

The ITZ25F12 is a very robust non punch through n-channel, enhancement mode insulated gate bipolar transistor (IGBT) designed for low power dissipation in a wide range of high voltage applications such as power supplies and motor drives. The high impedance gate simplifies gate drive considerations, allowing operation directly from low power control circuitry.

The device is optimised for high frequency operation with fast rise and fall times. The product is suitable for modern systems employing switching frequencies up to and beyond the audible spectrum.

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

The ITZ is fully short circuit rated making it especially suited for motor control and other applications requiring short circuit withstand capability. Each device in the Powerline range is available with or without an integral anti-parallel ultrafast soft recovery diode, see separate datasheet for co-pack device.

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 (SMPS) and uninterruptible power supplies (UPS).

FEATURES

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

APPLICATIONS

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

KEY PARAMETERS

V_{CES}	(max)	1200V
$V_{CE(sat)}$	(typ)	2.8V
I_{C25}	(max)	40A
I_{C85}	(max)	25A
I_{CM}	(max)	75A
t_{sc}	(max)	10µs

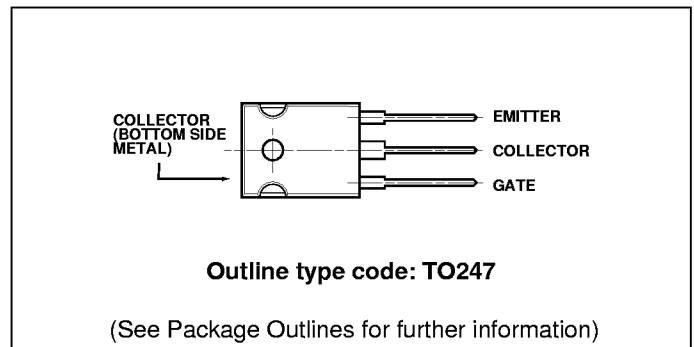


Fig.1 Pin connections - top view (not to scale)

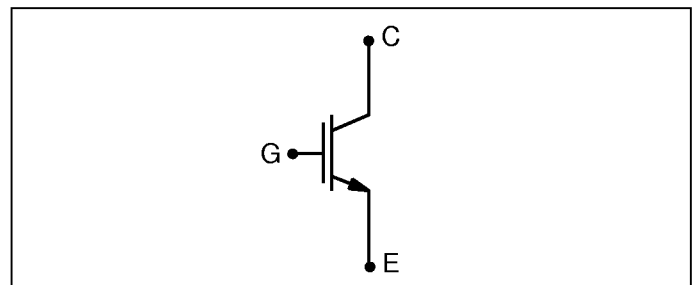


Fig.2 ITZ25F12 circuit

ORDERING INFORMATION

ITZ25F12P TO247

Note: When ordering, use the complete part number.

ITZ25F12

ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device.

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	40	A
I _{C85}	Continuous collector current	T _{case} = 85°C	25	A
I _{CM}	Pulsed collector current	1ms, T _{case} = 85°C	75	A
P _{tot}	Power dissipation	T _{case} = 85°C	100	W

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Conditions	Min.	Max.	Units
R _{th(j-c)}	Thermal resistance	DC junction to case	-	0.65	°C/W
T _{OP}	Operating junction temperature range	-	−40	150	°C
T _{slg}	Storage temperature range	-	−40	150	°C
-	Mounting torque	M3 screw	-	1.1	Nm

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	-	-	1	mA
I _{GES}	Gate leakage current	V _{GE} = 20V, V _{CE} = 0V	-	-	±500	nA
V _{GE(TH)}	Gate threshold voltage	I _C = 1mA, V _{CE} = V _{GE}	4.5	6	7.5	V
V _{CE(SAT)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 25A	-	2.8	3.3	V
		V _{GE} = 15V, I _C = 25A, T _j = 125°C	-	3.4	-	V

AC ELECTRICAL CHARACTERISTICS

 $T_{\text{case}} = 25^{\circ}\text{C}$ unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
C_{ies}	Input capacitance	$V_{\text{CE}} = 25\text{V}$, $V_{\text{GE}} = 15\text{V}$, $f = 1\text{MHz}$	-	4385	-	pF
C_{oes}	Output capacitance	$V_{\text{CE}} = 25\text{V}$, $V_{\text{GE}} = 15\text{V}$, $f = 1\text{MHz}$	-	325	-	pF
C_{res}	Reverse transfer capacitance	$V_{\text{CE}} = 25\text{V}$, $V_{\text{GE}} = 15\text{V}$, $f = 1\text{MHz}$	-	65	-	pF

INDUCTIVE SWITCHING CHARACTERISTICS - see figures 3 to 5

 $T_{\text{case}} = 25^{\circ}\text{C}$ unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{d(ON)}$	Turn-on delay time	$I_C = 25A,$ $V_{GE} = \pm 15V,$ $V_{CE} = 50\%V_{ces}$ $R_{G(ON)} = 20\Omega,$ $R_{G(OFF)} = 5\Omega$	-	90	-	ns
t_r	Rise time		-	35	-	ns
E_{ON}	Turn-on energy loss - per cycle		-	2.2	-	mJ
$t_{d(OFF)}$	Turn-off delay time		-	190	-	ns
t_f	Fall time		-	60	-	ns
E_{OFF}	Turn-off energy loss - per cycle		-	2.5	-	mJ
$T_{case} = 125^{\circ}C$ unless stated otherwise.						
$t_{d(ON)}$	Turn-on delay time	$I_C = 25A,$ $V_{GE} = \pm 15V,$ $V_{CE} = 50\%V_{ces}$ $R_{G(ON)} = 20\Omega,$ $R_{G(OFF)} = 5\Omega$	-	90	-	ns
t_r	Rise time		-	40	-	ns
E_{ON}	Turn-on energy loss - per cycle		-	3.5	-	mJ
$t_{d(OFF)}$	Turn-off delay time		-	210	-	ns
t_f	Fall time		-	80	-	ns
E_{OFF}	Turn-off energy loss - per cycle		-	3.1	-	mJ

For additional switching information please refer to figures 8 to 13.

SHORT CIRCUIT RATING

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
t_{sc}	Short circuit withstand time	$T_{\text{c}} = 125^{\circ}\text{C}$, $V_{\text{GE}} = 15\text{V}$, $V_{\text{CE}} = 80\% V_{\text{CES}}$	-	-	10	μs

Caution: These devices are sensitive to electrostatic discharge. Users should observe proper ESD handling precautions.

BASIC TEST CIRCUIT AND SWITCHING DEFINITIONS

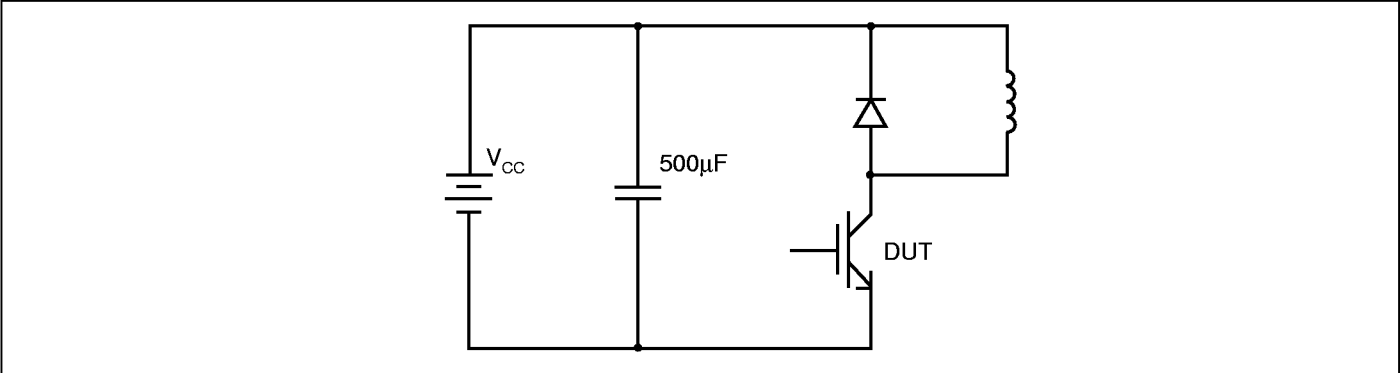


Fig.3 Basic d.c. chopper circuit

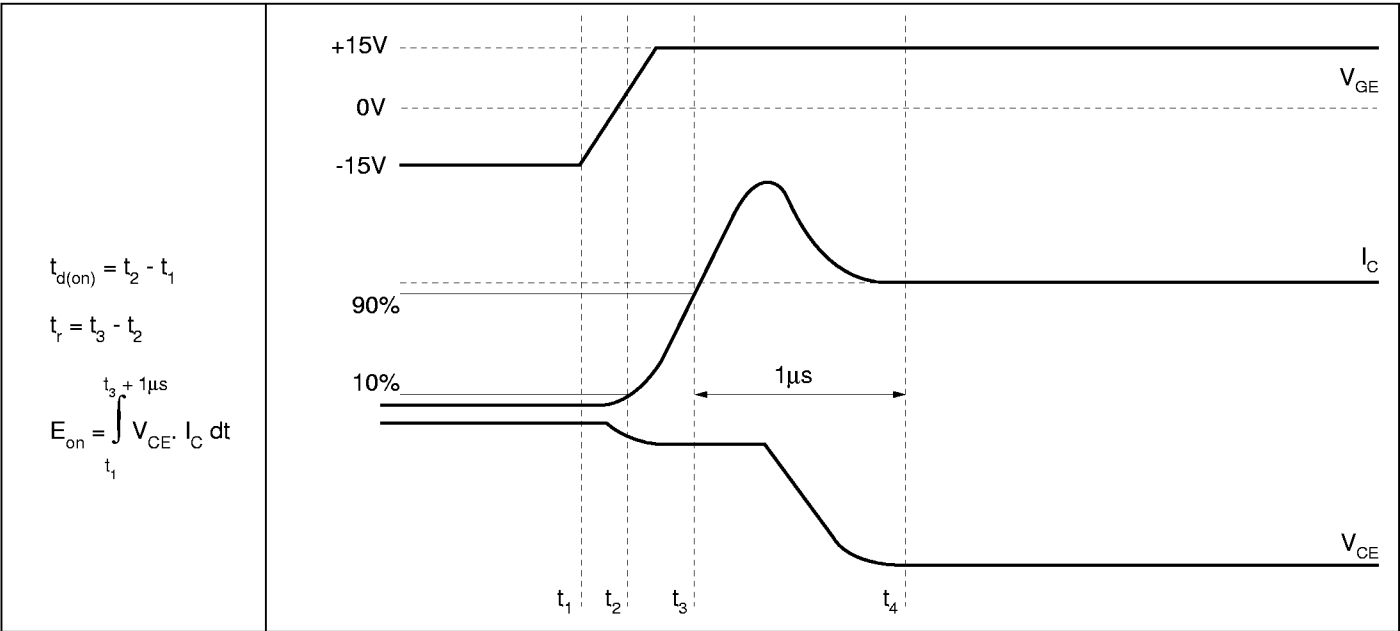


Fig.4 Turn-on characteristics

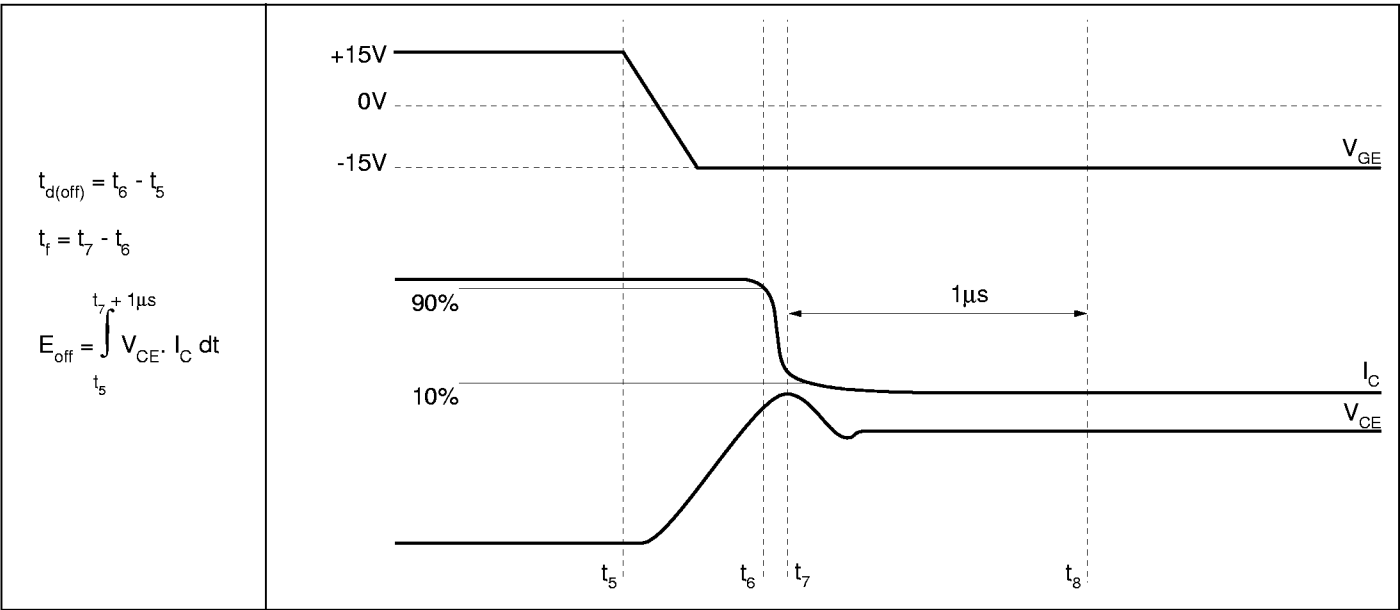


Fig.5 Turn-off characteristics

CURVES

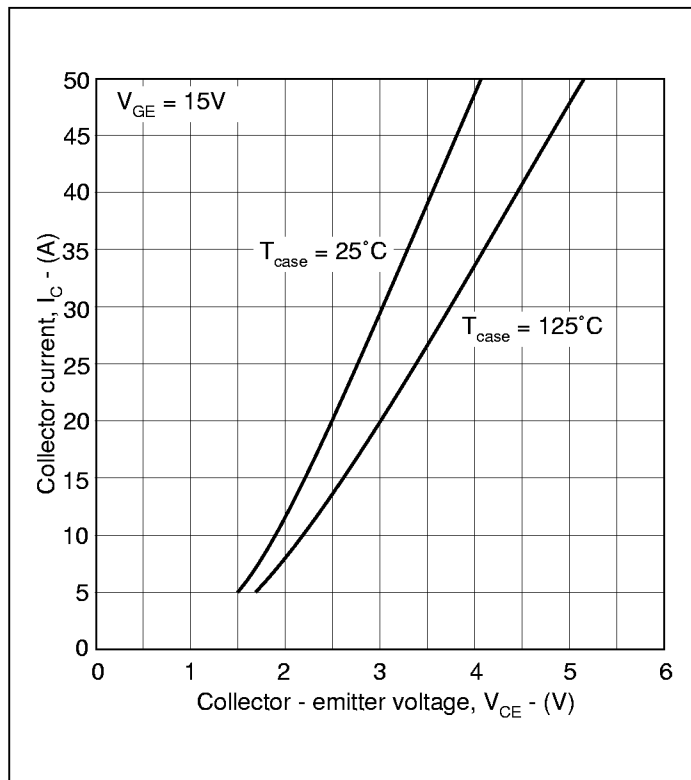


Fig.6 Typical output characteristics

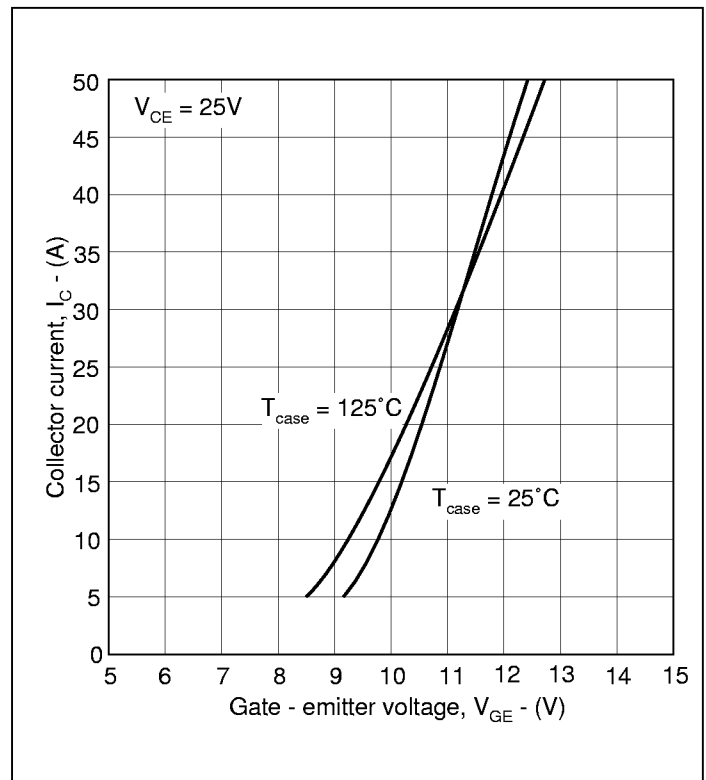


Fig.7 Typical transfer characteristics

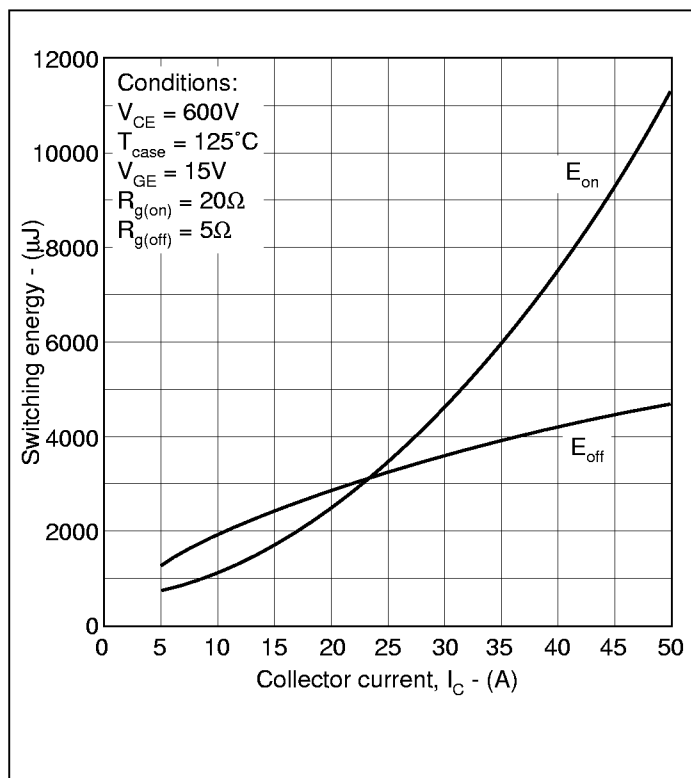


Fig.8 Typical switching losses vs collector current

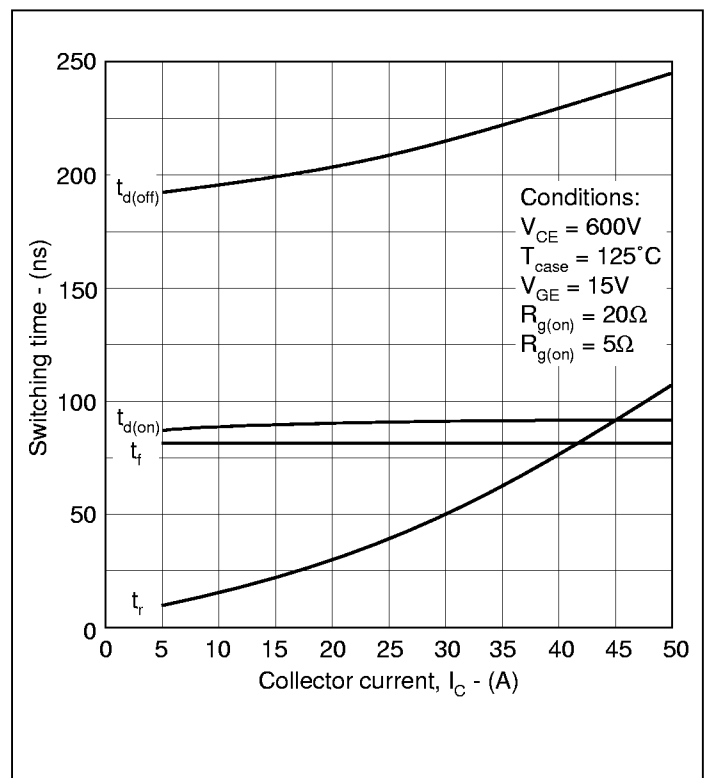


Fig.9 Typical switching times vs collector current

Caution: These devices are sensitive to electrostatic discharge. Users should observe proper ESD handling precautions.

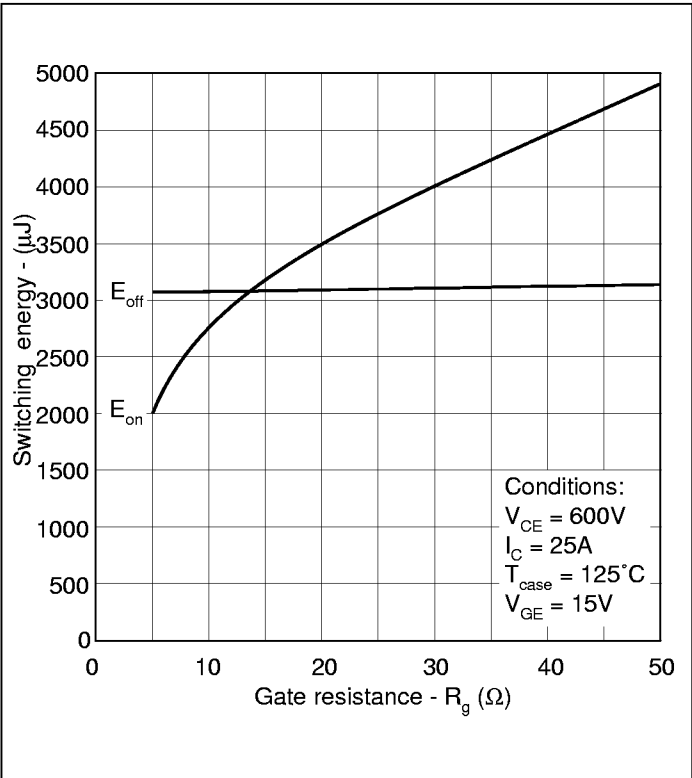


Fig.10 Typical switching losses vs gate resistance

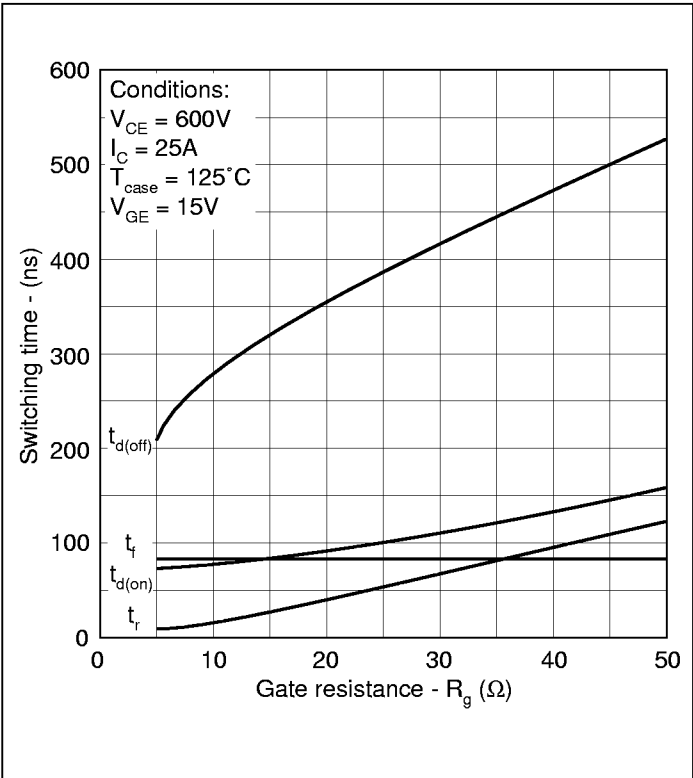


Fig.11 Typical switching times vs gate resistance

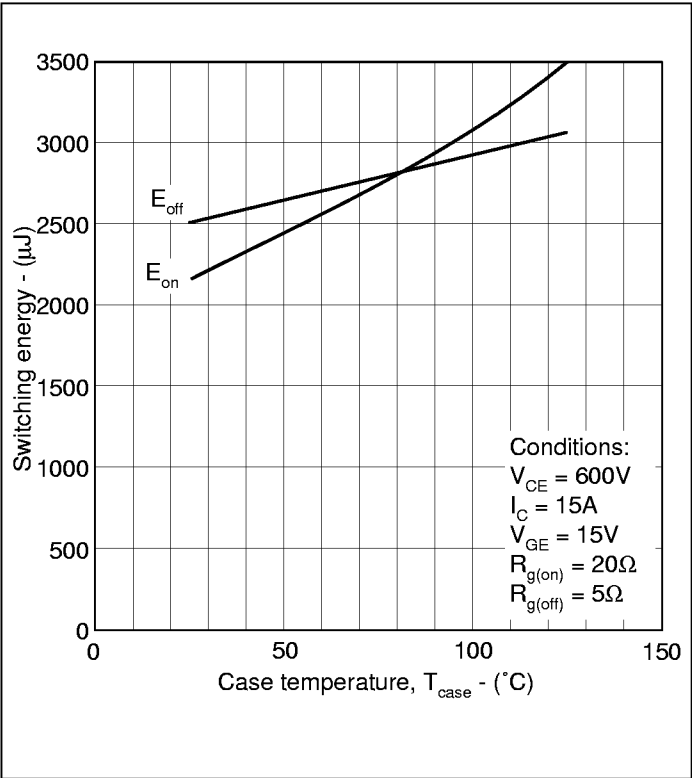


Fig.12 Typical switching losses vs case temperature

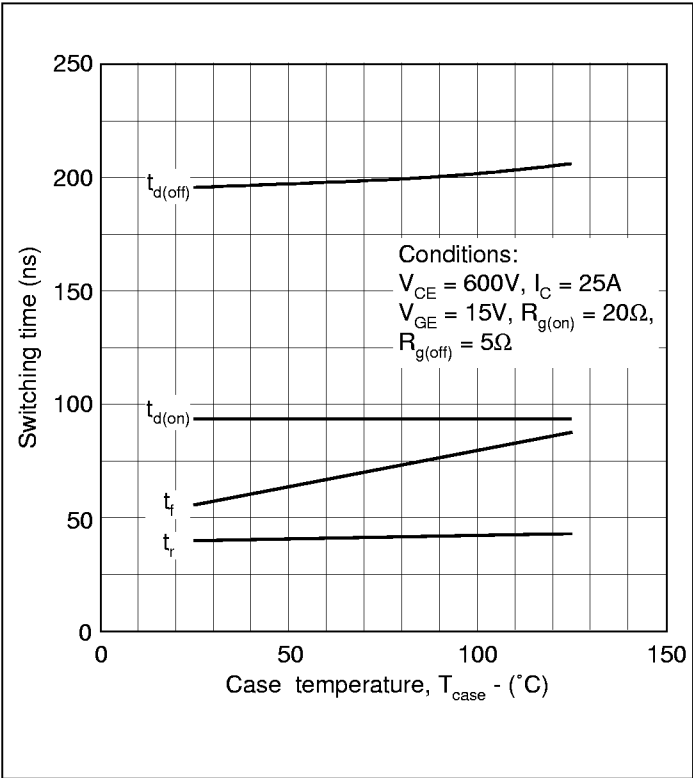


Fig.13 Typical switching time vs case temperature

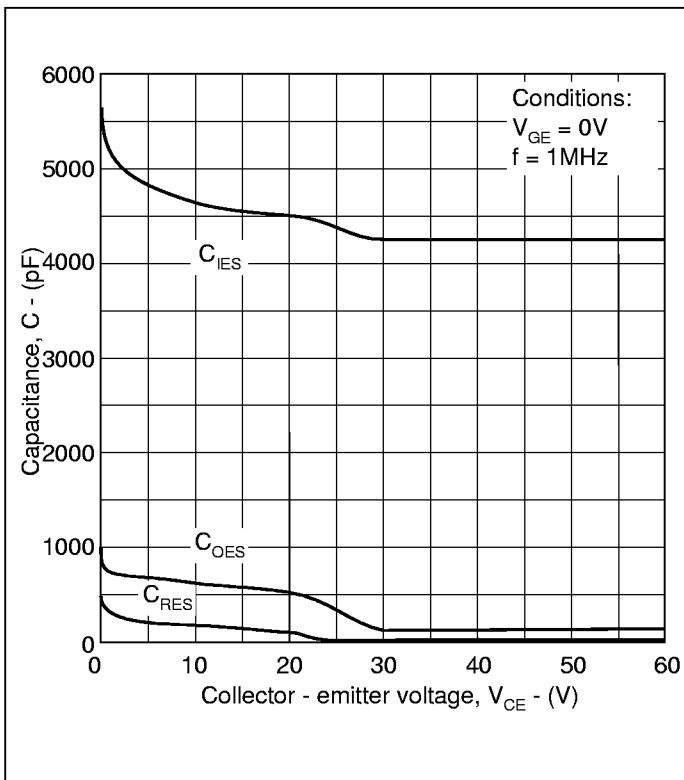


Fig.14 Typical capacitance

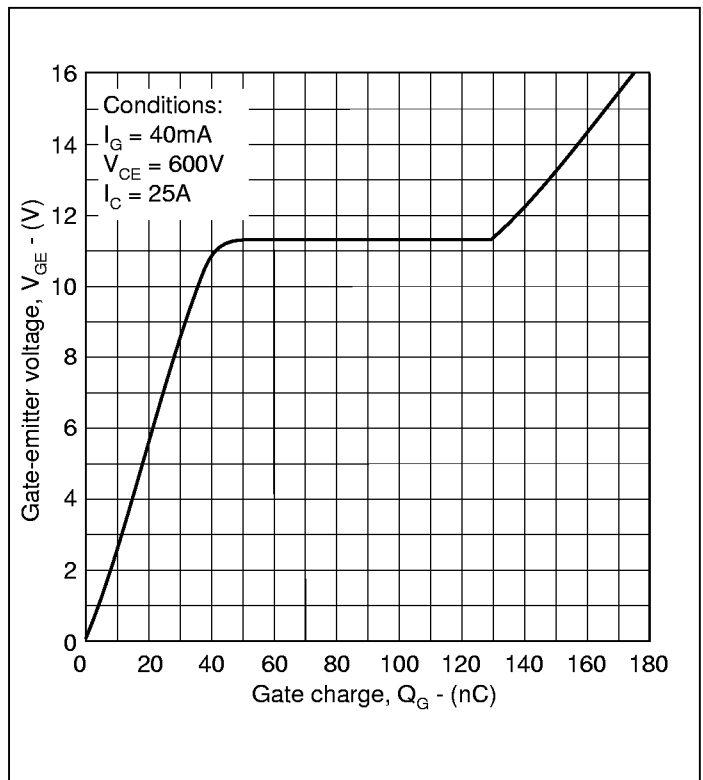


Fig.15 Typical gate charge

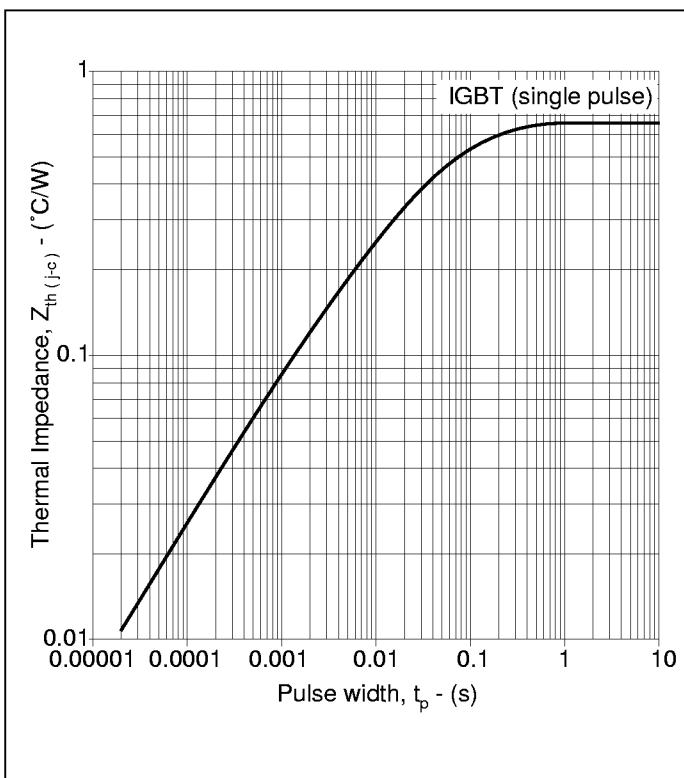


Fig.16 Transient thermal impedance - junction to case

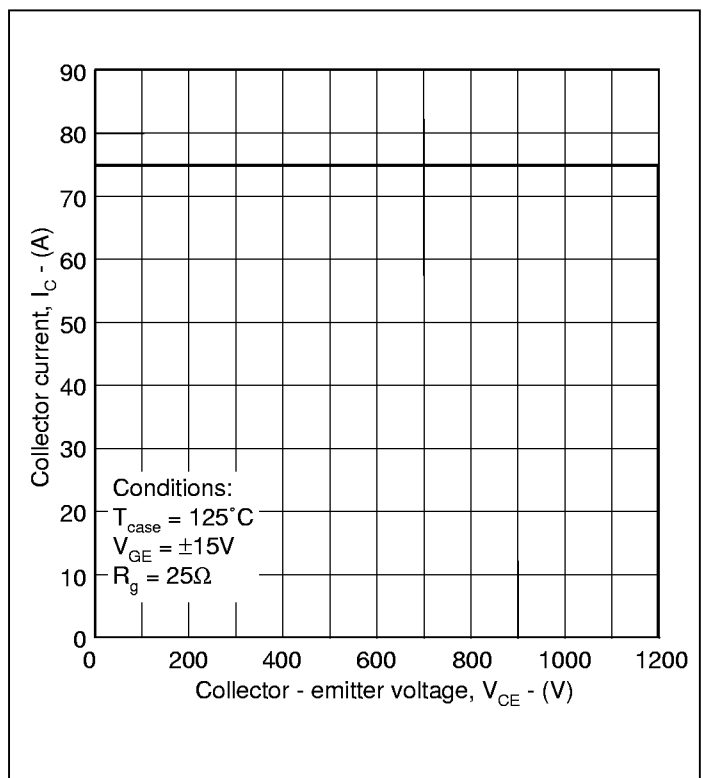


Fig.17 Reverse bias safe operating area

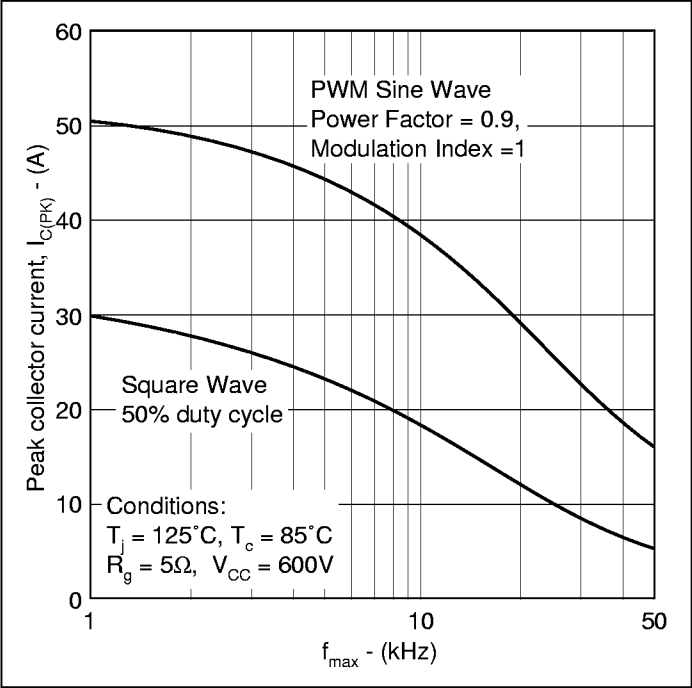


Fig.18 Three Phase PWM inverter operating frequency

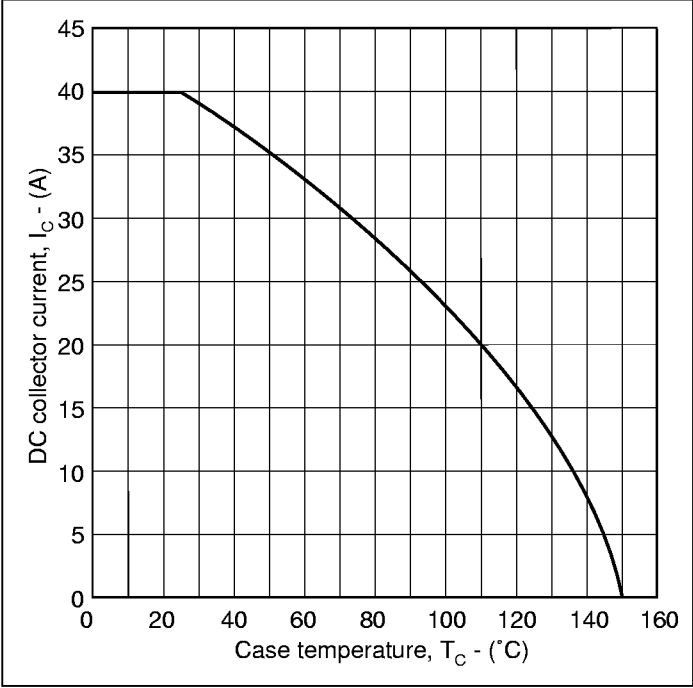
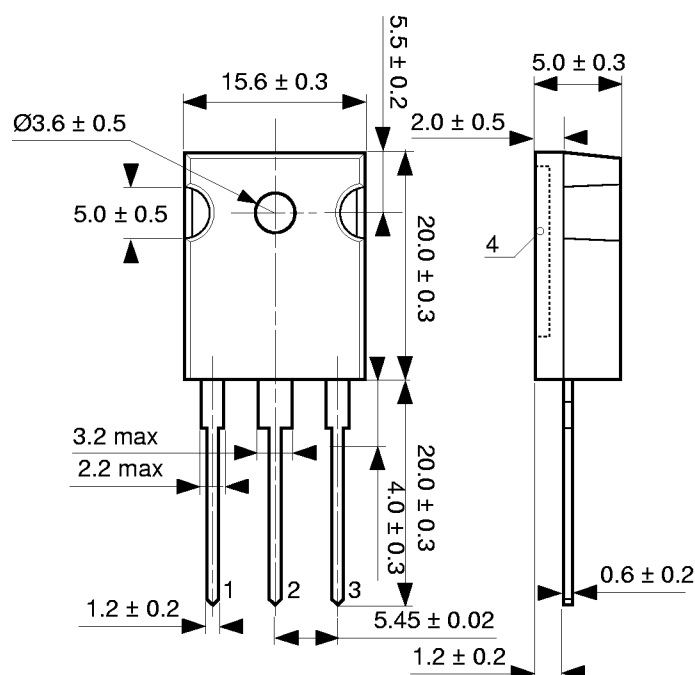


Fig.19 DC current rating vs case temperature

PACKAGE OUTLINE - TO247

For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise.
DO NOT SCALE.



Terminal 1 - Gate
Terminal 2 - Collector
Terminal 3 - Emitter
Terminal 4 - Collector



HEADQUARTERS POWER OPERATIONS

MITEL SEMICONDUCTOR

Doddington Road, Lincoln,
LN6 3LF, United Kingdom.
Tel: + 44 (0)1522 500500
Fax: + 44 (0)1522 500550

Internet: <http://www.mitelsemi.com>

e-mail: power_solutions@mitel.com

POWER PRODUCT CUSTOMER SERVICE CENTRES

- **FRANCE, BENELUX & SPAIN:** Tel: + 33 (0)1 69 18 90 00 Fax : +33 (0)1 64 46 54 50
- **NORTH AMERICA:** Tel: 011-800-5554-5554 Fax: 011-800-5444-5444
- **UK, GERMANY, REST OF WORLD:** Tel: + 44 (0)1522 500500 Fax : + 44 (0)1522 500020

ADVANCE INFORMATION - The product design is complete and final characterisation for volume production is well in hand. These are supported by agents and distributors in major countries world-wide.

© Mitel 1999 Publication No. DS5054-1 Issue No. 1.2 January 1999

TECHNICAL DOCUMENTATION – NOT FOR RESALE. PRINTED IN UNITED KINGDOM

This publication is issued to provide information only which (unless agreed by the Company in writing) may not be used, applied or reproduced for any purpose nor form part of any order or contract nor to be regarded as a representation relating to the products or services concerned. No warranty or guarantee express or implied is made regarding the capability, performance or suitability of any product or service. The Company reserves the right to alter without prior notice the specification, design or price of any product or service. Information concerning possible methods of use is provided as a guide only and does not constitute any guarantee that such methods of use will be satisfactory in a specific piece of equipment. It is the user's responsibility to fully determine the performance and suitability of any equipment using such information and to ensure that any publication or data used is up to date and has not been superseded. These products are not suitable for use in any medical products whose failure to perform may result in significant injury or death to the user. All products and materials are sold and services provided subject to the Company's conditions of sale, which are available on request.

All brand names and product names used in this publication are trademarks, registered trademarks or trade names of their respective owners.

Caution: These devices are sensitive to electrostatic discharge. Users should observe proper ESD handling precautions.