

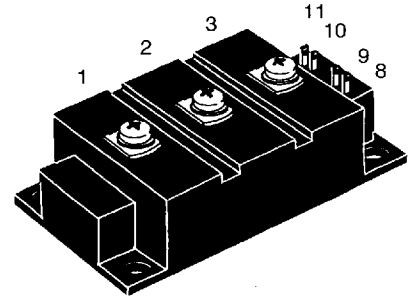
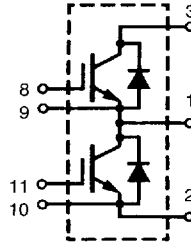
# IGBT Module

## Half-Bridge Configuration

### VII100-12S4

$I_{C(DC)} = 100 \text{ A}$   
 $V_{CES} = 1200 \text{ V}$   
 $V_{CE(sat)} = 3.4 \text{ V}$

High Short Circuit  
SOA Capability



Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	1200	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 1 \text{ M}\Omega$	1200	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	100	A
$I_{C80}$	$T_C = 80^\circ\text{C}$	90	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , $t_p = 1 \text{ ms}$	200	A
$t_{SC}$ (SCSOA)	$V_{GE} = 15 \text{ V}$ , $V_{CE} = 0.6 \cdot V_{CES}$ , $T_J = 125^\circ\text{C}$ $R_G = 5.6 \Omega$ , non repetitive	10	$\mu\text{s}$
<b>RBSOA</b>	$V_{GE} = 15 \text{ V}$ , $T_J = 125^\circ\text{C}$ , $R_G = 5.6 \Omega$ Clamped inductive load, $L = 100 \mu\text{H}$	$I_{CM} = 200$ @ $0.8 V_{CES}$	A
$P_{tot}$	$T_C = 25^\circ\text{C}$	625	W
$T_J$		-40 ... +150	$^\circ\text{C}$
$T_{Smax}$		110	$^\circ\text{C}$
$T_{stg}$		-40 ... +125	$^\circ\text{C}$
$V_{ISOL}$	50/60 Hz, RMS $t = 1 \text{ min}$ $I_{ISOL} \leq 1 \text{ mA}$ $t = 1 \text{ s}$ Insulating material: $\text{Al}_2\text{O}_3$	3000 3600	V~ V~
$M_d$	Mounting torque (M6)	2.25 - 2.75	Nm
	Terminal connection torque (M5)	20 - 25 2.50 - 3.70 22 - 33	lb.in. Nm lb.in.
$d_s$	Creepage distance on surface	10	mm
$d_A$	Strike distance through air	9.6	mm
$a$	Max. allowable acceleration	50	$\text{m/s}^2$
<b>Weight</b>	Typical, including screws	0.25 8.85	kg oz.

#### Features

- International standard package
- Package with DCB ceramic base plate
- Isolation voltage 3600 V~
- MOS-input (voltage controlled)
- Low saturation voltage
- High short circuit capability
- No latch-up
- Ultra fast free wheeling diode
- Low conduction and commutation losses
- Pulse frequency up to 20 kHz

#### Applications

- AC motor speed control
- DC servo and robot drives
- Uninterruptible power systems (UPS)
- Switch-mode and resonant-mode power supplies
- Induction heating
- DC choppers

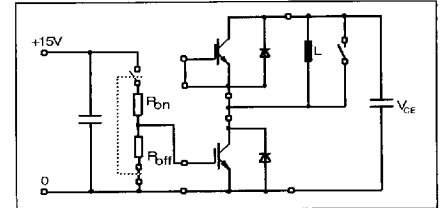
#### Advantages

- Space and weight savings
- Simple mounting
- Reduced protection circuits
- High  $V_{GE(th)}$  for good noise immunity

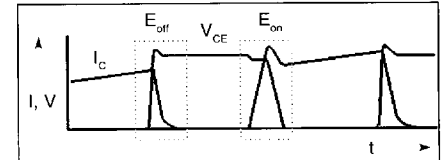
Data according to a single IGBT/FRED unless otherwise stated.  
IXYS reserves the right to change limits, test conditions and dimensions.

16 ■ 4686226 0002755 236 ■

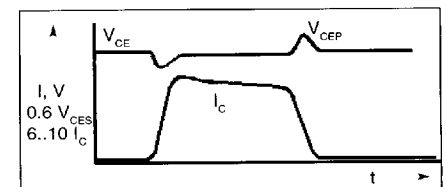
Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_{(BR)CES}$	$I_C = 14 \text{ mA}, V_{GE} = 0 \text{ V}$	1200		V
$V_{GE(th)}$	$I_C = 40 \text{ mA}, V_{CE} = V_{GE}$	5		8 V
$I_{CES}$	$V_{CE} = V_{CES}$ $V_{CE} = 0.8 \cdot V_{CES}$	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$		14 mA 44 mA
$I_{GES}$	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 500 \text{ nA}$
$V_{CE(sat)}$	$I_C = 100 \text{ A}, V_{GE} = 15 \text{ V}$		3.4	3.7 V
$C_{ies}$	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 1 \text{ MHz}$		18	nF
$C_{oes}$			2	nF
$C_{res}$			0.36	nF
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 100 \text{ A}, V_{GE} = 15 \text{ V}$ $V_{CE} = 600 \text{ V}, R_{on} = 1.8 \Omega, R_{off} = 5.6 \Omega$ Remarks: Switching times may increase for $V_{CE} > 600 \text{ V}, T_J > 125^\circ\text{C}$ or increased $R_G$		300	ns
$t_{rv}$			200	ns
$t_{d(off)}$			350	ns
$t_{fi}$			700	ns
$E_{on}$			14	18
$E_{off}$		14	18	mJ
$R_{thJC}$	for calculation of $P_{tot}$			0.20 K/W
$R_{thJS}$	with heat transfer paste			0.28 K/W



Test circuit for  $E_{on}$ ,  $E_{off}$ , SCSOA and RBSOA  
 $R_{on} = 1.8 \Omega$        $L = 100 \mu\text{H}$   
 $R_{off} = 5.6 \Omega$  for RBSOA,  $E_{off}$



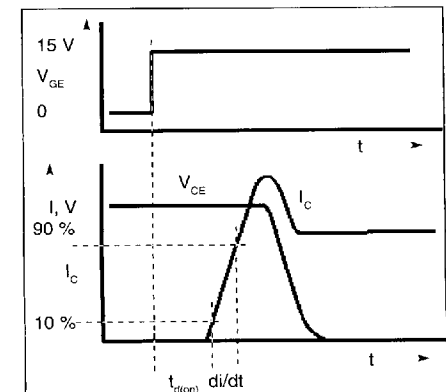
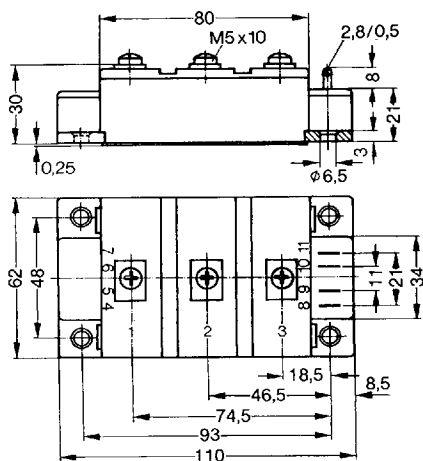
Typical V/I waveforms for inductive load



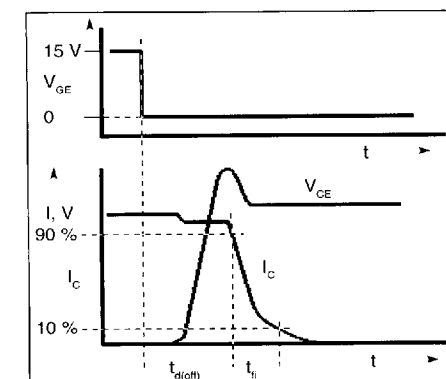
SCSOA conditions  $V_{CE} = 0.6 V_{CES}$ ,  
 $V_{CEP} < V_{CES}$ ,  $T_J = 125^\circ\text{C}$

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_F$	$I_F = 100 \text{ A}, V_{GE} = 0 \text{ V}$		1.8	1.9 V
$I_F$	$T_C = 25^\circ\text{C}$ $T_C = 80^\circ\text{C}$			100 A 90 A
$I_{RM}$	$I_F = 100 \text{ A}, V_{GE} = 0 \text{ V}, -di_F/dt = 800 \text{ A}/\mu\text{s}$			100 A
$t_{rr}$	$T_J = 125^\circ\text{C}, V_R = 600 \text{ V}$		200	ns
$R_{thJC}$	with heat transfer paste			0.45 K/W
$R_{thJS}$				0.78 K/W

### Dimensions in mm (1 mm = 0.0394")



Turn-on waveforms  $E_{on}$



Turn-off waveforms  $E_{off}$  RBSOA

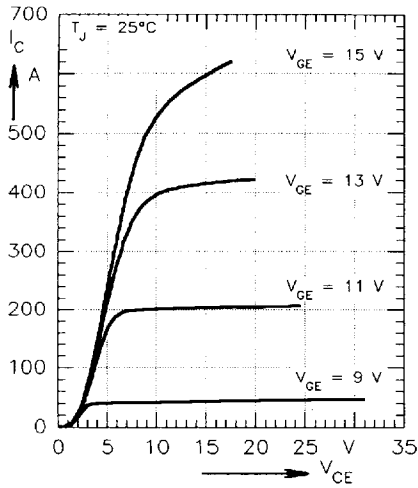


Fig. 1 Typ. output characteristics

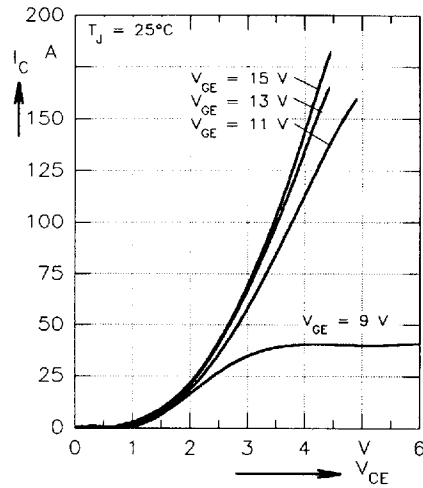


Fig. 2 Typ. output characteristics

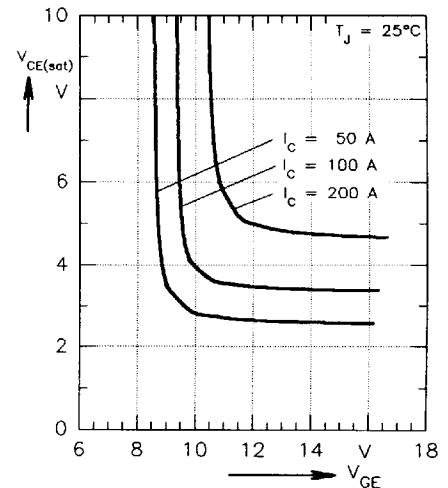


Fig. 3 Typ. on-state characteristics

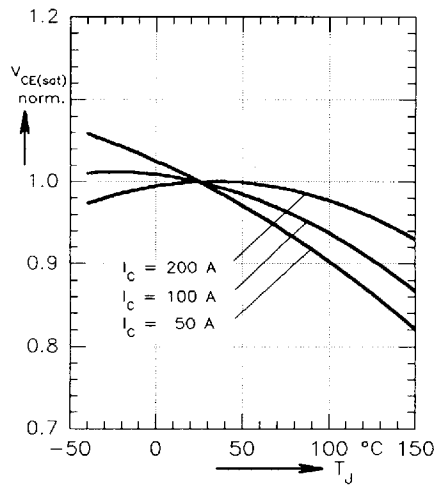
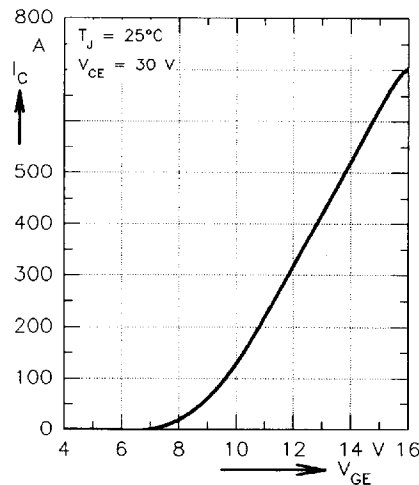
Fig. 4 Typ. temperature dependence of normalized  $V_{CE(sat)}$ 

Fig. 5 Typ. transfer characteristics

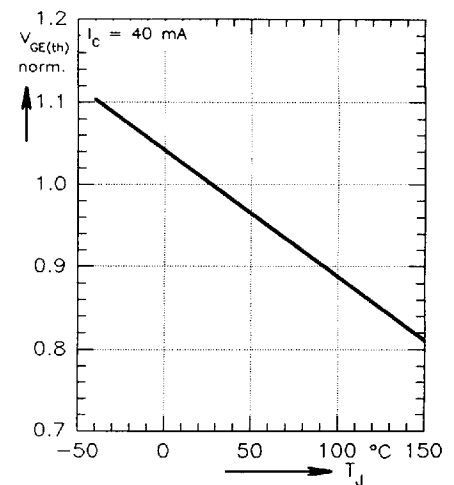
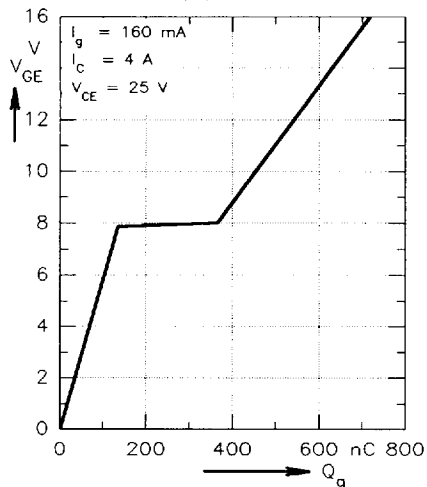
Fig. 6 Temperature dependence of normalized  $V_{GE(th)}$ 

Fig. 7 Typ. turn-on gate charge characteristics

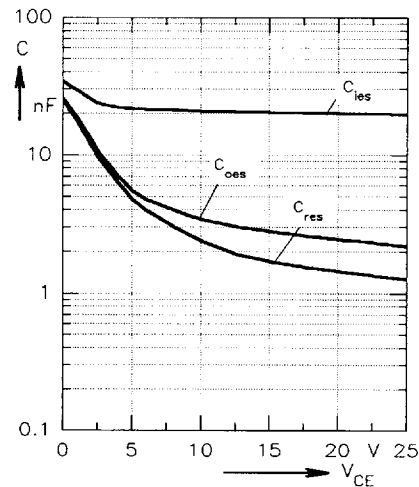


Fig. 8 Typ. capacitances

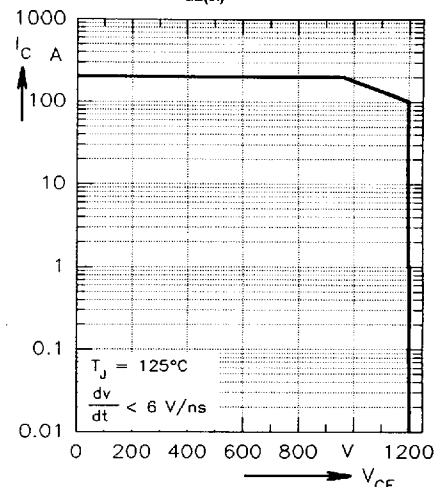


Fig. 9 Reverse biased SOA

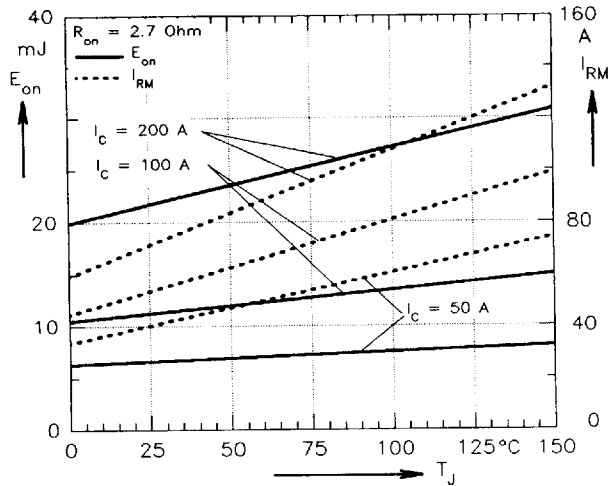


Fig. 10 Typ. turn-on energy per pulse

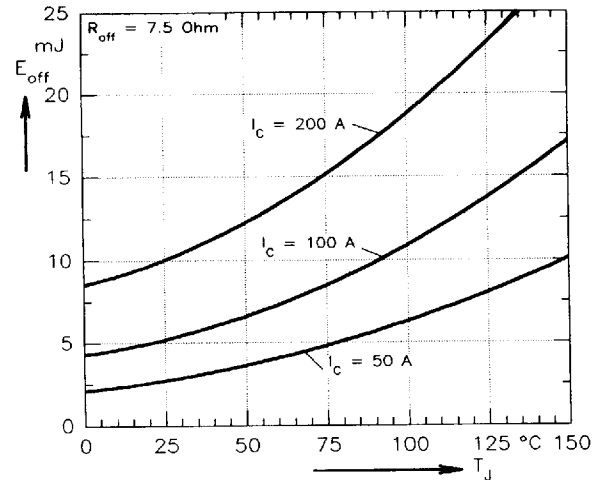


Fig. 11 Typ. turn-off energy per pulse

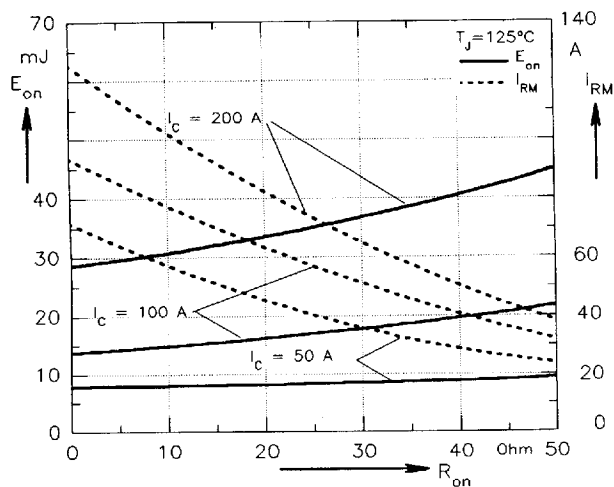


Fig. 12 Typ. turn-on energy per pulse

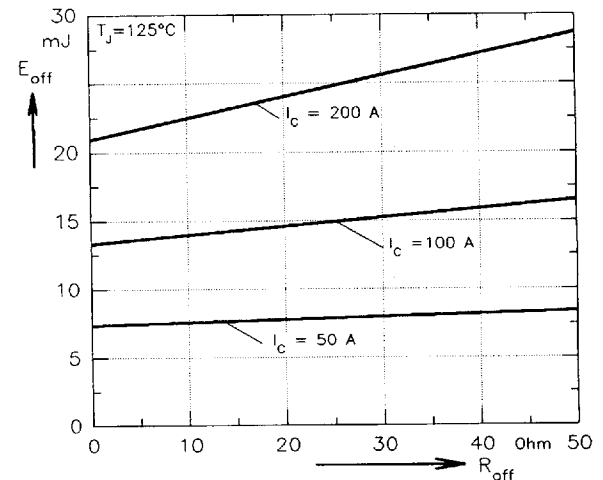


Fig. 13 Typ. turn-off energy per pulse

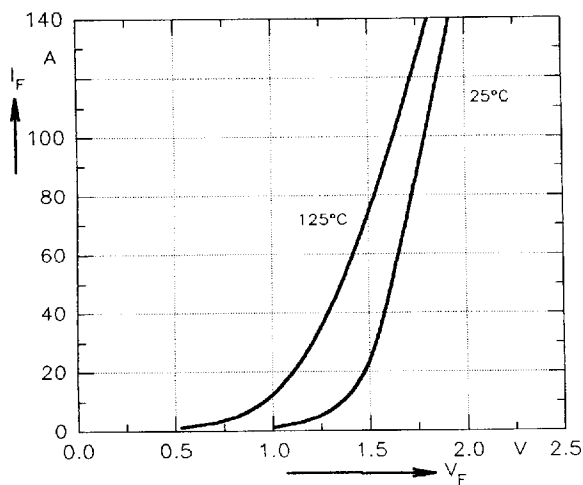


Fig. 14 Typ. forward characteristic of reverse diode

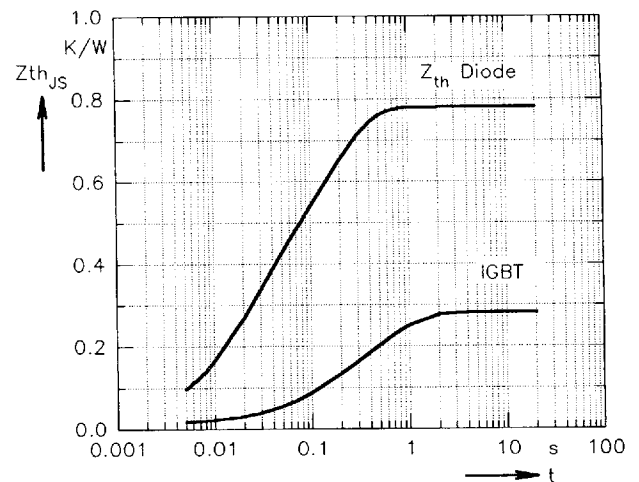


Fig. 15 Transient thermal resistance junction to heatsink of IGBT and Diode (per leg)