

Final datasheet

EasyDUAL module with CoolSiC™ Trench MOSFET and PressFIT / NTC

Features

- · Electrical features
 - V_{DSS} = 1200 V
 - $I_{DN} = 150 \text{ A} / I_{DRM} = 300 \text{ A}$
 - Low switching losses
 - Low inductive design
 - High current density
- Mechanical features
 - Rugged mounting due to integrated mounting clamps
 - PressFIT contact technology
 - Integrated NTC temperature sensor
 - AlN substrate with low thermal resistance

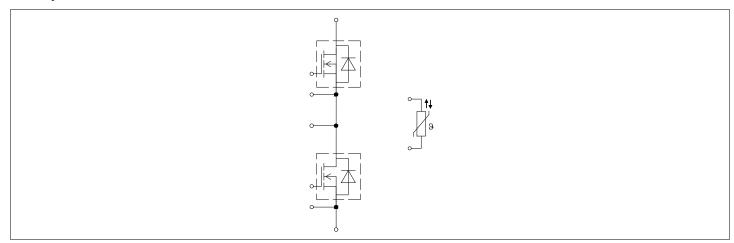
Potential applications

- Solar applications
- High-frequency switching application
- DC/DC converter
- UPS systems

Product validation

• Qualified for industrial applications according to the relevant tests of IEC 60747, 60749 and 60068

Description





EasyDUAL module





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EasyDUAL module

1 Package



1 Package

Table 1 Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V _{ISOL}	RMS, f = 50 Hz, t = 1 min	3.0	kV
Isolation test voltage NTC	V _{ISOL(NTC)}	RMS, f = 50 Hz, t = 1 min	3.0	kV
Internal isolation		basic insulation (class 1, IEC 61140)	AlN	
Comparative tracking index	СТІ		> 200	
Relative thermal index (electrical)	RTI	housing	140	°C

Table 2 Characteristic values

Parameter	Symbol	Note or test condition	Values			
			Min.	Тур.	Max.	
Stray inductance module	L _{sCE}			8		nH
Module lead resistance, terminals - chip	R _{CC'+EE'}	T _H = 25 °C, per switch		1.4		mΩ
Storage temperature	$T_{\rm stg}$		-40		125	°C
Mounting force per clamp	F		40		80	N
Weight	G			39		g

Note: The current under continuous operation is limited to 25 A rms per connector pin.

2 MOSFET

Table 3 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Drain-source voltage	V _{DSS}		T _{vj} = 25 °C	1200	V
Continuous DC drain current	I _{DDC}	$T_{\rm vj}$ = 175 °C, $V_{\rm GS}$ = 18 V	T _H = 90 °C	150	А
Repetitive peak drain current	I _{DRM}	verified by design, t _p lim	ited by T _{vjmax}	300	А
Gate-source voltage, max. transient voltage	V_{GS}	D < 0.01		-10/23	V
Gate-source voltage, max. static voltage	V_{GS}			-7/20	V

Table 4 Recommended values

Parameter	Symbol	Note or test condition	Values	Unit
On-state gate voltage	V _{GS(on)}		1518	V
7				

EasyDUAL module

2 MOSFET



Table 4 (continued) Recommended values

Parameter	Symbol	Note or test condition	Values	Unit
Off-state gate voltage	$V_{GS(off)}$		-50	V

Table 5 Characteristic values

Parameter	Symbol	Note or test condition			Values		Unit
				Min. Typ. N		Max.	
Drain-source on-resistance	R _{DS(on)}	I _D = 150 A	V _{GS} = 18 V, T _{vj} = 25 °C		5.4	8	mΩ
			V _{GS} = 18 V, T _{vj} = 125 °C		8.7		
			V _{GS} = 18 V, T _{vj} = 175 °C		11.6		
			$V_{\rm GS} = 15 \text{ V},$ $T_{\rm vj} = 25 ^{\circ}\text{C}$		6.5		
Gate threshold voltage	V _{GS(th)}	$I_D = 60 \text{ mA}, V_{DS} = V_{GS}, T_{vj} = 1 \text{ms pulse at } V_{GS} = +20 \text{ V})$	= 25 °C, (tested after	3.45	4.3	5.15	V
Total gate charge	Q _G	$V_{\rm DD}$ = 800 V, $V_{\rm GS}$ = -3/18 V,	T _{vj} = 25 °C		0.446		μC
Internal gate resistor	R _{Gint}	T _{vj} = 25 °C			1.4		Ω
Input capacitance	C _{ISS}	$f = 100 \text{ kHz}, V_{DS} = 800 \text{ V},$ $V_{GS} = 0 \text{ V}$	T _{vj} = 25 °C		13.2		nF
Output capacitance	C _{OSS}	$f = 100 \text{ kHz}, V_{DS} = 800 \text{ V},$ $V_{GS} = 0 \text{ V}$	T _{vj} = 25 °C		0.63		nF
Reverse transfer capacitance	C _{rss}	$f = 100 \text{ kHz}, V_{DS} = 800 \text{ V},$ $V_{GS} = 0 \text{ V}$	T _{vj} = 25 °C		0.042		nF
C _{OSS} stored energy	E _{OSS}	$V_{\rm DS}$ = 800 V, $V_{\rm GS}$ = -3/18 V,	T _{vj} = 25 °C		258		μJ
Drain-source leakage current	I _{DSS}	$V_{\rm DS}$ = 1200 V, $V_{\rm GS}$ = -3 V	T _{vj} = 25 °C		0.09	530	μA
Gate-source leakage current	I _{GSS}	$V_{\rm DS}$ = 0 V, $T_{\rm vj}$ = 25 °C	V _{GS} = 20 V			400	nA
Turn-on delay time	t _{d on}	$I_{\rm D} = 150 \text{A}, R_{\rm Gon} = 2.7 \Omega,$	T _{vj} = 25 °C		31		ns
(inductive load)		$V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V},$ $t_{dead} = 1000 \text{ ns}, 0.1 \text{ V}_{GS}$	T _{vj} = 125 °C		31		
		to 0.1 I _D	T _{vj} = 175 °C		32		
Rise time (inductive load)	t _r	$I_{\rm D} = 150 \text{A}, R_{\rm Gon} = 2.7 \Omega,$	T _{vj} = 25 °C		13		ns
		$V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V},$ $t_{dead} = 1000 \text{ ns}, 0.1 \text{ I}_{D} \text{ to}$	T _{vj} = 125 °C		13		
		0.9 I _D	T _{vj} = 175 °C		14		
Turn-off delay time	t _{d off}	$I_{\rm D} = 150 \text{ A}, R_{\rm Goff} = 0.51 \Omega,$	T _{vj} = 25 °C		35		ns
(inductive load)		$V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V},$ 0.9 V_{GS} to 0.9 I_{D}	T _{vj} = 125 °C		38		
		0.5 (65 to 0.5 10	T _{vi} = 175 °C		41		

(table continues...)

EasyDUAL module

3 Body diode (MOSFET)



Table 5 (continued) Characteristic values

Parameter	Symbol	Note or test condition			Values		Unit
				Min.	Тур.	Max.	
Fall time (inductive load)	t_{f}	$I_{\rm D} = 150 \text{A}, R_{\rm Goff} = 0.51 \Omega,$	T _{vj} = 25 °C		11		ns
		$V_{DD} = 600 \text{ V}, V_{GS} = -3/18 \text{ V},$ 0.9 I _D to 0.1 I _D	T _{vj} = 125 °C		12		
		0.3 10 to 0.1 10	T _{vj} = 175 °C		16		
Turn-on energy loss per	E _{on}	$I_{\rm D}$ = 150 A, $V_{\rm DD}$ = 600 V,	T _{vj} = 25 °C		2.12		mJ
pulse		$L_{\sigma} = 8 \text{ nH}, V_{GS} = -3/18 \text{ V},$ $R_{Gon} = 2.7 \Omega, \text{ di/dt} =$	T _{vj} = 125 °C		2.35		
		13.5 kA/ μ s (T _{vj} = 175 °C), t_{dead} = 1000 ns	T _{vj} = 175 °C		2.67		
Turn-on energy loss per	E _{on,o}	$L_{\sigma} = 8 \text{ nH}, V_{GS} = -3/18 \text{ V},$ $R_{GOD, 0} = 1.5 \Omega, \text{ di/dt} =$	T _{vj} = 25 °C		1.28		mJ
pulse, optimized			T _{vj} = 125 °C		1.3		
			T _{vj} = 175 °C		1.35		
Turn-off energy loss per	E _{off}	$I_{\rm D}$ = 150 A, $V_{\rm DD}$ = 600 V,	T _{vj} = 25 °C		0.41		mJ
pulse		$L_{\sigma} = 8 \text{ nH}, V_{GS} = -3/18 \text{ V},$ $R_{Goff} = 0.51 \Omega, \text{ dv/dt} =$	T _{vj} = 125 °C		0.434		
		$42.5 \text{ kV/}\mu\text{s} (T_{\text{vj}} = 175 \text{ °C})$	T _{vj} = 175 °C		0.445		
SC data	I _{SC}	$V_{GS} = -5/15 \text{ V}, V_{DD} = 800 \text{ V},$ $V_{DSmax} = V_{DSS} - L_{sDS} * \text{di/dt},$			1260		А
		$R_{G} = 10 \ \Omega$	$t_{\rm P}$ = 2 µs, $T_{\rm vj}$ = 150 °C		1230		
Thermal resistance, junction to heat sink	R _{thJH}	per MOSFET, $\lambda_{\text{grease}} = 1 \text{ W}$	/(m·K)		0.252		K/W
Temperature under switching conditions	T _{vj op}			-40		175	°C

Note:

The selection of positive and negative gate-source voltages impacts losses and the long-term behavior of the MOSFET and body diode. The design guidelines described in Application Notes AN 2018-09 and AN 2021-13 must be considered to ensure sound operation of the device over the planned lifetime.

Tvj,op > 150°C is allowed for operation at overload conditions for MOSFET and body diode. For detailed specifications, please refer to AN 2021-13.

3 Body diode (MOSFET)

Table 6 Maximum rated values

Parameter	Symbol Note or test condi		Note or test condition		Unit
DC body diode forward current	I _{SD}	$T_{\rm vj}$ = 175 °C, $V_{\rm GS}$ = -3 V	T _H = 90 °C	85	A

EasyDUAL module

4 NTC-Thermistor



Table 7 Characteristic values

Parameter	Symbol	Note or test condition			Values		Unit
				Min.	Тур.	Max.	
Forward voltage	V _{SD}	$I_{SD} = 150 \text{ A}, V_{GS} = -3 \text{ V}$	T _{vj} = 25 °C		4.2	5.35	V
			T _{vj} = 125 °C		3.9		1
			T _{vj} = 175 °C		3.8		1
Peak reverse recovery	I _{rrm}	$I_{SD} = 150 \text{ A, di}_{s}/\text{dt} =$	T _{vj} = 25 °C		106		А
current		13.5 kA/ μ s, V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 1000 ns	T _{vj} = 125 °C		155		1
		ν _{GS} – -5 ν, ι _{dead} – 1000 115	T _{vj} = 175 °C		175		1
Recovered charge	Qrr	$I_{SD} = 150 \text{ A, di}_{s}/\text{dt} =$	T _{vj} = 25 °C		1.36		μC
		13.5 kA/ μ s, V_{DD} = 600 V, V_{GS} = -3 V, t_{dead} = 1000 ns	T _{vj} = 125 °C		2.47		1
		ν _{GS} – -5 ν, ι _{dead} – 1000 IIS	T _{vj} = 175 °C		3.2		1
Reverse recovery energy	E _{rec}	$I_{SD} = 150 \text{ A, di}_{s}/\text{dt} =$	T _{vj} = 25 °C		0.521		mJ
		13.5 kA/ μ s (T_{vj} = 175 °C), V_{DD} = 600 V, V_{GS} = -3 V,	T _{vj} = 125 °C		0.863		1
		$t_{\text{dead}} = 1000 \text{ ns}$	T _{vj} = 175 °C		1.16		1
Reverse recovery energy, E	$E_{\rm rec,o}$	I_{SD} = 150 A, di _s /dt =	T _{vi} = 25 °C		0.764		mJ
optimized	,	18.1 kA/μs (Τ _{vj} = 175 °C),	T _{vi} = 125 °C		0.816		1
		$V_{\rm DD}$ = 600 V, $V_{\rm GS}$ = -3 V, $t_{\rm dead}$ = 100 ns	T _{vj} = 175 °C		0.963		1

4 NTC-Thermistor

Table 8 Characteristic values

Parameter	Symbol	Note or test condition		Values		
			Min.	Тур.	Max.	
Rated resistance	R ₂₅	T _{NTC} = 25 °C		5		kΩ
Deviation of R ₁₀₀	△R/R	$T_{\rm NTC} = 100 {}^{\circ}{\rm C}$, $R_{100} = 493 \Omega$	-5		5	%
Power dissipation	P ₂₅	T _{NTC} = 25 °C			20	mW
B-value	B _{25/50}	$R_2 = R_{25} \exp[B_{25/50}(1/T_2-1/(298,15 \text{ K}))]$		3375		K
B-value	B _{25/80}	$R_2 = R_{25} \exp[B_{25/80}(1/T_2-1/(298,15 \text{ K}))]$		3411		К
B-value	B _{25/100}	$R_2 = R_{25} \exp[B_{25/100}(1/T_2-1/(298,15 \text{ K}))]$		3433		K

Note: For an analytical description of the NTC characteristics please refer to AN2009-10, chapter 4.

EasyDUAL module

5 Characteristics diagrams

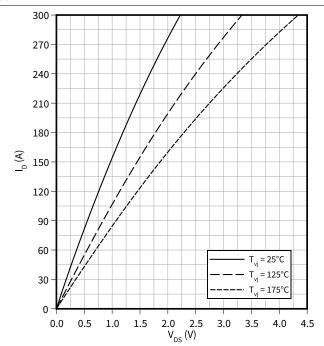


5 Characteristics diagrams

Output characteristic (typical), MOSFET

 $I_D = f(V_{DS})$

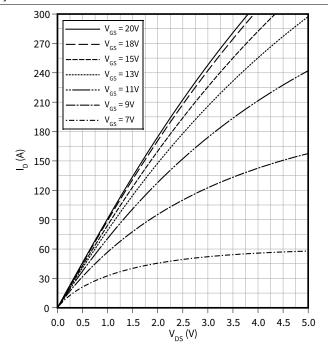
 $V_{GS} = 15 V$



Output characteristic (typical), MOSFET

 $I_D = f(V_{DS})$

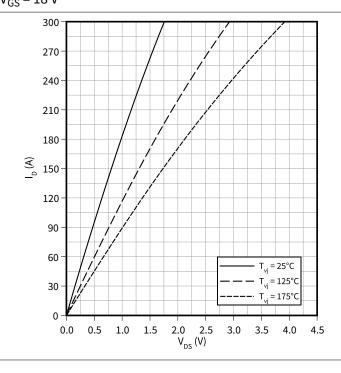
 $T_{vj} = 175$ °C



Output characteristic (typical), MOSFET

 $I_D = f(V_{DS})$

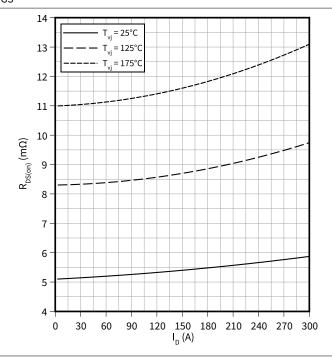
V_{GS} = 18 V



Drain source on-resistance (typical), MOSFET

 $R_{DS(on)} = f(I_D)$

 $V_{GS} = 18 V$



EasyDUAL module

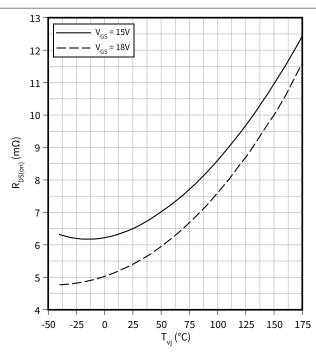
5 Characteristics diagrams



Drain source on-resistance (typical), MOSFET

$$R_{DS(on)} = f(T_{vj})$$

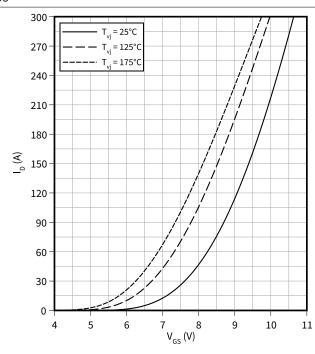
 $I_D = 150 A$



Transfer characteristic (typical), MOSFET

$$I_D = f(V_{GS})$$

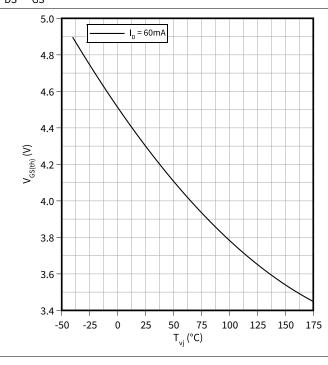
 $V_{DS} = 20 V$



Gate-source threshold voltage (typical), MOSFET

$$V_{GS(th)} = f(T_{vj})$$

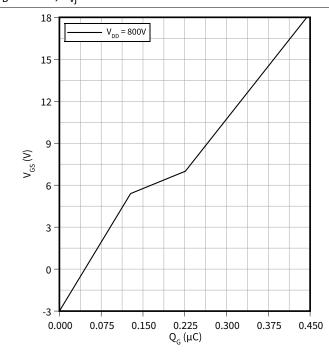
 $V_{DS} = V_{GS}$



Gate charge characteristic (typical), MOSFET

$$V_{GS} = f(Q_G)$$

$$I_D = 150 A$$
, $T_{vi} = 25 °C$



EasyDUAL module

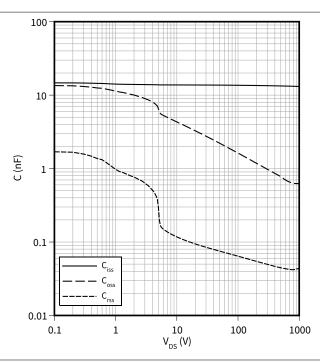
5 Characteristics diagrams



Capacity characteristic (typical), MOSFET

 $C = f(V_{DS})$

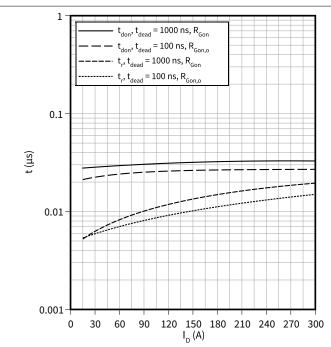
f = 100 kHz, $T_{vi} = 25 \,^{\circ}\text{C}$, $V_{GS} = 0 \,^{\circ}\text{V}$



Switching times (typical), MOSFET

 $t = f(I_D)$

 V_{DD} = 600 V, R_{Gon} = 2.7 $\Omega,\,R_{Gon,o}$ = 1.5 $\Omega,\,T_{vj}$ = 175 °C, V_{GS} = -3/18 V



Switching times (typical), MOSFET

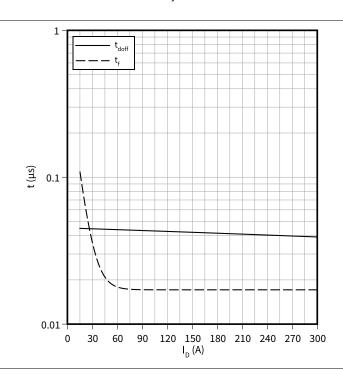
 $t = f(I_D)$

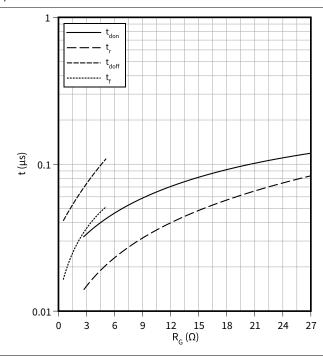
 R_{Goff} = 0.51 Ω , V_{DD} = 600 V, T_{vj} = 175 °C, V_{GS} = -3/18 V

Switching times (typical), MOSFET

 $t = f(R_G)$

 V_{DD} = 600 V, t_{dead} = 1000 ns, I_D = 150 A, T_{vj} = 175 °C, V_{GS} = -3/18 V





EasyDUAL module

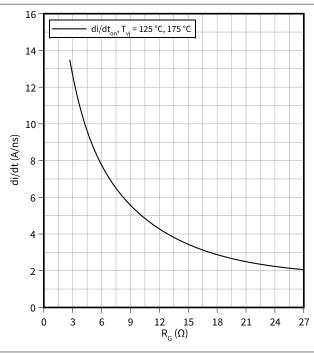


5 Characteristics diagrams

Current slope (typical), MOSFET

 $di/dt = f(R_G)$

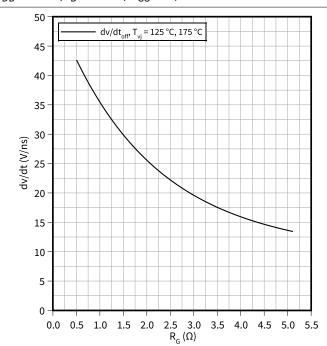
 V_{DD} = 600 V, t_{dead} = 1000 ns, I_{D} = 150 A, V_{GS} = -3/18 V



Voltage slope (typical), MOSFET

 $dv/dt = f(R_G)$

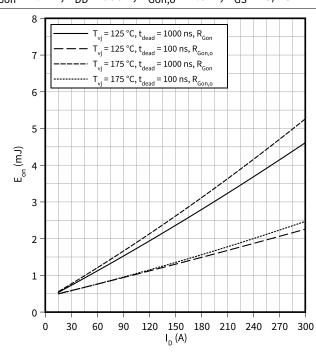
 $V_{DD} = 600 \text{ V}, I_D = 150 \text{ A}, V_{GS} = -3/18 \text{ V}$



Switching losses (typical), MOSFET

 $E_{on} = f(I_D)$

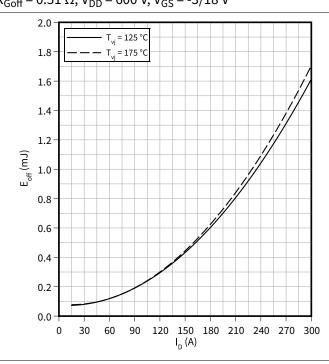
 R_{Gon} = 2.7 Ω , V_{DD} = 600 V, $R_{Gon,o}$ = 1.5 Ω , V_{GS} = -3/18 V



Switching losses (typical), MOSFET

 $E_{off} = f(I_D)$

 $R_{Goff} = 0.51 \Omega$, $V_{DD} = 600 V$, $V_{GS} = -3/18 V$



EasyDUAL module

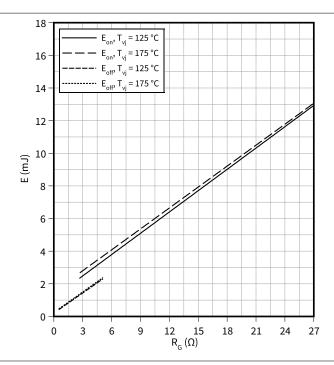
5 Characteristics diagrams



Switching losses (typical), MOSFET

 $E = f(R_G)$

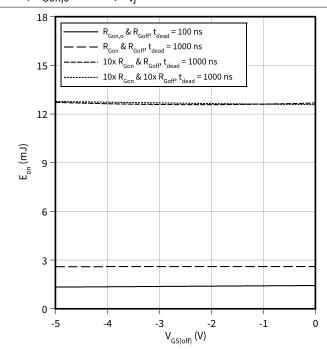
 V_{DD} = 600 V, t_{dead} = 1000 ns, I_{D} = 150 A, V_{GS} = -3/18 V



Switching losses (typical), MOSFET

 $E_{on} = f(V_{GS(off)})$

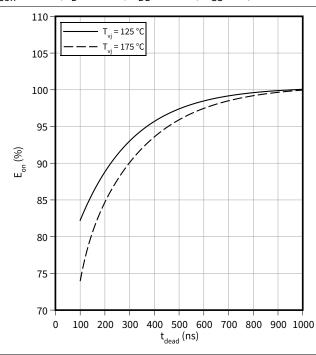
 R_{Goff} = 0.51 Ω , V_{DD} = 600 V, R_{Gon} = 2.7 Ω , $V_{GS(on)}$ = 18 V, I_{D} = 150 A, $R_{Gon,o}$ = 1.5 Ω , T_{vj} = 175 °C



Switching losses (typical), MOSFET

 $E_{on} = f(t_{dead})$

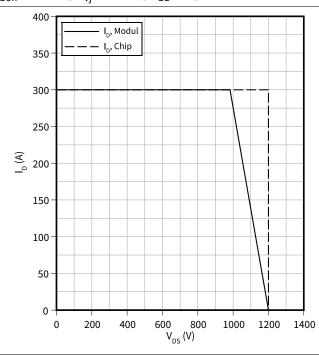
 $R_{Gon} = 2.7 \Omega$, $I_D = 150 A$, $V_{DD} = 600 V$, $V_{GS} = -3/18 V$



Reverse bias safe operating area (RBSOA), MOSFET

 $I_D = f(V_{DS})$

 $R_{Goff} = 0.51 \Omega$, $T_{vj} = 175 \, ^{\circ}C$, $V_{GS} = -3/18 \, V$



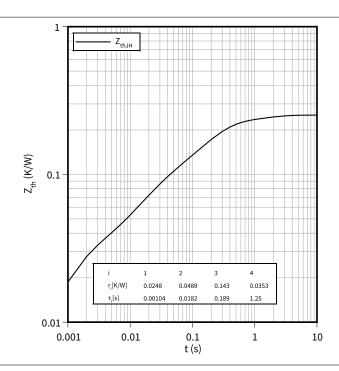
EasyDUAL module

5 Characteristics diagrams



Transient thermal impedance, MOSFET

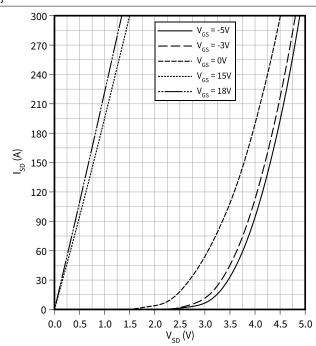
$$Z_{th} = f(t)$$



Forward characteristic body diode (typical), MOSFET

$$I_{SD} = f(V_{SD})$$

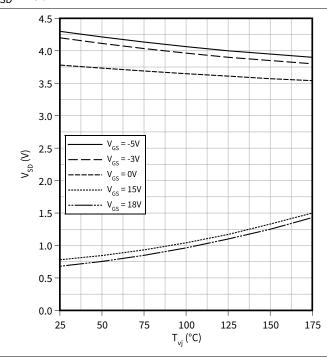
$$T_{vj} = 25 \, ^{\circ}C$$



Forward voltage of body diode (typical), MOSFET

$$V_{SD} = f(T_{vj})$$

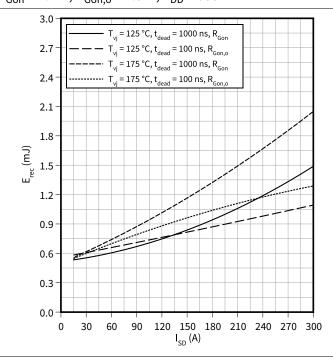
$$I_{SD} = 150 A$$



Switching losses body diode (typical), MOSFET

$$E_{rec} = f(I_{SD})$$

$$R_{Gon}$$
 = 2.7 Ω , $R_{Gon,o}$ = 1.5 Ω , V_{DD} = 600 V



EasyDUAL module

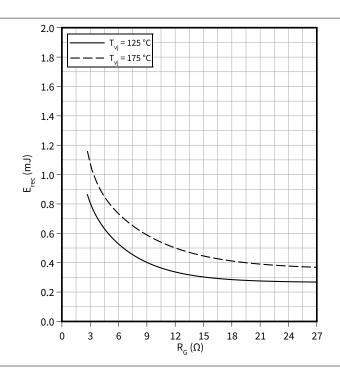
5 Characteristics diagrams



Switching losses body diode (typical), MOSFET

 $E_{rec} = f(R_G)$

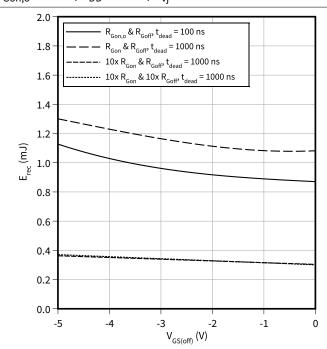
 t_{dead} = 1000 ns, I_{SD} = 150 A, V_{DD} = 600 V



Switching losses body diode (typical), MOSFET

 $E_{rec} = f(V_{GS(off)})$

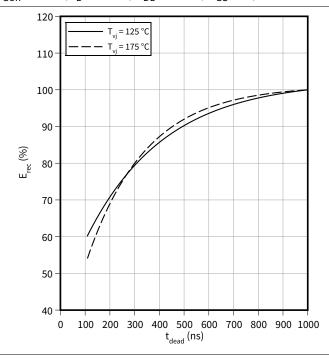
 R_{Goff} = 0.51 $\Omega,\,R_{Gon}$ = 2.7 $\Omega,\,V_{GS(on)}$ = 18 V, I_{SD} = 150 A, $R_{Gon,o}$ = 1.5 $\Omega,\,V_{DD}$ = 600 V, T_{vj} = 175 °C



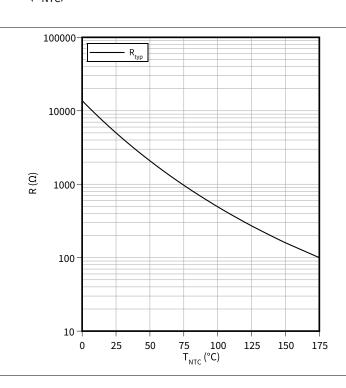
Switching losses body diode (typical), MOSFET

 $E_{rec} = f(t_{dead})$

 $R_{Gon} = 2.7 \Omega$, $I_D = 150 A$, $V_{DD} = 600 V$, $V_{GS} = -3/18 V$



Temperature characteristic (typical), NTC-Thermistor R = f(T_{NTC})



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6 Circuit diagram

Circuit diagram 6

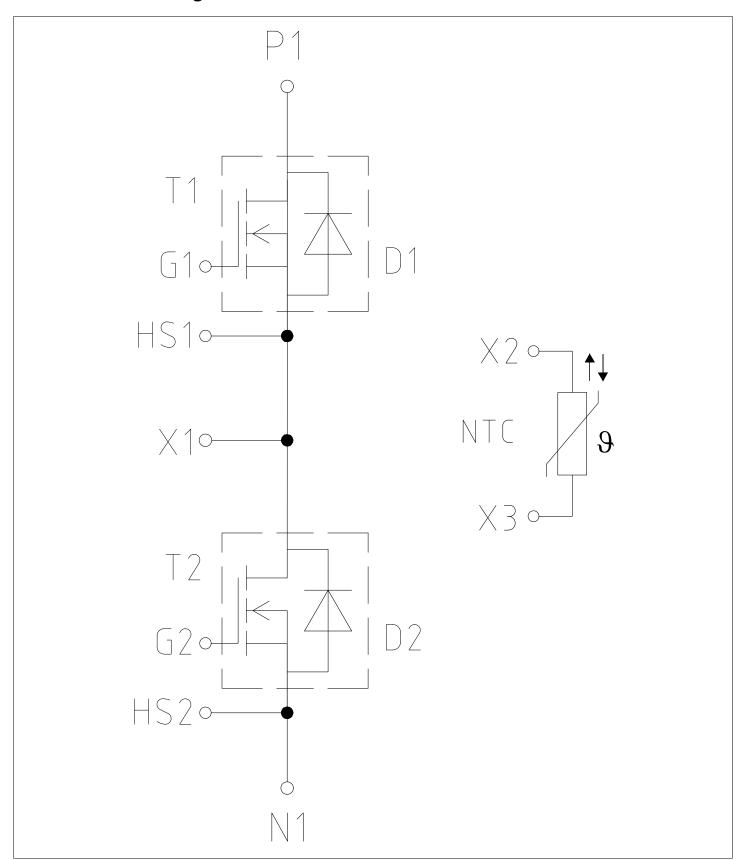


Figure 1



7 Package outlines

7 Package outlines

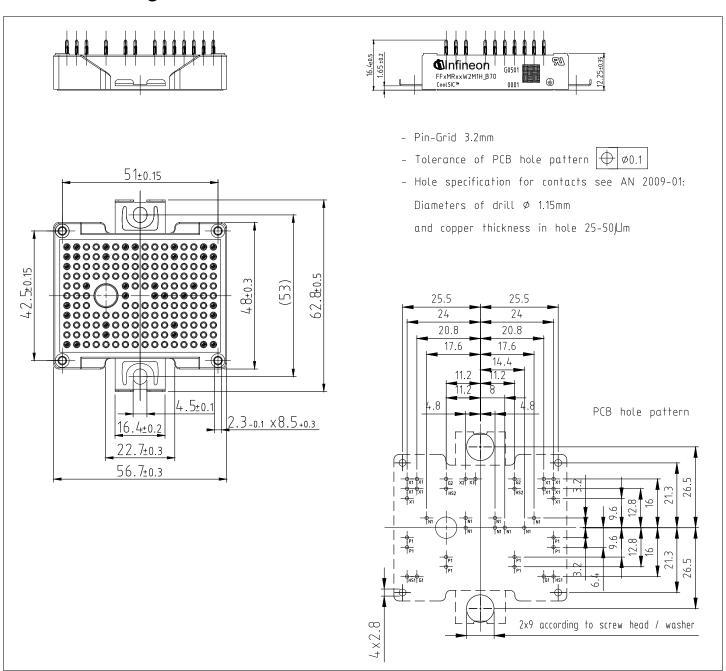


Figure 2

EasyDUAL module

8 Module label code



8 Module label code

Code format	de format Data Matrix			 Code128	
Code format	Data Matrix		Darcoue		
Encoding	ASCII text		Code Set A	A	
Symbol size	16x16		23 digits		
Standard	IEC24720 and IEC16022		IEC8859-1	-	
Code content	Content	Digit		Example	
	Module serial number	1-5		71549	
	Module material number	6 - 11		142846	
	Production order number	12 - 19		55054991	
	Date code (production year)	20 – 21		15	
	Date code (production week)	22 – 23		30	
Example	MANUFACTURE V				
				88 88 1 88 8 1 88 1 8 1 8 8	
	71549142846550549911530		71549142846550549911530		

Figure 3

EasyDUAL module

Revision history



Revision history

Document revision	Date of release	Description of changes
0.20	2023-05-12	Preliminary datasheet
1.00	2025-03-14	Final datasheet

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