

DIM2400ESM12-A000

Single Switch IGBT Module

Replaces DS5536-3.0

DS5536-4 October 2010 (LN27615)

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Non Punch Through Silicon
- Isolated AISiC Base with AIN Substrates
- Lead Free construction

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- **Traction Drives**

The Powerline range of high power modules includes half bridge, chopper, dual, single and bi-directional switch configurations covering voltages from 1200V to 6500V and currents up to 2400A.

The DIM2400ESM12-A000 is a single switch 1200V, n-channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10µs short circuit withstand. This device is optimised for traction drives and other applications requiring high thermal cycling capability.

The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise grounded heat sinks for safety.

ORDERING INFORMATION

Order As:

DIM2400ESM12-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		1200V
V _{CE(sat)}	* (typ)	2.2V
l _c ` ´	(max)	2400A
I _{C(PK)}	(max)	4800A

^{*} Measured at the power busbars, not the auxiliary terminals

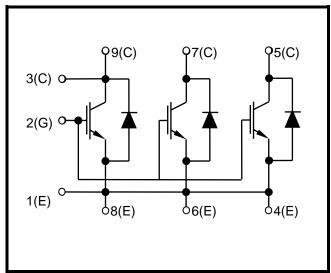


Fig. 1 Circuit configuration



Fig. 2 Package



ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings 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 _C	Continuous collector current	T _{case} = 85°C	2400	Α
I _{C(PK)}	Peak collector current	1ms, T _{case} = 115°C	4800	Α
P _{max}	Max. transistor power dissipation	$T_{case} = 25^{\circ}C, T_{j} = 150^{\circ}C$	20830	W
l ² t	Diode I ² t value	$V_R = 0$, $t_p = 10$ ms, $T_j = 125$ °C	900	kA ² s
V _{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	2500	V
Q_{PD}	Partial discharge – per module	IEC1287, $V_1 = 1300V$, $V_2 = 1000V$, 50Hz RMS	10	рC

THERMAL AND MECHANICAL RATINGS

Internal insulation material:

Baseplate material:

Creepage distance:

Clearance:

CTI (Comparative Tracking Index):

AIN

AISiC

33mm

20mm

600

Symbol	Parameter	Test Conditions	Min	Тур.	Max	Units
R _{th(j-c)}	Thermal resistance – transistor	Continuous dissipation - junction to case	-	-	6	°C/kW
R _{th(j-c)}	Thermal resistance – diode	Continuous dissipation - junction to case	-	-	13	°C/kW
R _{th(c-h)}	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	6	°C/kW
Tj	Junction temperature	Transistor	-	-	150	°C
		Diode	-	-	125	°C
T _{stg}	Storage temperature range	-	-40	-	125	°C
	Screw torque	Mounting – M6	-	-	5	Nm
		Electrical connections – M4	-	-	2	Nm
		Electrical connections – M8	-	-	10	Nm



ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
	Collector cut-off current	$V_{GE} = 0V$, $V_{CE} = V_{CES}$			3	mA
I _{CES}		$V_{GE} = 0V$, $V_{CE} = V_{CES}$, $T_{case} = 125$ °C			75	mA
I _{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			12	μA
V _{GE(TH)}	Gate threshold voltage	$I_C = 120$ mA, $V_{GE} = V_{CE}$	4.5	5.5	6.5	V
\	Collector-emitter	V _{GE} = 15V, I _C = 2400A		2.2	2.8	V
V _{CE(sat)} †	saturation voltage	V _{GE} = 15V, I _C = 2400A, T _j = 125°C		2.6	3.3	V
I _F	Diode forward current	DC			2400	Α
I _{FM}	Diode maximum forward current	t _p = 1ms			4800	Α
\ †	Diode forward voltage	I _F = 2400A		2.1	2.4	V
V _F [†]		I _F = 2400A, T _j = 125°C		2.1	2.4	V
C _{ies}	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		270		nF
Q_g	Gate charge	±15V		26		μC
C _{res}	Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$				nF
L _M	Module inductance			10		nΗ
R _{INT}	Internal transistor resistance			90		μΩ
SC _{Data}	Short circuit current, I _{SC}	$T_{j} = 125^{\circ}\text{C}, V_{CC} = 900\text{V}$ $t_{p} \le 10\mu\text{s}, V_{GE} \le 15\text{V}$ $V_{CE (max)} = V_{CES} - L^{*} x dI/dt$ IEC 60747-9		13500		А

 $^{^{\}dagger}$ Measured at the power busbars, not the auxiliary terminals * L is the circuit inductance + $L_{\rm M}$



ELECTRICAL CHARACTERISTICS

T_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Тур.	Max	Units
t _{d(off)}	Turn-off delay time	$I_{C} = 2400A$ $V_{GF} = \pm 15V$		1370		ns
t _f	Fall time			230		ns
E _{OFF}	Turn-off energy loss	$V_{CE} = 600V$		520		mJ
t _{d(on)}	Turn-on delay time	$R_{G(ON)} = 1.0\Omega$ $R_{G(OFF)} = 1.0\Omega$ $L_{S} \sim 50 \text{nH}$		250		ns
t _r	Rise time			230		ns
E _{ON}	Turn-on energy loss			180		mJ
Q_{rr}	Diode reverse recovery charge	I _F = 2400A		310		μC
I _{rr}	Diode reverse recovery current	$V_{CE} = 600V$		1000		Α
E _{rec}	Diode reverse recovery energy	$dI_F/dt = 9500A/\mu s$		150		mJ

T_{case} = 125°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Тур.	Max	Units
t _{d(off)}	Turn-off delay time	$I_{C} = 2400A$ $V_{GF} = \pm 15V$		1570		ns
t _f	Fall time			230		ns
E _{OFF}	Turn-off energy loss	$V_{CE} = 600V$		600		mJ
t _{d(on)}	Turn-on delay time	$R_{G(ON)} = 1.0\Omega$ $R_{G(OFF)} = 1.0\Omega$ $L_S \sim 50 \text{nH}$		360		ns
t _r	Rise time			290		ns
E _{ON}	Turn-on energy loss			200		mJ
Q_{rr}	Diode reverse recovery charge	$I_F = 2400A$ $V_{CE} = 600V$ $dI_F/dt = 8500A/\mu s$		540		μC
I _{rr}	Diode reverse recovery current			1260		Α
E _{rec}	Diode reverse recovery energy			260		mJ



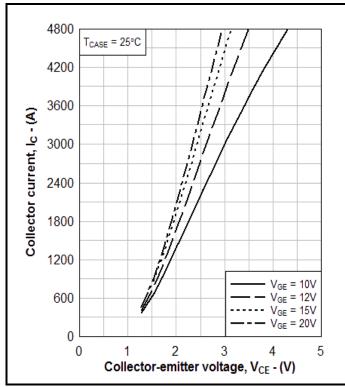


Fig. 3 Typical output characteristics

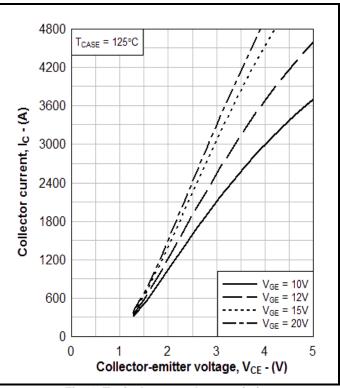


Fig. 4 Typical output characteristics

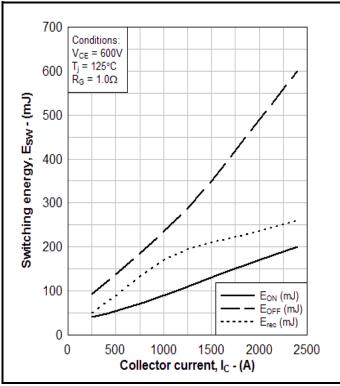


Fig. 5 Typical switching energy vs collector current

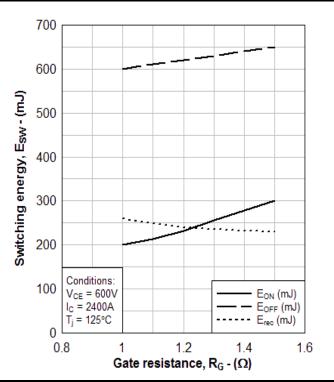


Fig. 6 Typical switching energy vs gate resistance



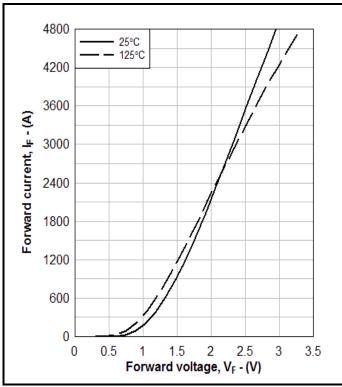


Fig. 7 Diode typical forward characteristics

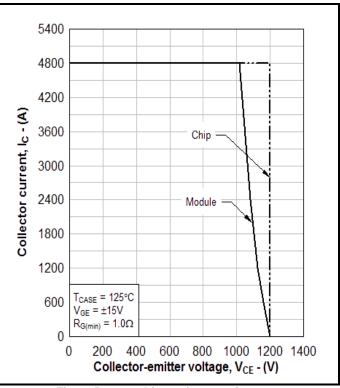


Fig. 8 Reverse bias safe operating area

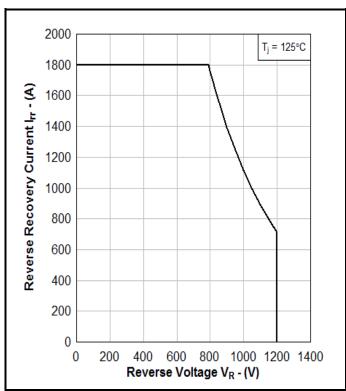


Fig. 9 Diode reverse bias safe operating area

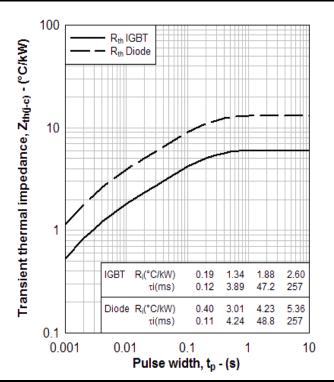


Fig. 10 Transient thermal impedance



PACKAGE DETAILS

For further package information, please visit our website or contact Customer Services. All dimensions in mm, unless stated otherwise.

DO NOT SCALE.

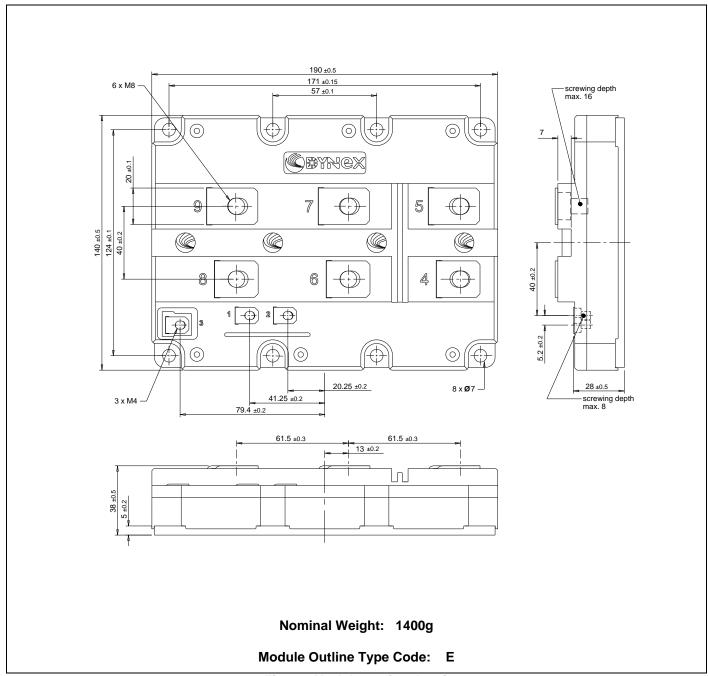


Fig. 11 Module outline drawing



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HEADQUARTERS OPERATIONS

DYNEX SEMICONDUCTOR LTD

Doddington Road, Lincoln, Lincolnshire, LN6 3LF, United Kingdom

Fax: +44(0)1522 500550 Tel: +44(0)1522 500500

Web: http://www.dynexsemi.com

CUSTOMER SERVICE

DYNEX SEMICONDUCTOR LTD

Doddington Road, Lincoln, Lincolnshire, LN6 3LF, United Kingdom

Fax: +44(0)1522 500020

Tel: +44(0)1522 502753 / 502901 Email: Power_solutions@dynexsemi.com

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