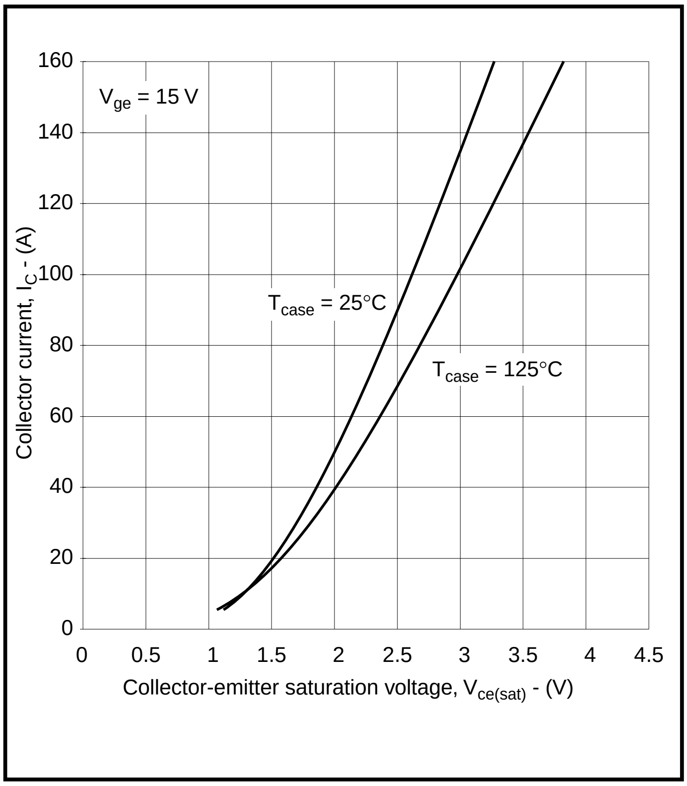


Fig.6 Typical output characteristics

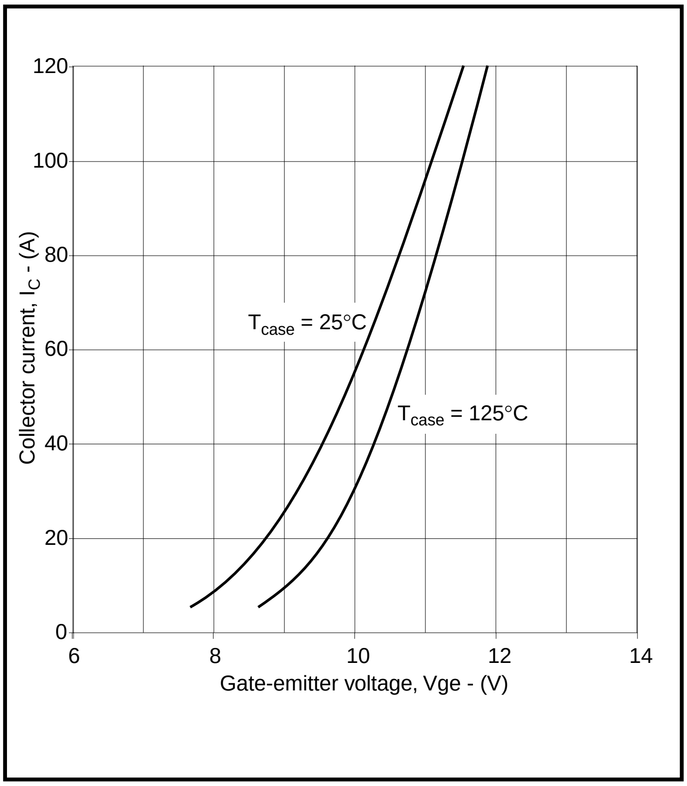


Fig.7 Typical transfer characteristics

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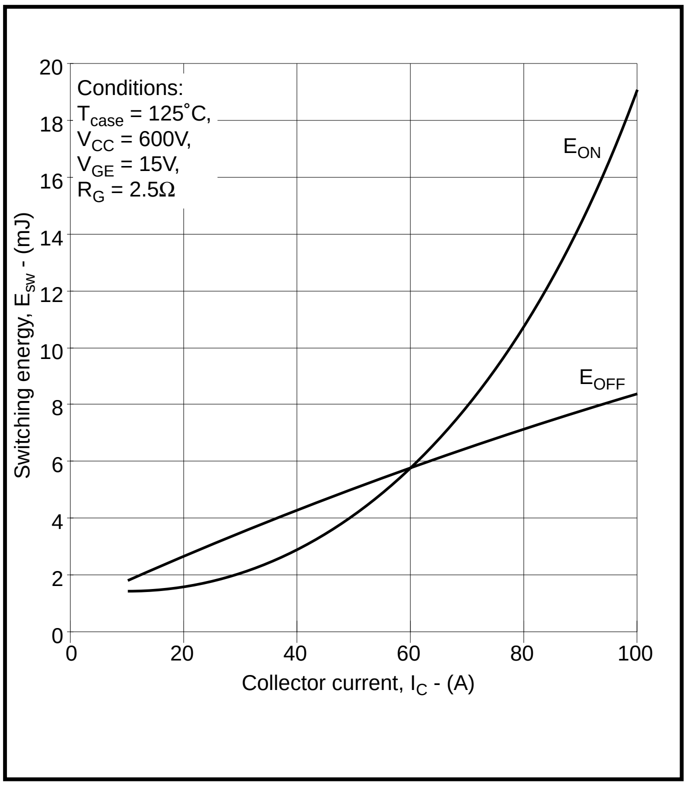


Fig.8 Typical switching losses vs collector current

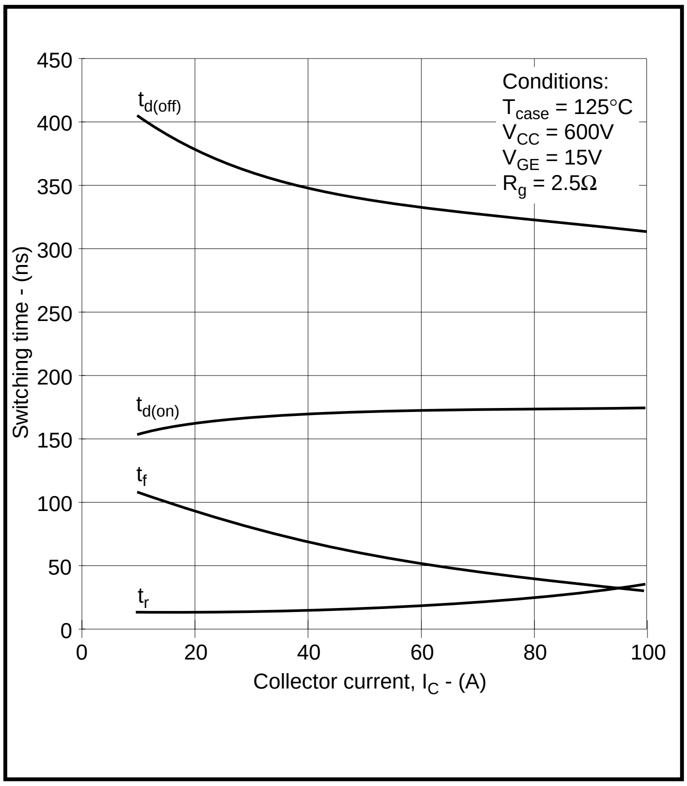


Fig.9 Typical switching times vs collector current

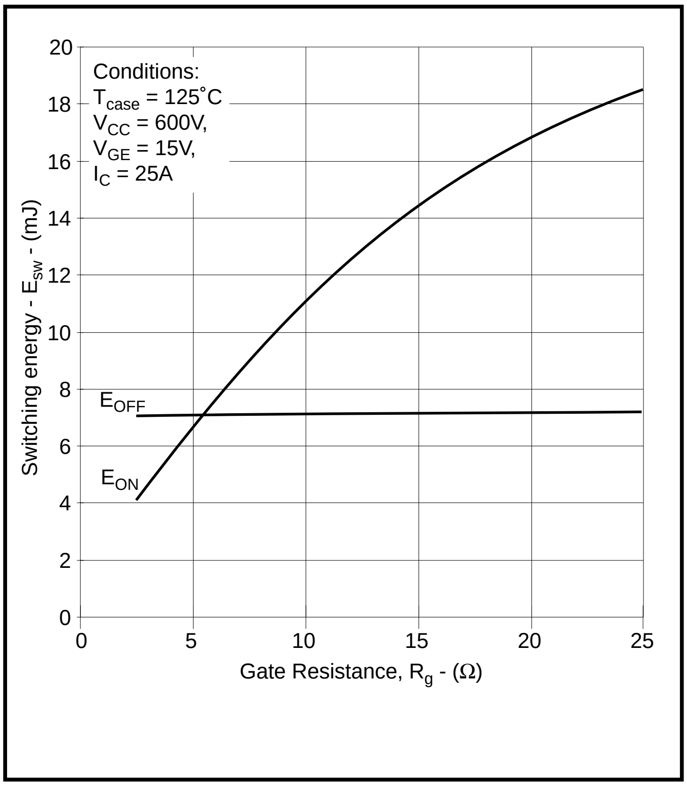


Fig.10 Typical switching losses vs gate resistance

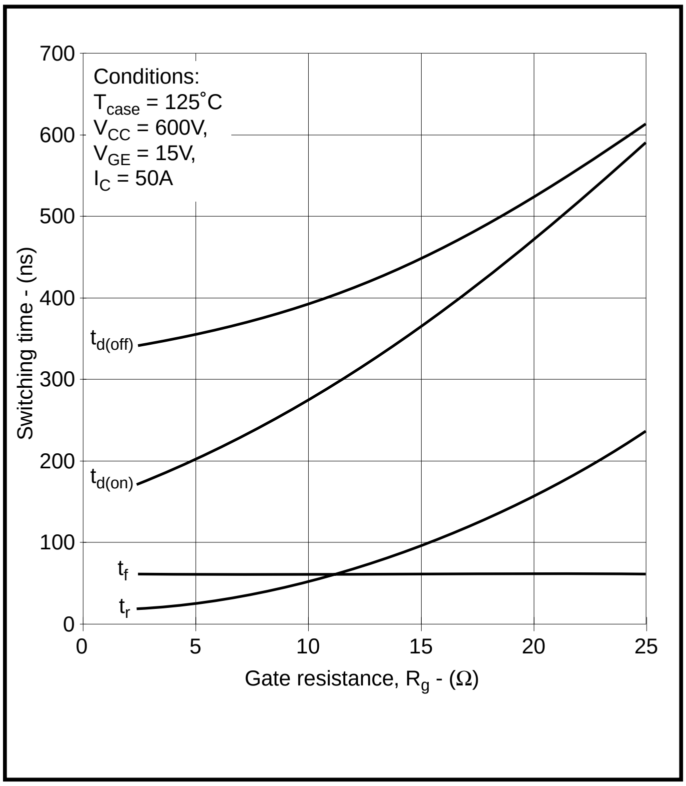


Fig.11 Typical switching times vs gate resistance

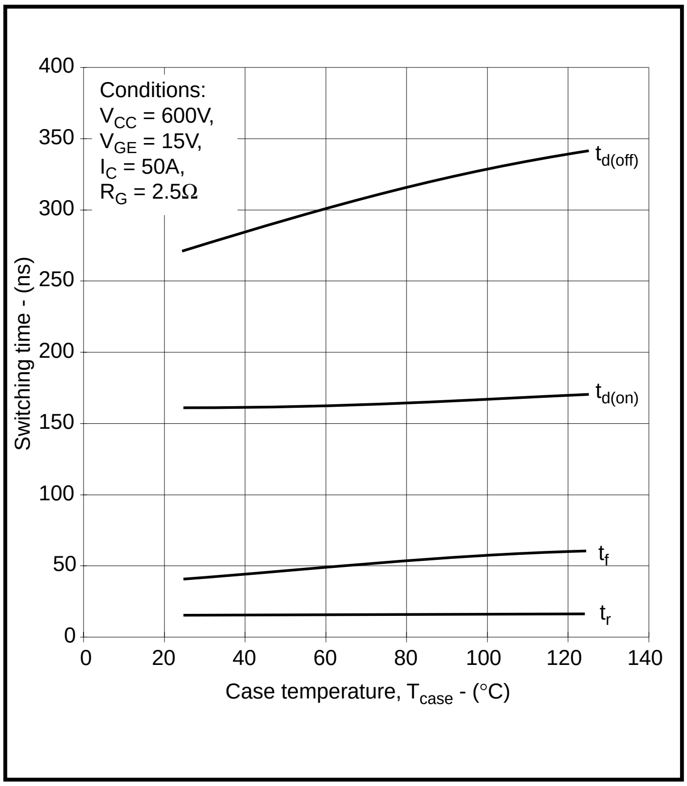


Fig.12 Typical switching losses vs case temperature

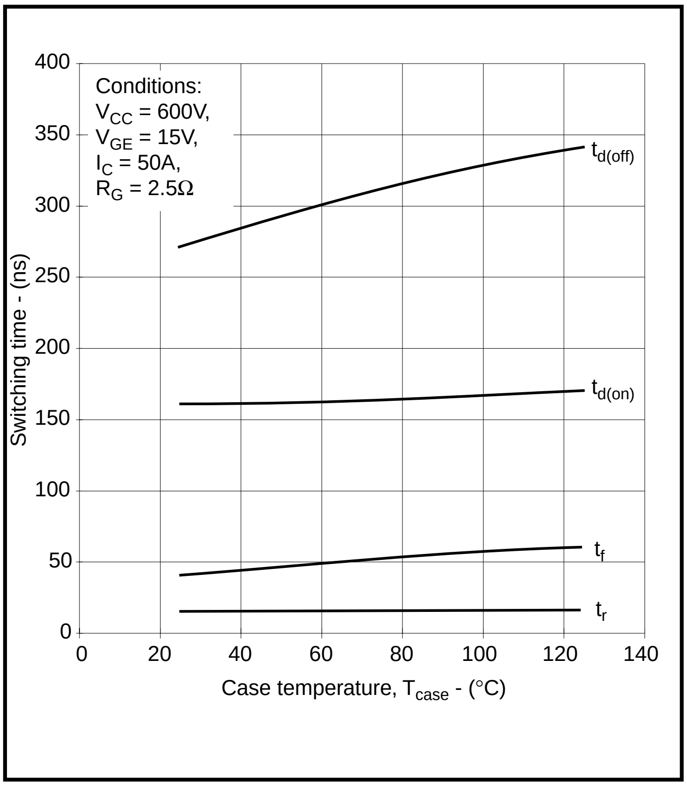


Fig.13 Typical switching times vs case temperature

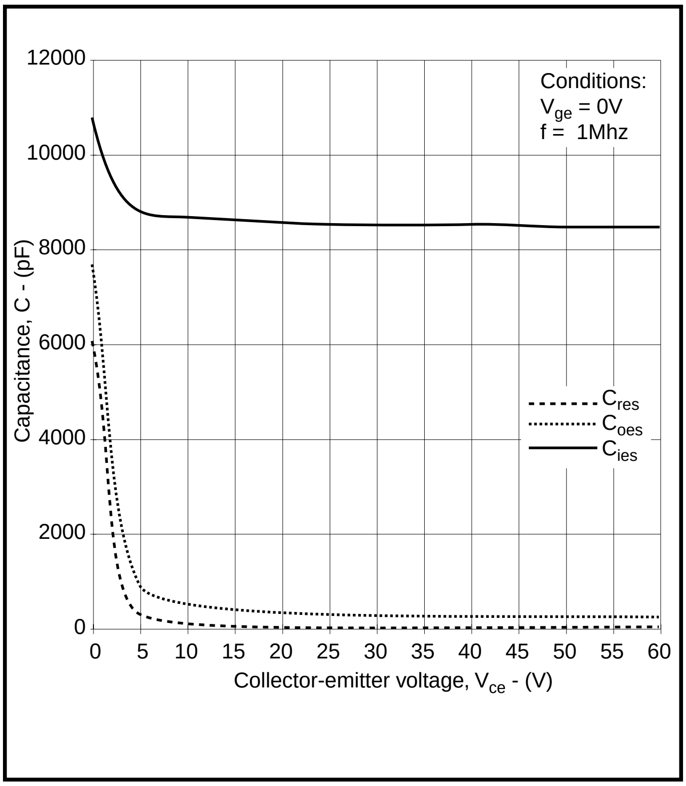


Fig.14 Typical capacitance

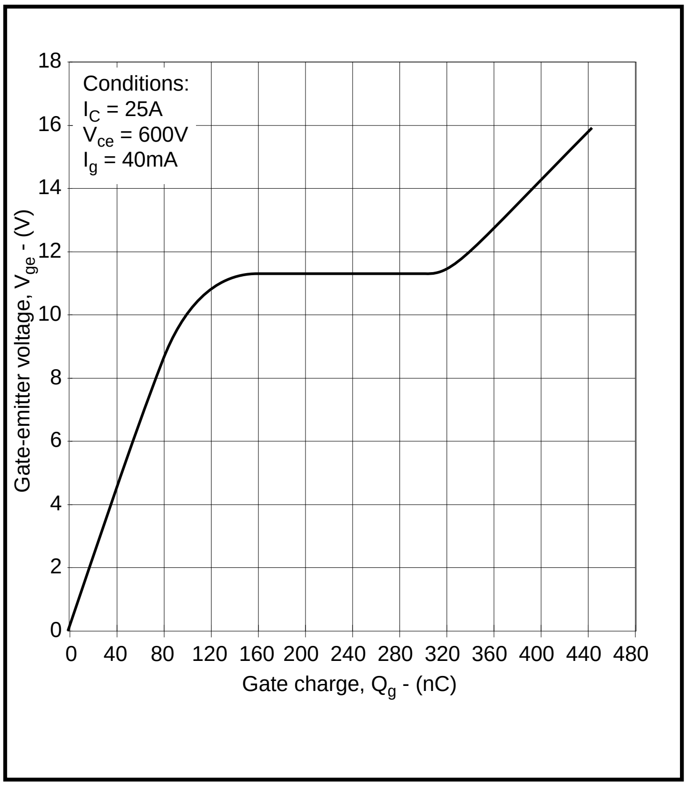


Fig.15 Typical gate charge

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

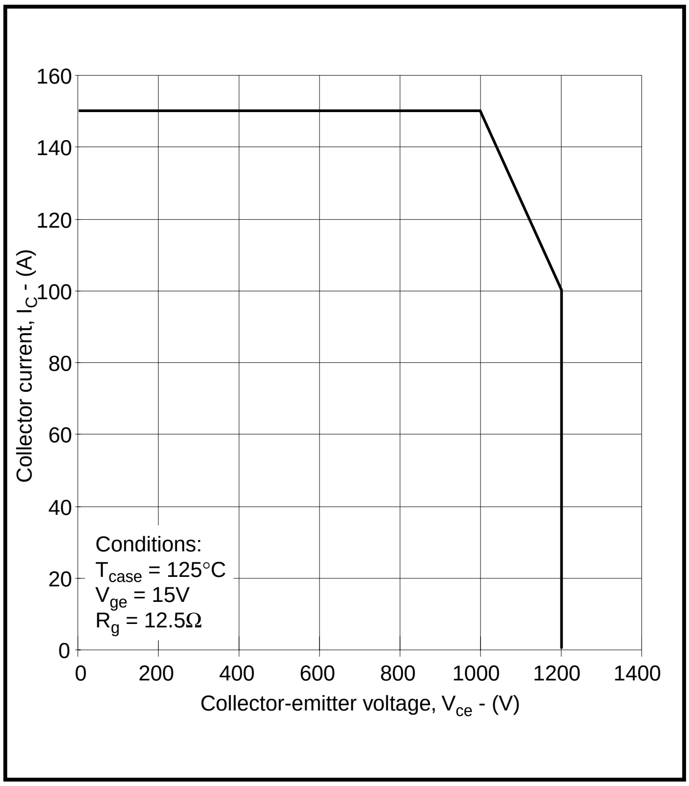


Fig.16 Reverse bias safe operating area

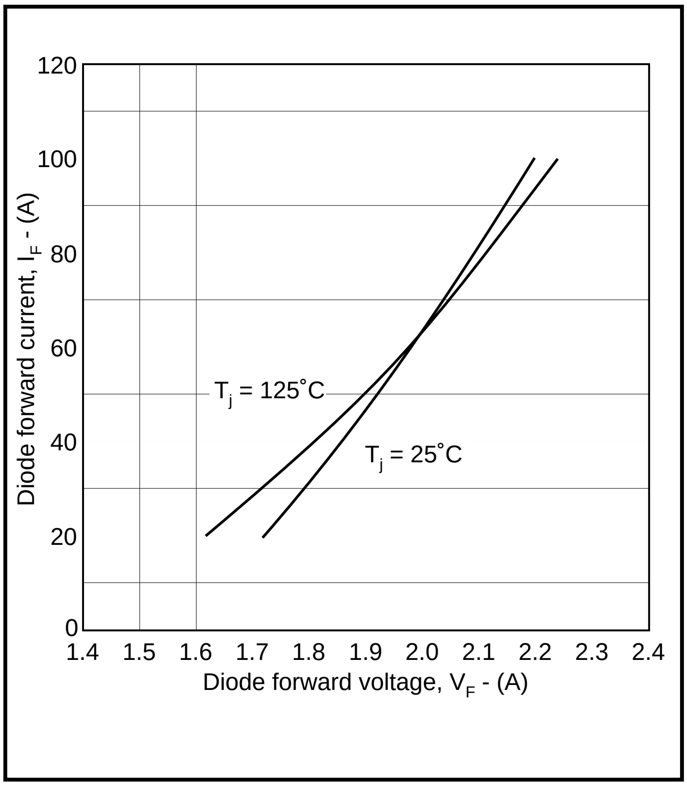


Fig.17 Diode typical forward characteristics

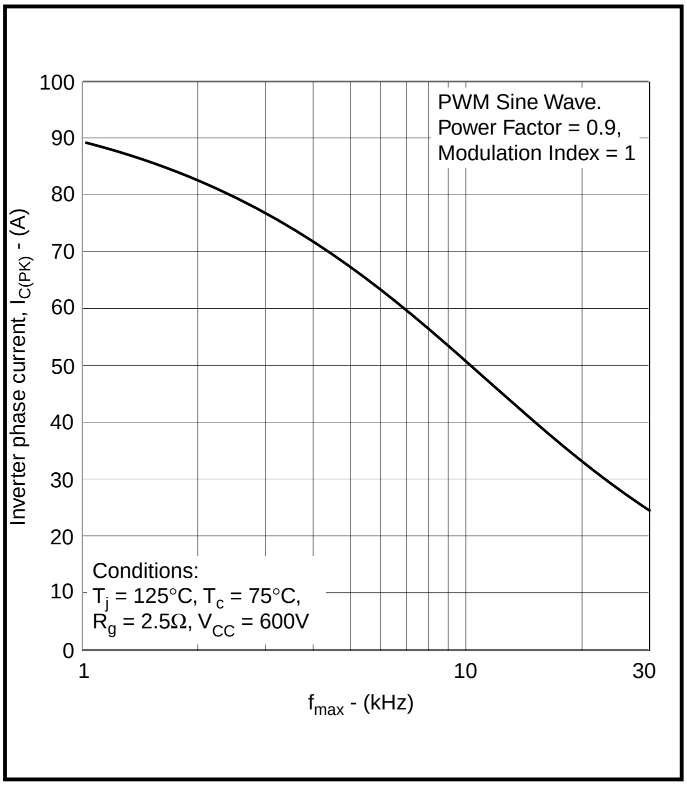


Fig.18 3-Phase PWM inverter operating frequency

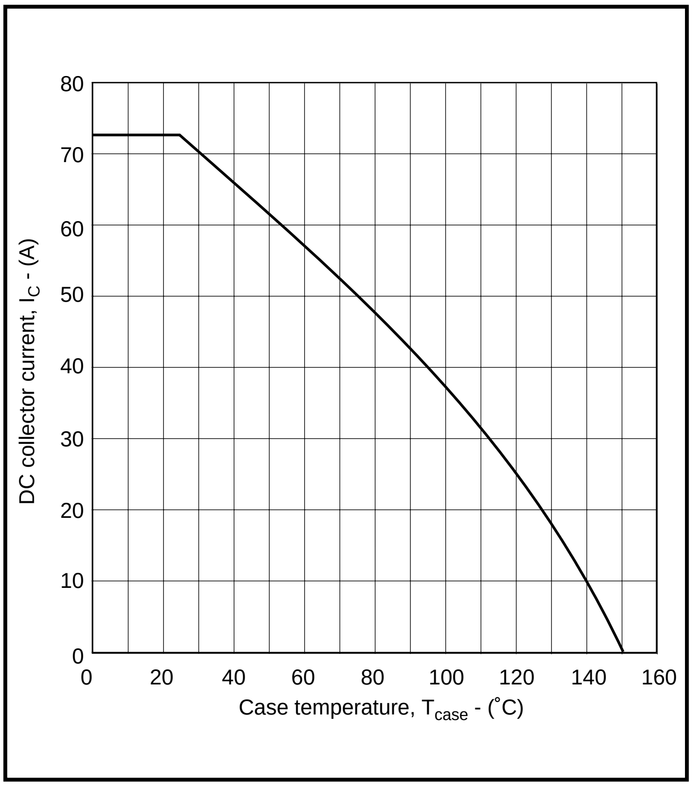
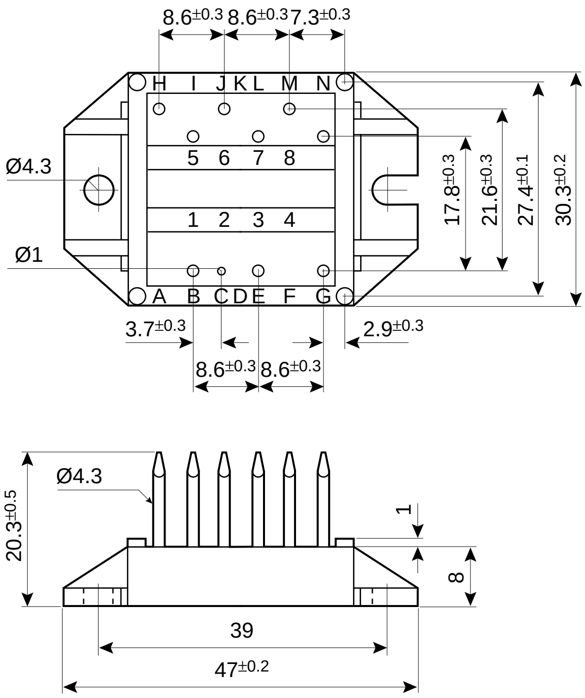


Fig.19 DC current rating vs case temperature

PACKAGE DETAILS

For additional package information, please contact your nearest representative or Dynex Semiconductor Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



Package outline type: H (ECO-PAC)

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

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Target Information: This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.

Preliminary Information: The product is in design and development. The datasheet represents the product as it is understood but details may change.

Advance Information: The product design is complete and final characterisation for volume production is well in hand.

No Annotation: The product parameters are fixed and the product is available to datasheet specification.

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.