

Supersedes February 1998, version DS4716-2.4

DS4716-3.2 March 1999

The ITS08F12 is a robust n-channel, enhancement mode insulated gate bipolar transistor (IGBT) designed for low power dissipation in a wide range of low to medium voltage applications such as power supplies, lighting ballasts and motor drives. The high impedance gate simplifies gate drive considerations, allowing operation directly from low power control circuitry.

Fast rise and fall times allow high frequency operation making the device suitable for the latest systems employing high frequency switching.

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

The ITS 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, automotive, welding and heating apparatus. The Powerline range of IGBTs is also applicable to switched mode and uninterruptible power supplies.

### Features

- Enhancement Mode n-Channel Device
- High Switching Speed
- Low On-state Saturation Voltage
- High Input Impedance Simplifies Gate Drive
- Latch-Free Operation
- Short Circuit Rated
- OrCAD PSpice® Model Data Provided

### Applications

- High Frequency Inverters
- Motor Control
- Switched Mode Power Supplies
- High Frequency Welding
- Battery Truck Drives
- Automotive

### Key Parameters

$V_{CES}$	(max)	1200V
$V_{CE(sat)}$	(typ)	2.9V
$I_{C25}$	(max)	16A
$I_{C85}$	(max)	8A
$I_{CM}$	(max)	16A
$t_{sc}$	(max)	10 $\mu$ s

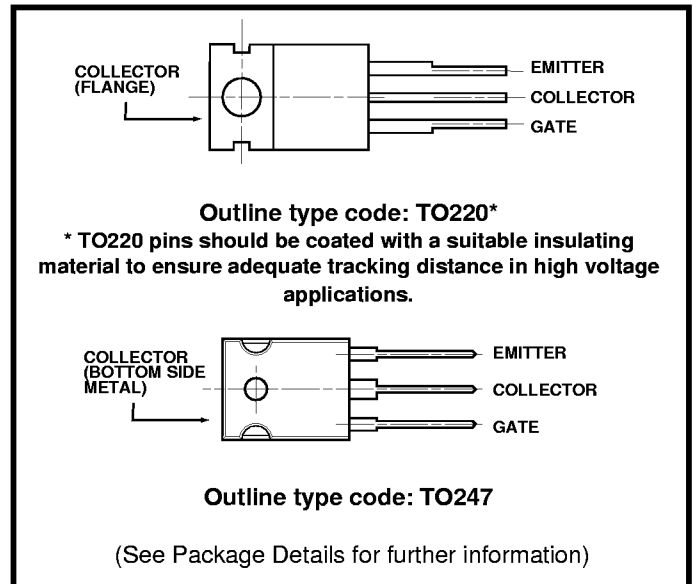


Fig.1 Pin connections - top view (not to scale)

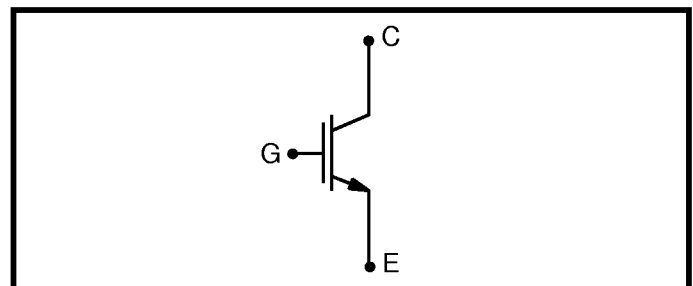


Fig.2 ITS08F12 circuit

### Ordering Information

Order as:

ITS08F12B TO220 package

ITS08F12P TO247 package

Note: When ordering use complete part number.

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

### 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.

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

Symbol	Parameter	Test Conditions	Max.	Units
$V_{CES}$	Collector-emitter voltage	$V_{GE} = 0\text{V}$	1200	V
$V_{GES}$	Gate-emitter voltage	-	$\pm 20$	V
$I_{C25}$	Continuous collector current	$T_{case} = 25^{\circ}\text{C}$	16	A
$I_{C85}$	Continuous collector current	$T_{case} = 85^{\circ}\text{C}$	8	A
$I_{CM}$	Pulsed collector current	1 ms, $T_{case} = 85^{\circ}\text{C}$	16	A
$P_{tot}$	Power dissipation	$T_{case} = 85^{\circ}\text{C}$	54	W

### Thermal And Mechanical Ratings

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance	DC junction to case	-	1.2	$^{\circ}\text{C/W}$
$T_j$	Operating junction temperature range	-	-40	150	$^{\circ}\text{C}$
$T_{stg}$	Storage temperature range	-	-40	150	$^{\circ}\text{C}$
-	Mounting torque	M3 Screw	-	1.1	Nm

### DC Electrical Characteristics

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$I_{CES}$	Collector cut-off current	$V_{GE} = 0\text{V}, V_{CE} = 1200\text{V}$	-	-	0.5	mA
$I_{GES}$	Gate leakage current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$	-	-	$\pm 500$	nA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 0.5\text{mA}, V_{CE} = V_{GE}$	4	6	7.5	V
$V_{CE(SAT)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{V}, I_C = 8\text{A}$	-	2.9	3.8	V
		$V_{GE} = 15\text{V}, I_C = 8\text{A}, T_j = 125^{\circ}\text{C}$	-	3.1	-	V

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## AC Electrical Characteristics

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$C_{\text{ies}}$	Input capacitance	$V_{\text{CE}} = 25\text{V}, V_{\text{GE}} = 15\text{V}, f = 1\text{MHz}$	-	670	-	pF
$C_{\text{oes}}$	Output capacitance	$V_{\text{CE}} = 25\text{V}, V_{\text{GE}} = 15\text{V}, f = 1\text{MHz}$	-	170	-	pF
$C_{\text{res}}$	Reverse transfer capacitance	$V_{\text{CE}} = 25\text{V}, V_{\text{GE}} = 15\text{V}, f = 1\text{MHz}$	-	150	-	pF

## Inductive Switching Characteristics

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{\text{d(ON)}}$	Turn-on delay time	$I_{\text{C}} = 8\text{A}$ $V_{\text{GE}} = \pm 15\text{V},$ $V_{\text{CE}} = 50\%V_{\text{ces}}$ $R_{\text{G(ON)}} = R_{\text{G(OFF)}} = 25\Omega$	-	120	-	ns
$t_{\text{r}}$	Rise time		-	20	-	ns
$E_{\text{ON}}$	Turn-on energy loss - per cycle		-	0.5	-	mJ
$t_{\text{d(OFF)}}$	Turn-off delay time		-	70	-	ns
$t_{\text{f}}$	Fall time		-	500	1000	ns
$E_{\text{OFF}}$	Turn-off energy loss - per cycle		-	0.8	-	mJ

$T_{\text{case}} = 125^{\circ}\text{C}$  unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{\text{d(ON)}}$	Turn-on delay time	$I_{\text{C}} = 8\text{A}$ $V_{\text{GE}} = \pm 15\text{V},$ $V_{\text{CE}} = 50\%V_{\text{ces}}$ $R_{\text{G(ON)}} = R_{\text{G(OFF)}} = 25\Omega$	-	130	-	ns
$t_{\text{r}}$	Rise time		-	25	-	ns
$E_{\text{ON}}$	Turn-on energy loss - per cycle		-	0.6	-	mJ
$t_{\text{d(OFF)}}$	Turn-off delay time		-	90	-	ns
$t_{\text{f}}$	Fall time		-	900	-	ns
$E_{\text{OFF}}$	Turn-off energy loss - per cycle		-	1.4	-	mJ

## Short Circuit Rating

$T_{\text{case}} = 125^{\circ}\text{C}$  unless stated otherwise.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
$t_{\text{sc}}$	Short circuit withstand time	$V_{\text{GE}} = 15\text{V}, V_{\text{CE}} = 50\% V_{\text{CES}}$	-	-	10	$\mu\text{s}$

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

OrCAD PSpice® Model Parameters

AGD	AREA	BVF	BVN	CGS	COXD	JSNE	KF	KP
3.60E-06	5.40E-06	1	4	2.05E-07	5.00E-09	6.50E-13	1.045	0.7773
MUN	MUP	NB	TAU	THETA	VT	VTD	WB	
1.50+03	450	2.00E+14	4.32E-07	2.00E-02	6.116	-5	1.10E-04	

Basic Test Circuit

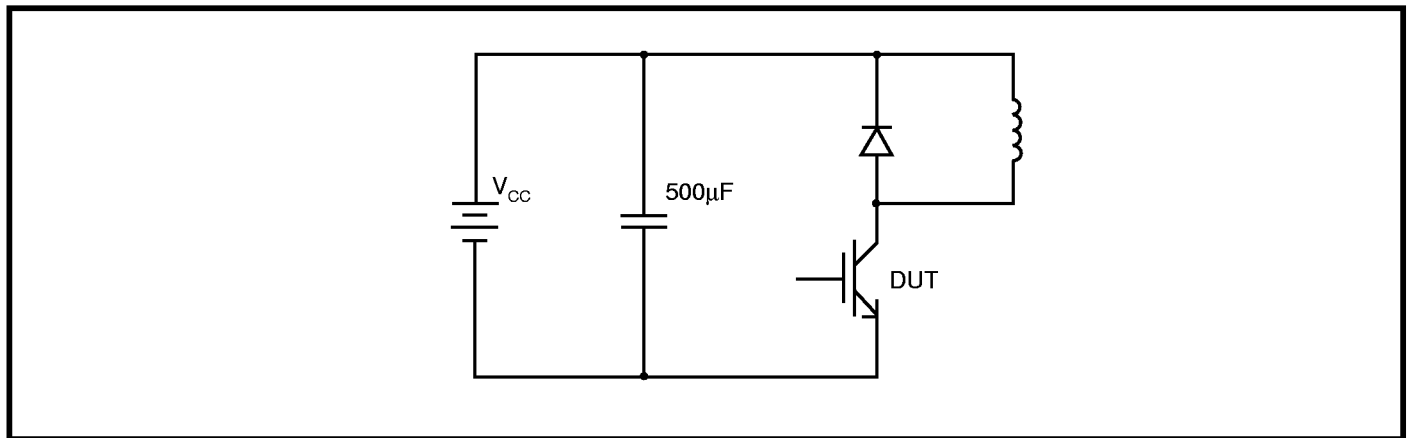


Fig.3 Basic d.c. chopper circuit

Switching Definitions

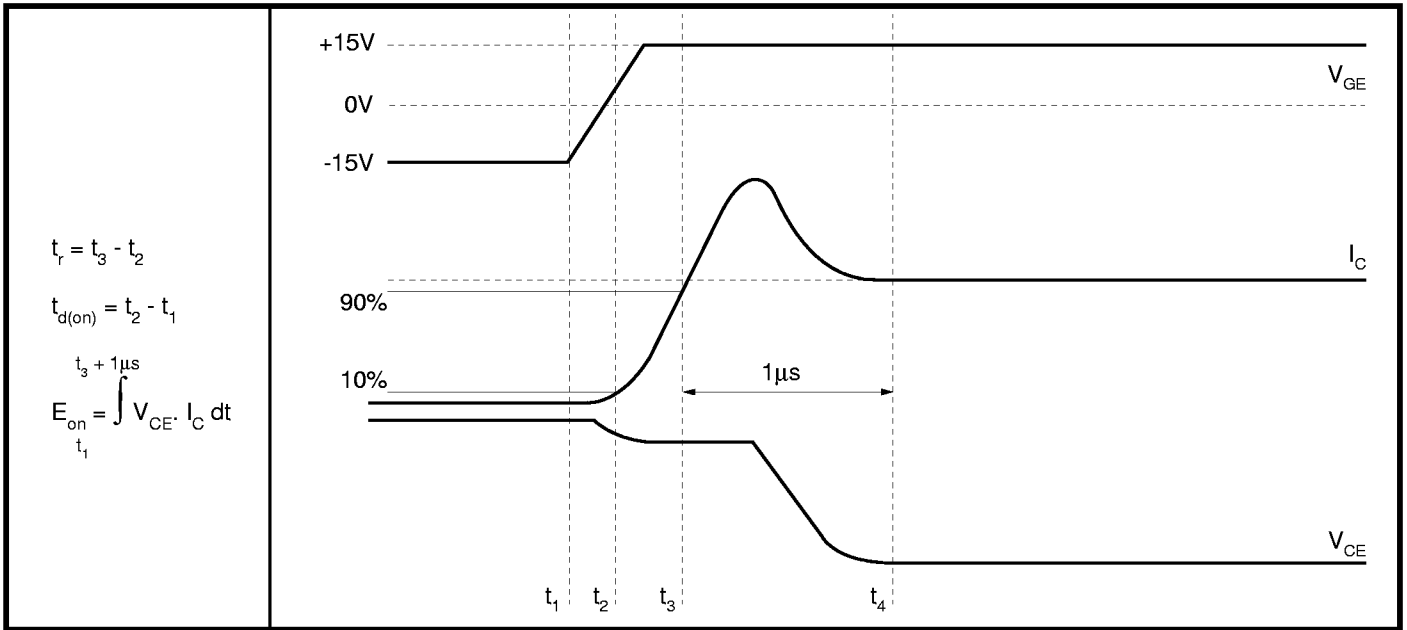


Fig.4 Turn-on characteristics

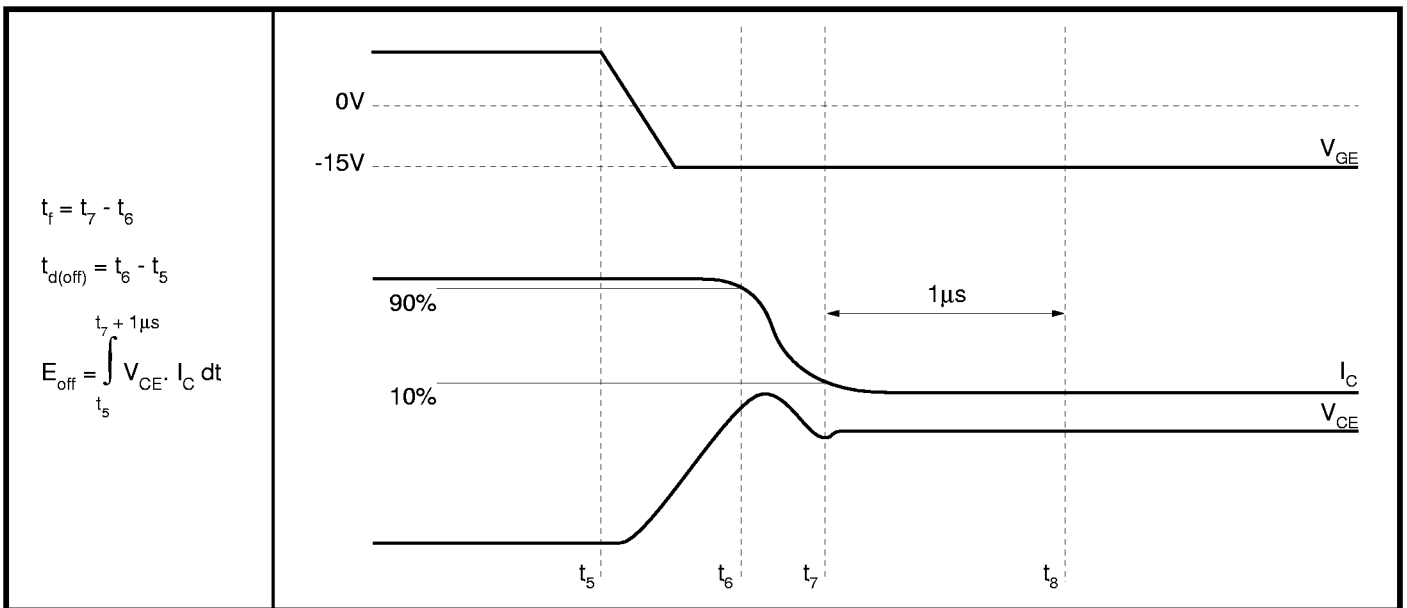


Fig.5 Turn-off characteristics

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Curves

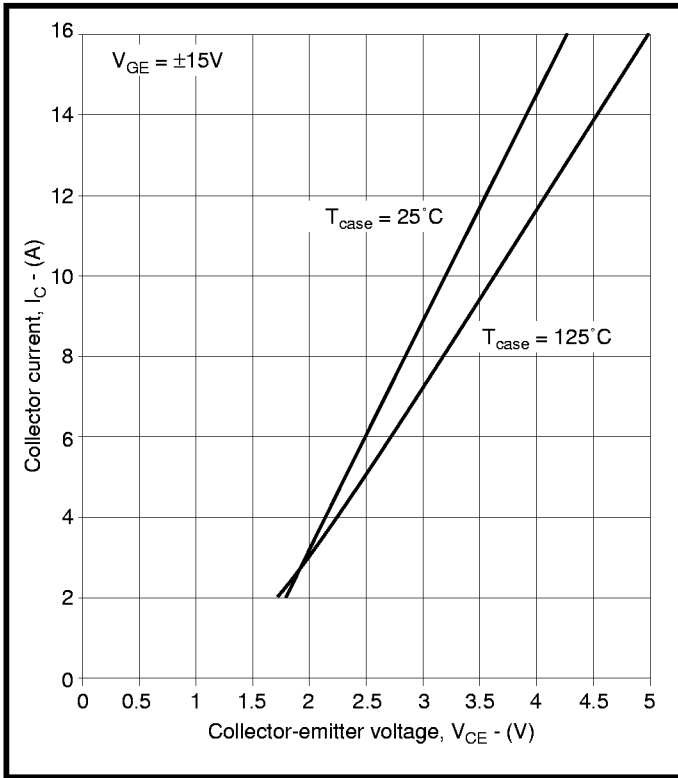


Fig.6 Typical output characteristics

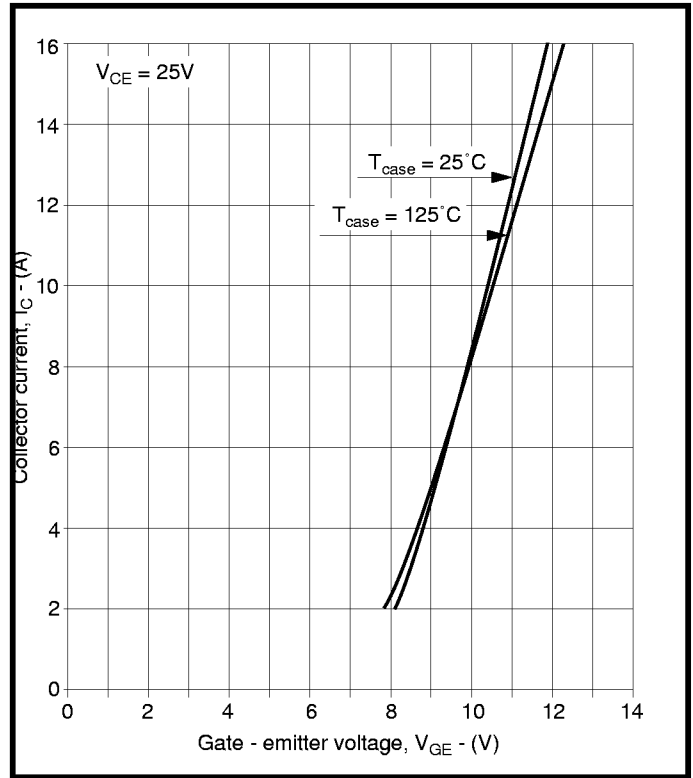


Fig.7 Typical transfer characteristics

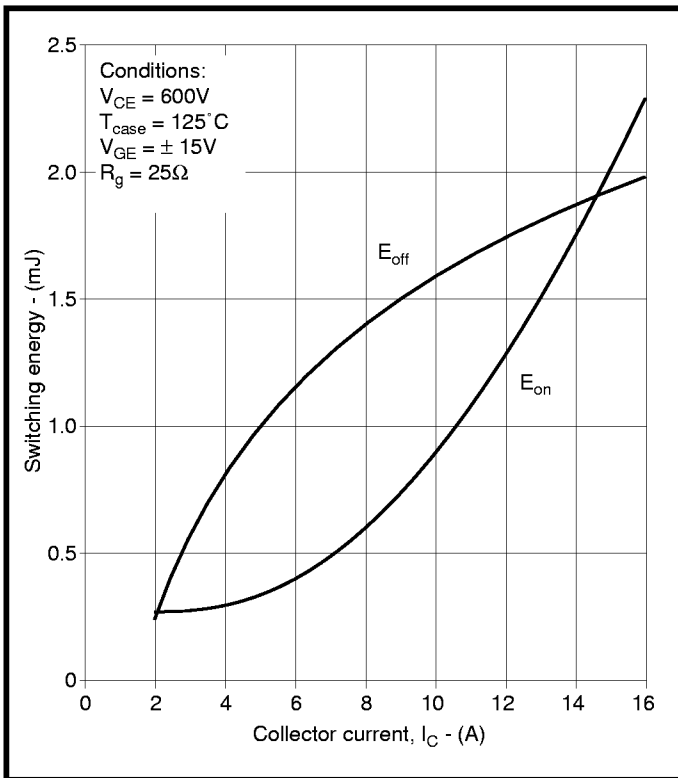


Fig.8 Typical switching losses vs collector current

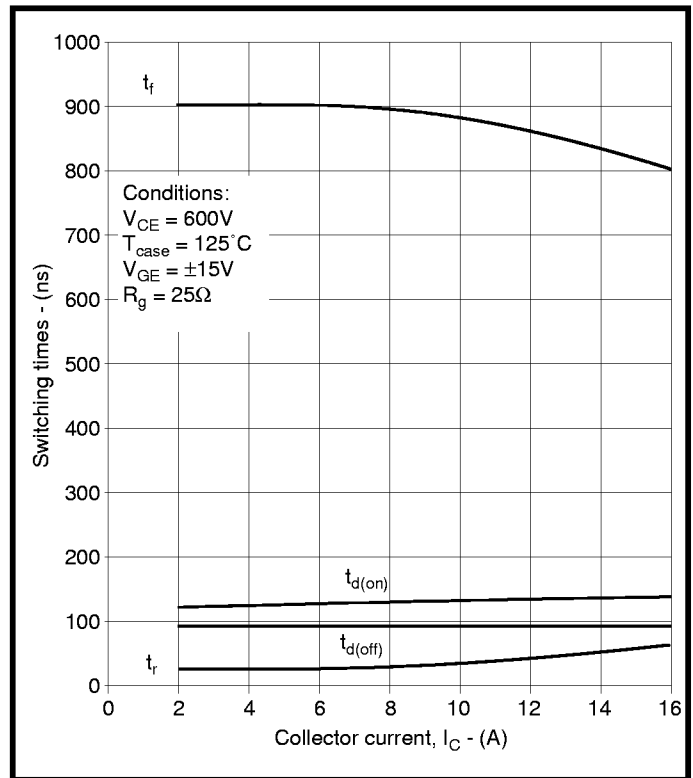


Fig.9 Typical switching times vs collector current

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

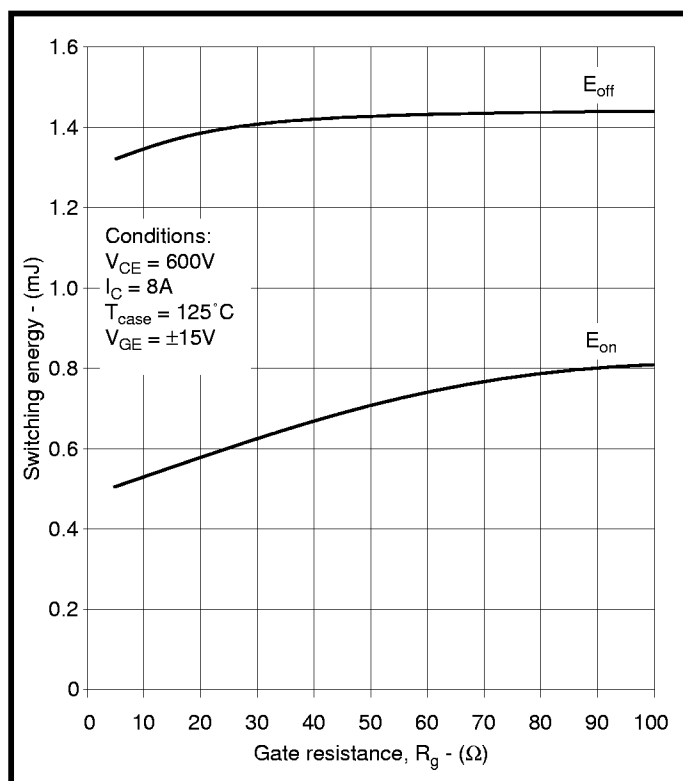


Fig.10 Typical switching losses vs gate resistance

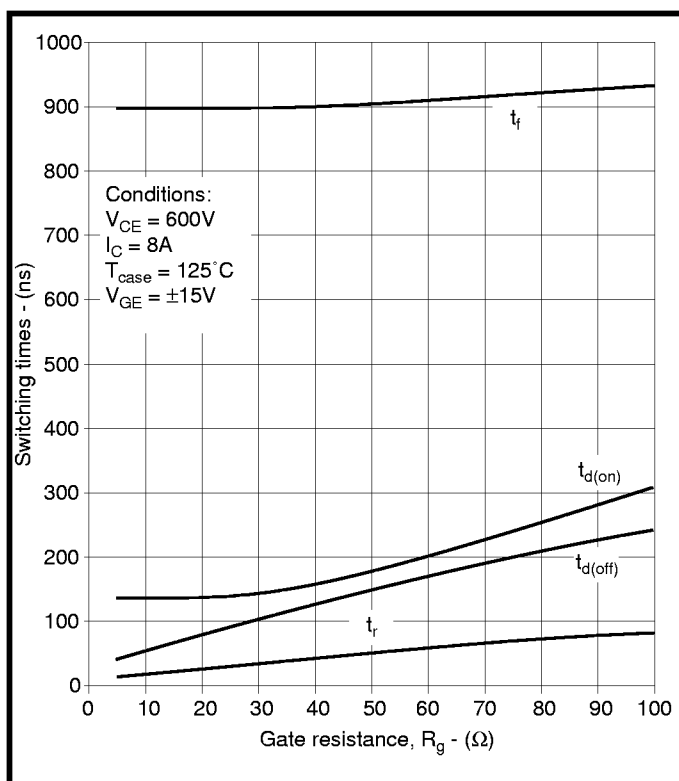


Fig.11 Typical switching times vs gate resistance

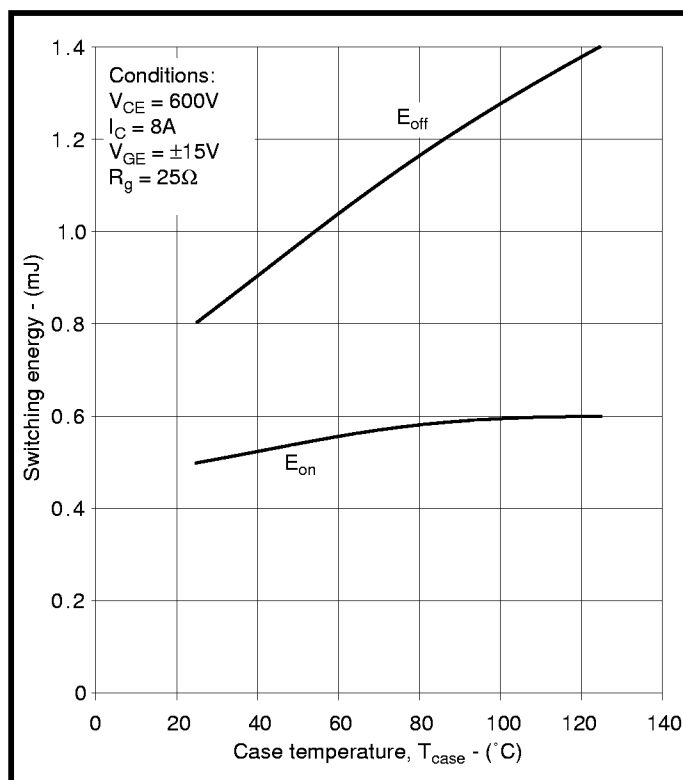


Fig.12 Typical switching losses vs case temperature

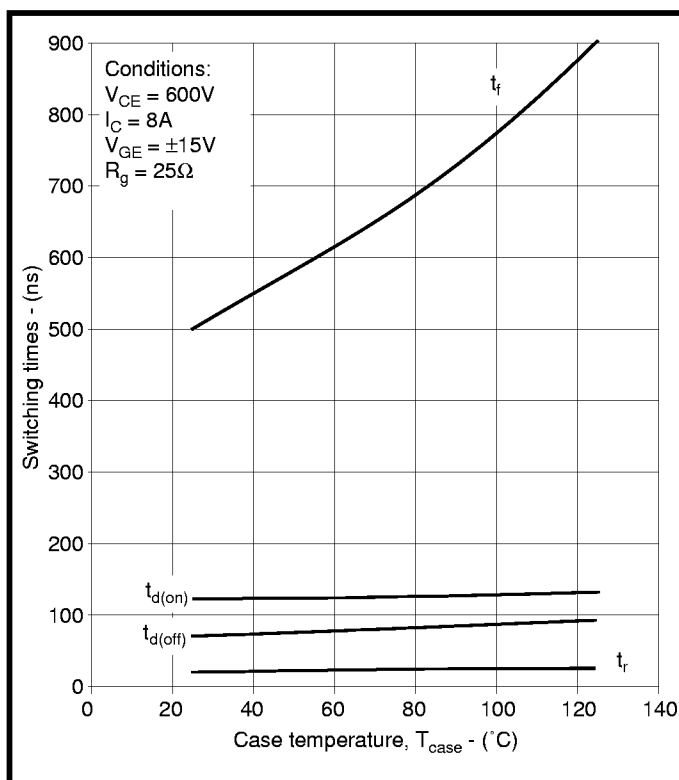


Fig.13 Typical switching times vs case temperature

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

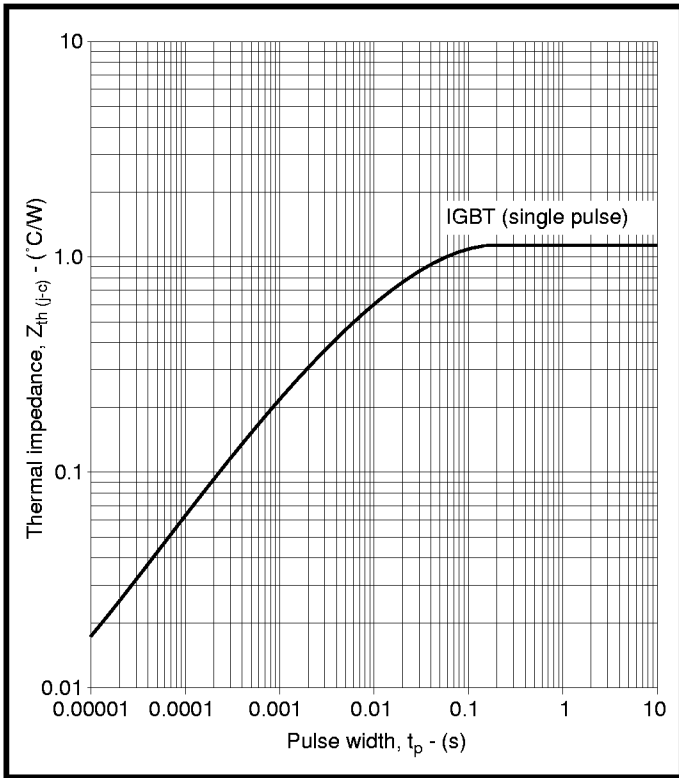


Fig.14 Transient thermal impedance - junction to case

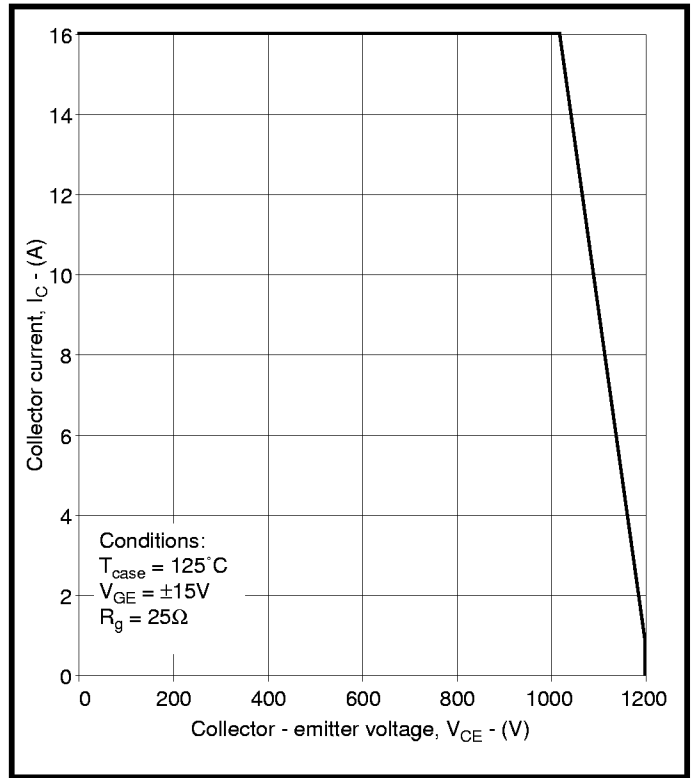


Fig.15 Reverse bias safe operating area

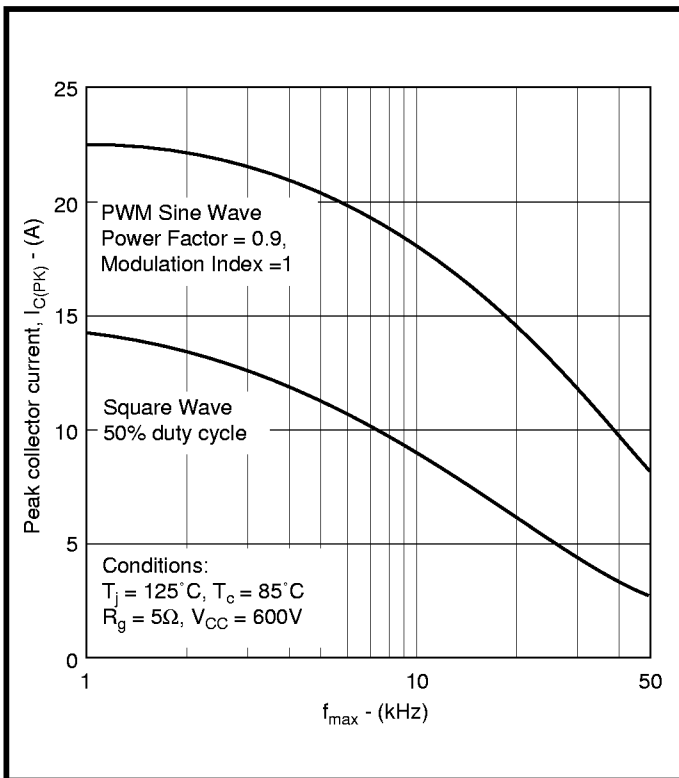


Fig.16 Peak current vs operating frequency

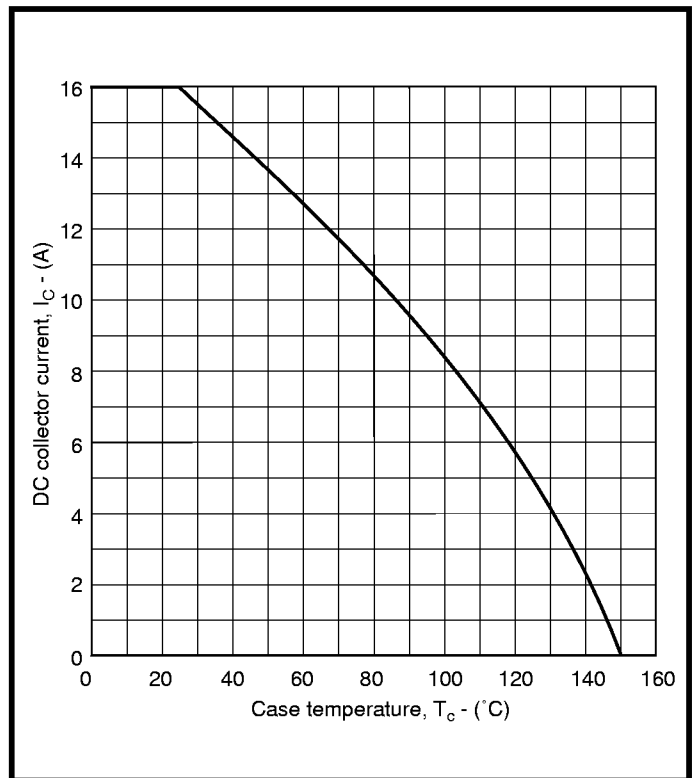


Fig.17 Collector current vs case temperature

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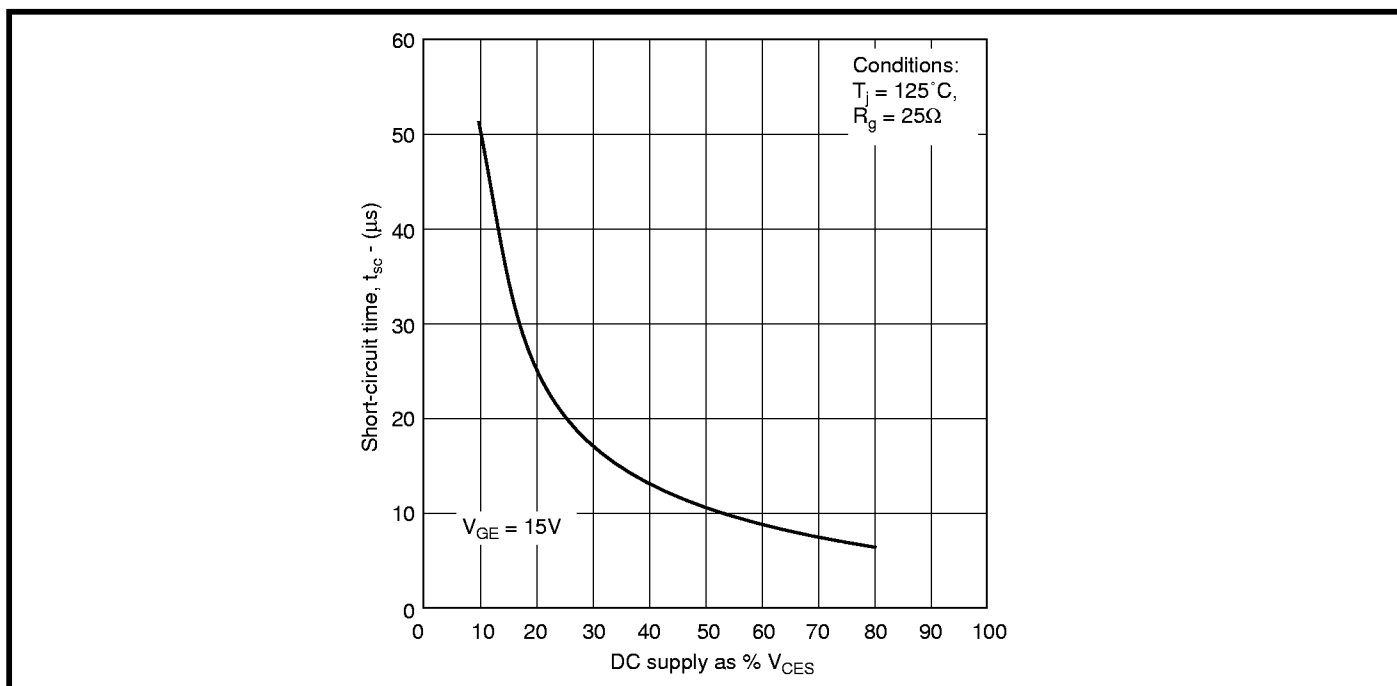
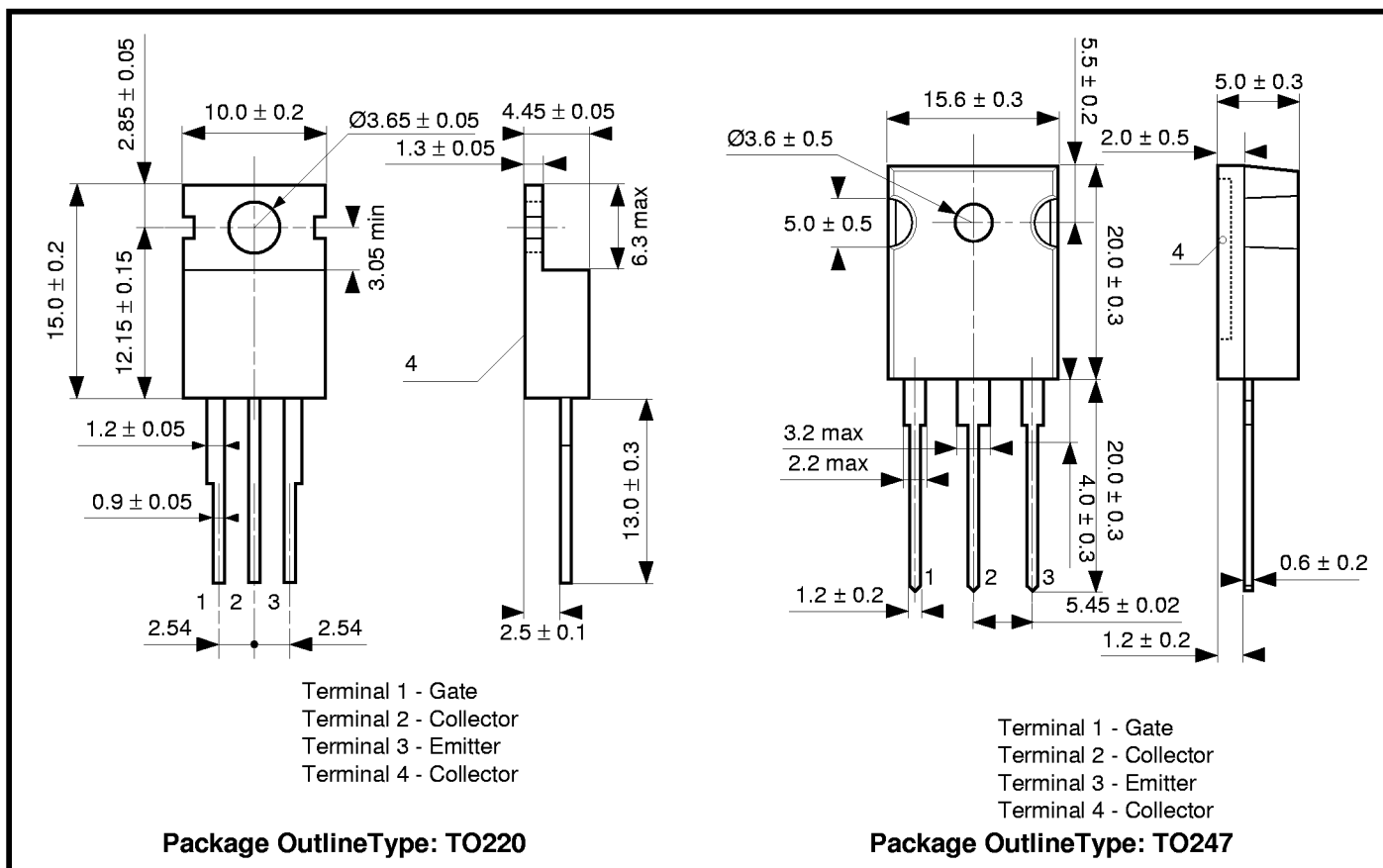


Fig.18 Short circuit withstand

Package Details

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



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