

# IGBT (NPT) Module

$$V_{CES} = 2 \times 1200V$$

$$I_{C25} = 90A$$

$$V_{CE(sat)} = 2.2V$$

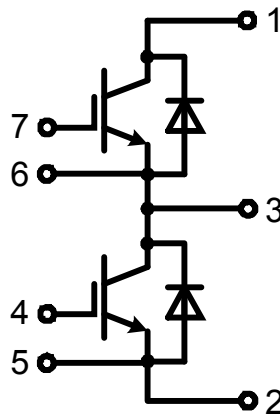
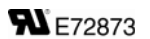
Phase leg

Part number

**MII75-12A3**



Backside: isolated



**Features / Advantages:**

- NPT IGBT technology
- low saturation voltage
- low switching losses
- switching frequency up to 30 kHz
- square RBSOA, no latch up
- high short circuit capability
- positive temperature coefficient for easy parallelling
- MOS input, voltage controlled
- ultra fast free wheeling diodes

**Applications:**

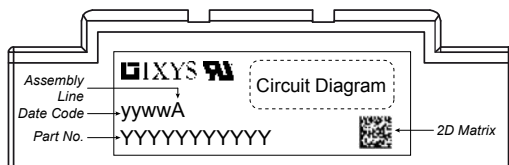
- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies
- Inductive heating, cookers
- Pumps, Fans

**Package: Y4**

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

IGBT				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{CES}$	collector emitter voltage	$T_{VJ} = 25^{\circ}C$			1200	V	
$V_{GES}$	max. DC gate voltage				$\pm 20$	V	
$V_{GEM}$	max. transient gate emitter voltage				$\pm 30$	V	
$I_{C25}$	collector current	$T_C = 25^{\circ}C$			90	A	
$I_{C80}$		$T_C = 80^{\circ}C$			60	A	
$P_{tot}$	total power dissipation	$T_C = 25^{\circ}C$			370	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 50A; V_{GE} = 15V$		2.2	2.7	V	
				2.7		V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 2mA; V_{CE} = V_{CE}$	4.5	5.5	6.5	V	
$I_{CES}$	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0V$			4	mA	
				6		mA	
$I_{GES}$	gate emitter leakage current	$V_{GE} = \pm 20V$			200	nA	
$Q_{G(on)}$	total gate charge	$V_{CE} = 600V; V_{GE} = 15V; I_C = 50A$		240		nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600V; I_C = 50A$ $V_{GE} = \pm 15V; R_G = 22\Omega$		100		ns	
$t_r$	current rise time		$T_{VJ} = 125^{\circ}C$	70		ns	
$t_{d(off)}$	turn-off delay time		500		ns		
$t_f$	current fall time		70		ns		
$E_{on}$	turn-on energy per pulse		7.6		mJ		
$E_{off}$	turn-off energy per pulse		5.6		mJ		
<b>RBSOA</b>	reverse bias safe operating area	$V_{GE} = \pm 15V; R_G = 22\Omega$					
$I_{CM}$		$V_{CEmax} = 1200V$			100	A	
<b>SCSOA</b>	short circuit safe operating area	$V_{CEmax} = 1200V$					
$t_{sc}$	short circuit duration	$V_{CE} = 1200V; V_{GE} = \pm 15V$			10	$\mu s$	
$I_{sc}$	short circuit current	$R_G = 22\Omega; \text{non-repetitive}$		180		A	
$R_{thJC}$	thermal resistance junction to case				0.33	K/W	
$R_{thCH}$	thermal resistance case to heatsink				0.33	K/W	
<b>Diode</b>							
$V_{RRM}$	max. repetitive reverse voltage	$T_{VJ} = 25^{\circ}C$			1200	V	
$I_{F25}$	forward current	$T_C = 25^{\circ}C$			100	A	
$I_{F80}$		$T_C = 80^{\circ}C$			60	A	
$V_F$	forward voltage	$I_F = 50A$			2.50	V	
				1.80		V	
$I_R$	reverse current	$V_R = V_{RRM}$			0.65	mA	
				1		mA	
$Q_{rr}$	reverse recovery charge	$V_R = 600V$ $-di_F/dt = 400A/\mu s$ $I_F = 50A; V_{GE} = 0V$		3.5		$\mu C$	
$I_{RM}$	max. reverse recovery current		$T_{VJ} = 125^{\circ}C$	40		A	
$t_{rr}$	reverse recovery time		200		ns		
$E_{rec}$	reverse recovery energy		1		mJ		
$R_{thJC}$	thermal resistance junction to case				0.66	K/W	
$R_{thCH}$	thermal resistance case to heatsink				0.66	K/W	

Package Y4				Ratings		
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			300	A
$T_{VJ}$	virtual junction temperature		-40		150	°C
$T_{op}$	operation temperature		-40		125	°C
$T_{stg}$	storage temperature		-40		125	°C
<b>Weight</b>					110	g
$M_D$	mounting torque		2.25		2.75	Nm
$M_T$	terminal torque		4.5		5.5	Nm
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	14.0	10.0		mm
$d_{Spb/Apb}$		terminal to backside	16.0	16.0		mm
$V_{ISOL}$	isolation voltage	t = 1 second			3600	V
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA		3000	V

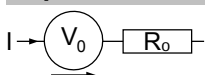


Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MII75-12A3	MII75-12A3	Box	6	466735

### Equivalent Circuits for Simulation

\* on die level

$T_{VJ} = 150$  °C

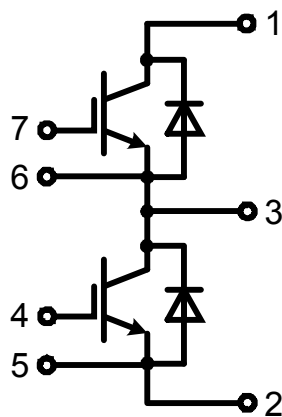
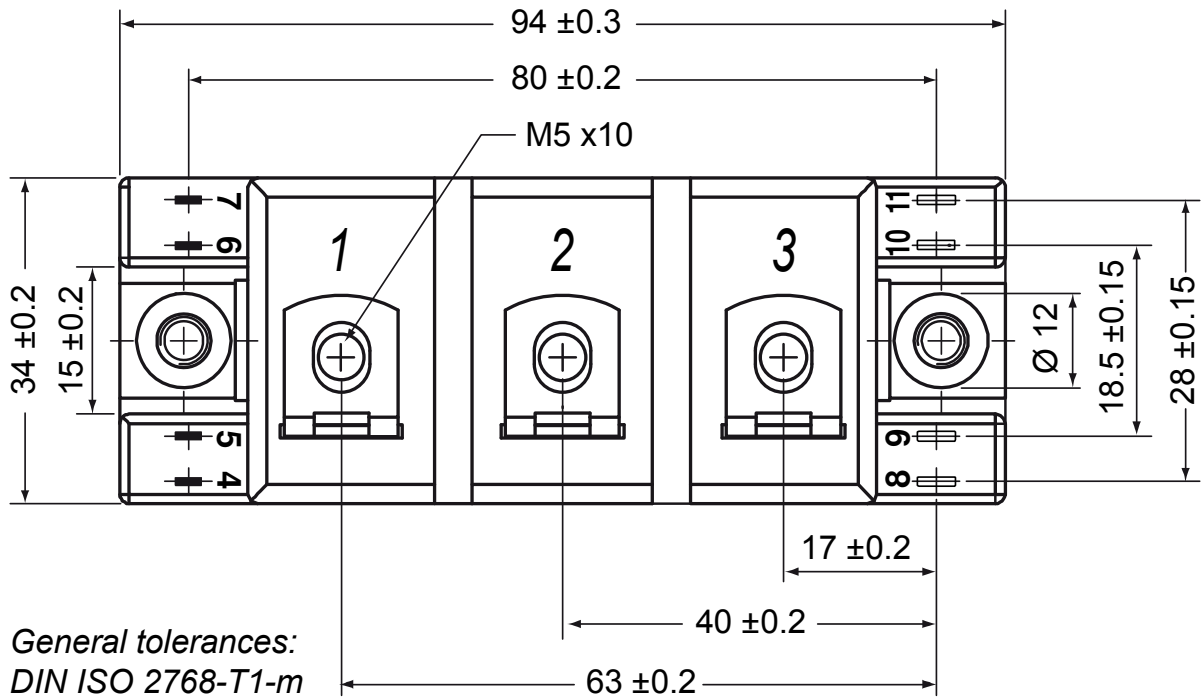
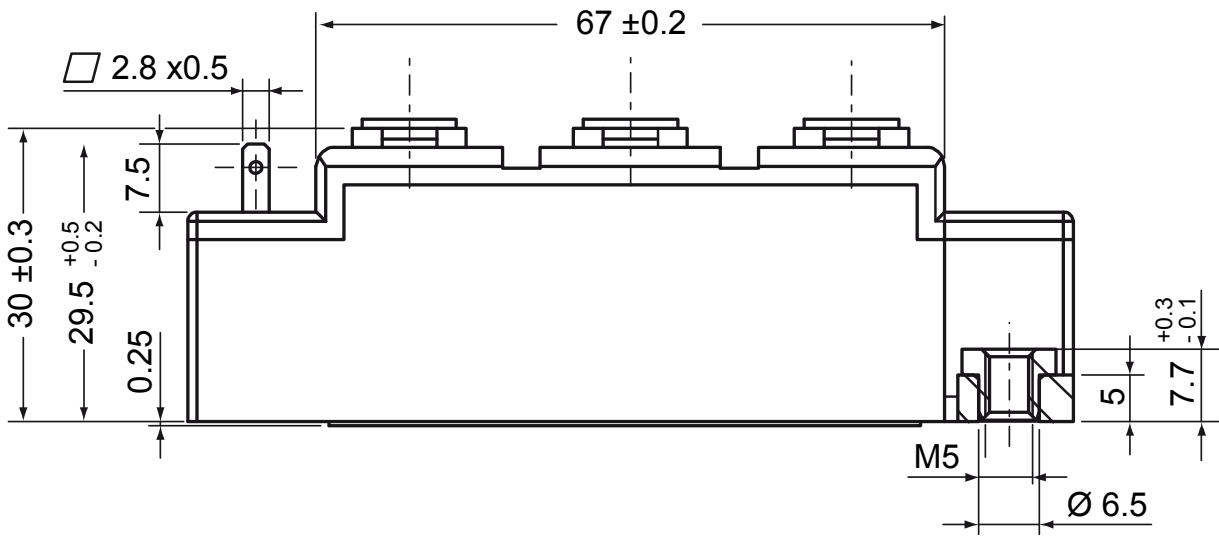


$V_{0\ max}$  threshold voltage

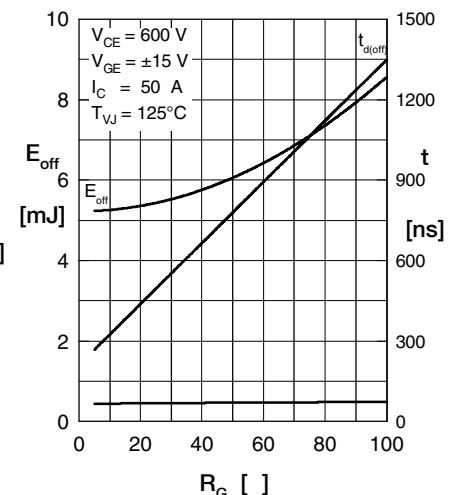
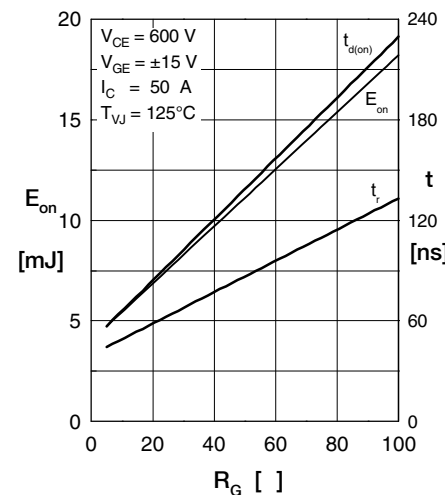
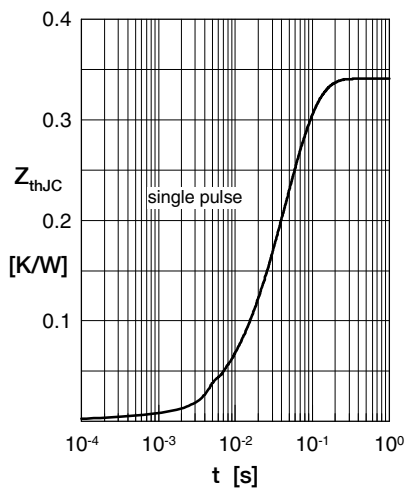
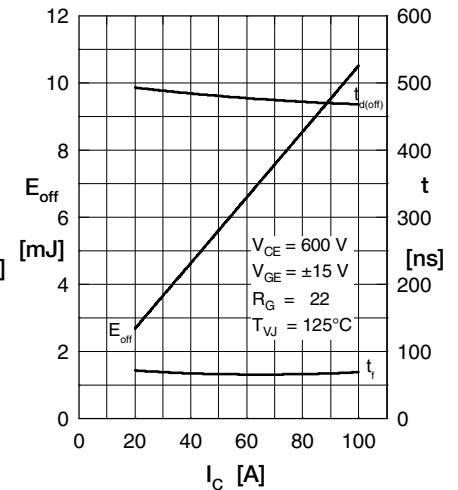
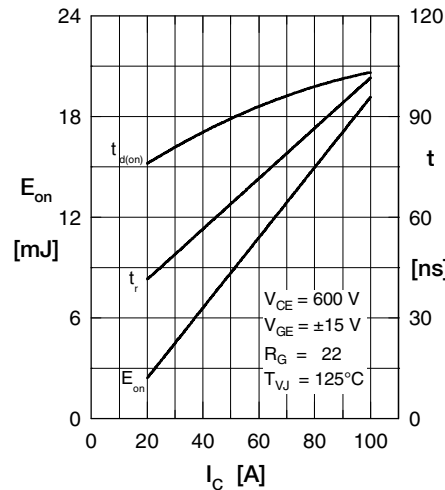
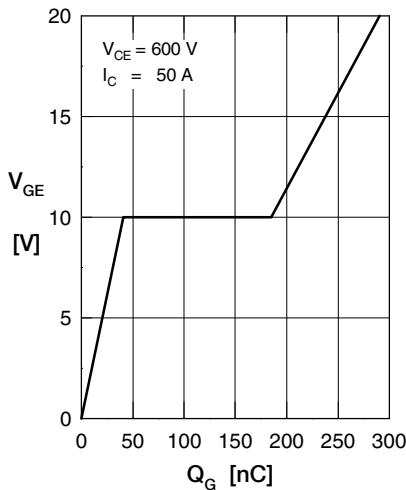
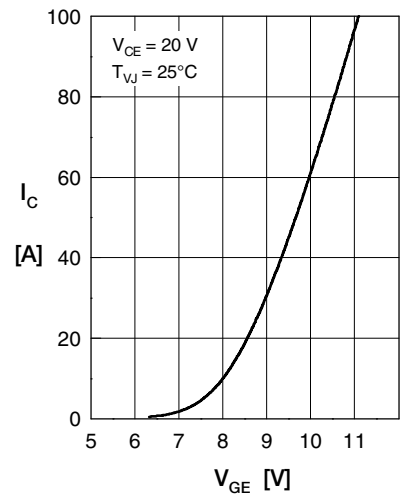
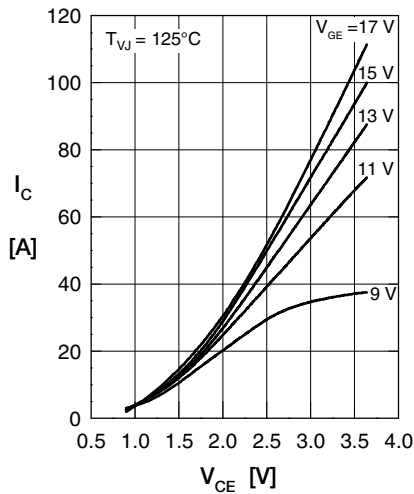
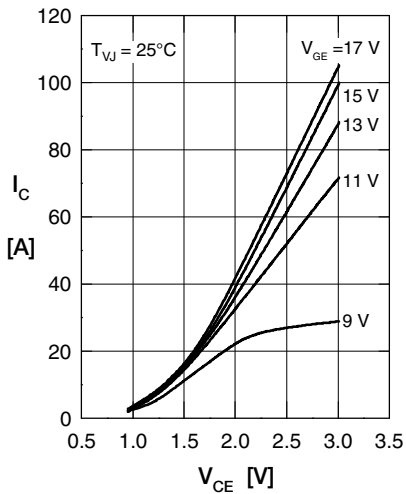
$R_{0\ max}$  slope resistance \*

	IGBT	Diode	
$V_{0\ max}$	1.5	1.3	V
$R_{0\ max}$	20.1	10.8	mΩ

**Outlines Y4**



## IGBT



**Diode**

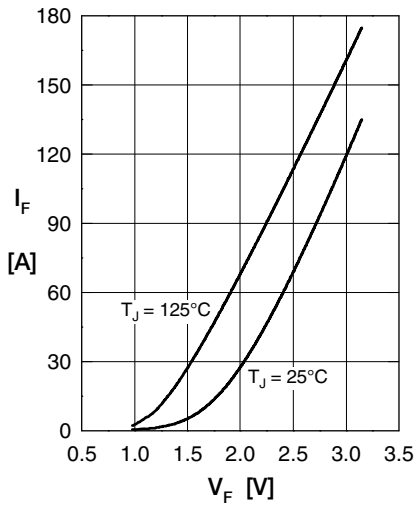


Fig. 1 Typ. Forward current vs.  $V_F$

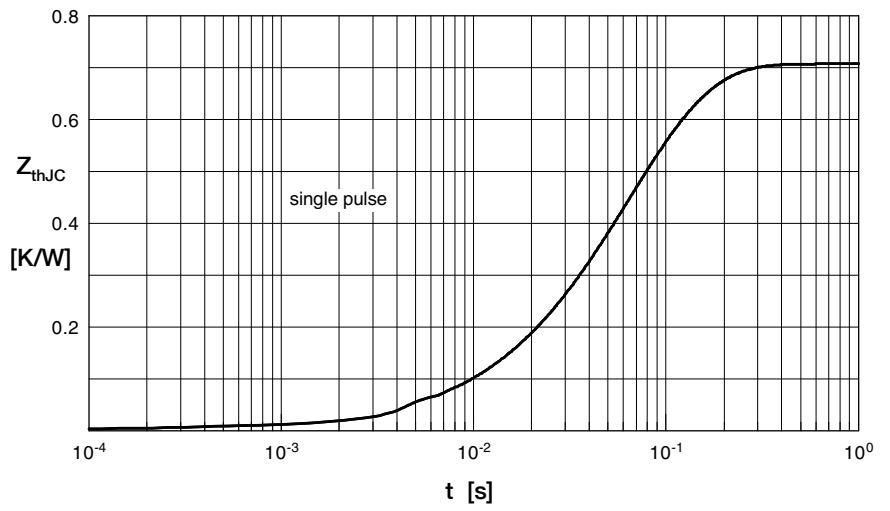


Fig. 2 Typ. transient thermal impedance junction to case