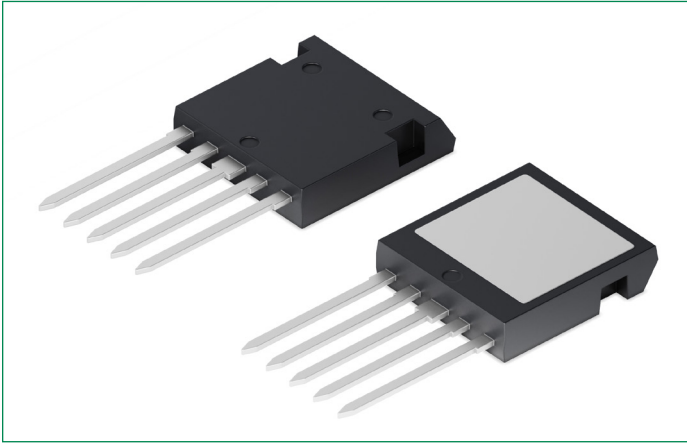


MXB12R600DPHFC

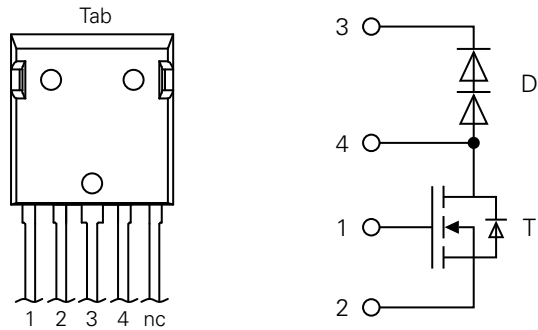
600 V, 160 mΩ, 18 A X2-Class Power MOSFET with Co-Pack FRED Diode

Boost Configuration

E72873



Pinout Diagram (ISOPLUS i4-PAC™)



1: Gate; **2:** Source; **3:** Cathode; **4:** Drain/Anode

Tab: Electrically Isolated

Features & Benefits:

- MOSFET
 - Low $R_{DS(ON)}$ and Q_G
 - Fast Switching
 - Robust Design
 - Avalanche Rated
- HiPerDynFRED
 - High Performance Dynamic Fast Recovery Diode
 - Consisting of series connected diodes
 - Enhanced dynamic behavior for high frequency operation

Applications:

- Power Factor Correction (PFC)
- Switch - Mode Power Supplies (SMPS)
- Uninterruptible Power Supplies (UPS)

Package:

- Isolation Voltage: 2500 V~
- RoHS Compliant
- Epoxy Meets UL 94V-0
- Soldering Pins for PCB Mounting
- Backside: DCB Ceramic
- Low Drain to Tab Capacitance (< 40 pF)

Product Summary

Characteristic	Value	Unit
I_{D25}	18	A
V_{DSS}	600	V
$R_{DS(on)max}$	160	mΩ

MOSFET T

Symbol	Characteristics	Conditions		Value			Unit	
				Min.	Typ.	Max.		
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA, T _{VJ} = 25°C		650	–	–	V	
V _{GS}	Gate-Source Voltage	Continuous	T _{VJ} = 25°C	–30	–	30	V	
		Transient		–40	–	40	V	
I _{D25}	Continuous Drain Current	V _{GS} = 10 V	T _C = 25°C	–	–	18	A	
I _{D90}			T _C = 90°C	–	–	12.5	A	
I _{D110}			T _C = 110°C	–	–	10	A	
P _D	Power Dissipation	T _C = 25°C, T _{VJ} = 150°C		–	–	130	W	
E _{AS}	Non-Repetitive Avalanche Energy	I _D = 12 A		–	–	600	mJ	
dv/dt	Rate of Rise of Voltage	I _S ≤ 24 A, V _{DS} ≤ 650 V	T _{VJ} ≤ 25°C	–	–	50	V/ns	
R _{DS(on)}	Drain-Source On-State Resistance	I _D = 11 A; V _{GS} = 10 V	T _{VJ} = 25°C	–	–	160	mΩ	
			T _{VJ} = 125°C	–	320	–		
V _{GS(th)}	Gate Threshold Voltage	I _D = 1.5 mA; V _{DS} = V _{GS}	T _{VJ} = 25°C	3.5	–	5.0	V	
I _{DSS}	Drain-Source Leakage Current	V _{DS} = V _{DSS} ; V _{GS} = 0 V	T _{VJ} = 25°C	–	–	10	μA	
			T _{VJ} = 125°C	–	–	1.5	mA	
I _{GSS}	Gate-Source Leakage Current	V _{DS} = 0 V; V _{GS} = ±30 V		–100	–	100	nA	
R _{G(int)}	Internal Gate Resistance	–		–	1.0	–	Ω	
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 25 V, f = 1 MHz	T _{VJ} = 25°C	–	2190	–	pF	
C _{oss}	Output Capacitance			–	1450	–		
C _{rss}	Reverse Transfer Capacitance			–	1.3	–		
Q _g	Total Gate Charge	V _{DS} = 320 V, I _D = 11 A, V _{GS} = 10 V	T _{VJ} = 25°C	–	37	–	nC	
Q _{gs}	Gate-Source Charge			–	12	–		
Q _{gd}	Gate-Drain (Miller) Charge			–	14	–		
t _{d(on)}	Turn-on Delay Time	Inductive Switching V _{DS} = 300 V, I _D = 11 A, V _{GS} = 10 V, R _{G(ext)} = 33 Ω	T _{VJ} = 25°C	–	65	–	ns	
			T _{VJ} = 125°C	–	65	–		
t _r	Current Rise Time		T _{VJ} = 25°C	–	70	–	ns	
			T _{VJ} = 125°C	–	65	–		
t _{d(off)}	Turn-off Delay Time		T _{VJ} = 25°C	–	95	–	ns	
			T _{VJ} = 125°C	–	110	–		
t _f	Current Fall Time		T _{VJ} = 25°C	–	30	–	ns	
			T _{VJ} = 125°C	–	30	–		
E _{on}	Turn-on Energy per Pulse		T _{VJ} = 25°C	–	0.26	–	mJ	
			T _{VJ} = 125°C	–	0.35	–		
E _{off}	Turn-off Energy per Pulse		T _{VJ} = 25°C	–	0.05	–	mJ	
			T _{VJ} = 125°C	–	0.06	–		
T _{VJ,op}	Virtual Junction Temperature	–		–40	–	150	°C	
R _{th, JC}	Thermal Resistance, junction-to-case	–		–	–	0.95	K/W	
R _{th, JH}	Thermal Resistance, junction-to-heatsink	With heatsink compound λ = 0.67 W/mK		–	1.3	–	K/W	

Source-Drain Diode of MOSFET T

Symbol	Characteristics	Conditions		Value			Unit
				Min.	Typ.	Max.	
V _{SD}	Forward Voltage Drop	I _F = 24 A, V _{GS} = 0 V	T _{VJ} = 25°C	–	1.0	1.4	V
t _{rr}	Reverse Recovery Time	I _F = 12 A, V _r = 100 V, –di _F /dt = 100 A/μs,	T _{VJ} = 25°C	–	145	–	ns
Q _{rr}	Reverse Recovery Charge			–	0.89	–	μC
I _{rr}	Reverse Recovery Current			–	12	–	A
T _{VJ,op}	Virtual Junction Temperature	–		–40	–	150	°C

HiPerDynFRED D (Data for Series Connection)

Symbol	Characteristics	Conditions		Value			Unit	
				Min.	Typ.	Max.		
V _{RSM}	Non-repetitive Peak Reverse Voltage	—		—	—	600	V	
V _{RRM}	Repetitive Peak Reverse Voltage	T _{VJ} = 25°C		—	—	600	V	
I _R	Leakage Current	V _R = V _{RRM}	T _{VJ} = 25°C	—	—	1	μA	
			T _{VJ} = 150°C	—	—	0.08	mA	
V _F	Forward Voltage	I _F = 11 A	T _{VJ} = 25°C	—	—	2.30	V	
		I _F = 20 A		—	—	2.60		
		I _F = 11 A	T _{VJ} = 150°C	—	—	1.76	V	
		I _F = 20 A		—	—	2.10		
I _{FAV}	Average Forward Current	T _C = 25°C	Rectangular, d = 0.5	T _{VJ} = 150°C	—	—	22	A
		T _C = 90°C			—	—	13	
		T _C = 110°C			—	—	9.5	
I _{F25}	Forward Current	Based on max. V _{F0} and r _F		T _C = 25°C	—	—	27	A
I _{F90}				T _C = 90°C	—	—	15	
I _{F110}				T _C = 110°C	—	—	11	
I _{FSM}	Non-repetitive Forward Surge Current	t = 10 ms, (50 Hz), sine		T _{VJ} = 45°C	—	—	150	A
V _{F0}	Threshold Voltage	For Power Loss Calculation	I _F = 11 A	T _{VJ} = 90°C	—	—	1.68	V
r _F	Slope Resistance			T _{VJ} = 125°C	—	—	1.52	V
			I _F = 11 A	T _{VJ} = 90°C	—	—	30.8	mΩ
				T _{VJ} = 125°C	—	—	31.8	mΩ
di/dt	Reverse Recovery Current Slope	V _{DS} = 300 V, I _D = 11 A Gate Drive of MOSFET T V _{GS} = 0/10 V R _{G(ext)} = 32 Ω		T _{VJ} = 125°C	—	150	—	A/μs
Q _{rr}	Reverse Recovery Charge				—	0.18	—	μC
I _{rr}	Reverse Recovery Current				—	5.9	—	A
t _{rr}	Reverse Recovery Time				—	60	—	ns
E _{rr}	Reverse Recovery Energy				—	4.2	—	μJ
T _{VJ,op}	Virtual Junction Temperature	—		—40	—	150	°C	
R _{th, JC}	Thermal Resistance, junction-to-case	—		—	—	2	K/W	
R _{th, JH}	Thermal Resistance, junction-to-heatsink	With heatsink compound λ = 0.67 W/mK		—	2.5	—	K/W	

Package i4-Pac

Symbol	Characteristics	Conditions		Value			Unit
				Min.	Typ.	Max.	
I _{RMS}	RMS Current	—		—	—	70	A
T _{op}	Operation Temperature	—		−40	—	125	°C
T _{stg}	Storage Temperature	—		−40	—	150	°C
F _C	Mounting Force with Clip	—		20	—	120	N
d _{Spp/App} d _{Spb/Apb}	Creepage Distance on Surface / Clearance Distance Through Air	Terminal to Terminal	between Pin 1 to 2	1.9	—	—	mm
			between Pin 4 to 5				
			between Pin 2 to 3	2.28	—	—	mm
			between Pin 3 to 4				
	Clearance Distance Through Air	Terminal to Backside Plane	For All Terminals	2.8	—	—	mm
Creepage Distance on Surface	Terminal to Backside Tab	6		—	—	mm	
V _{ISOL}	Isolation Voltage	50/60 Hz, I _{ISOL} ≤ 1 mA, t = 1 min		—	2500	—	V
		50/60 Hz, I _{ISOL} ≤ 1 mA, t = 1 s		—	3000	—	V
m	Weight			—	9	—	g

MOSFET T

Fig. 1. Drain-Source Breakdown Voltage V_{DS} vs. Junction Temperature T_{VJ}

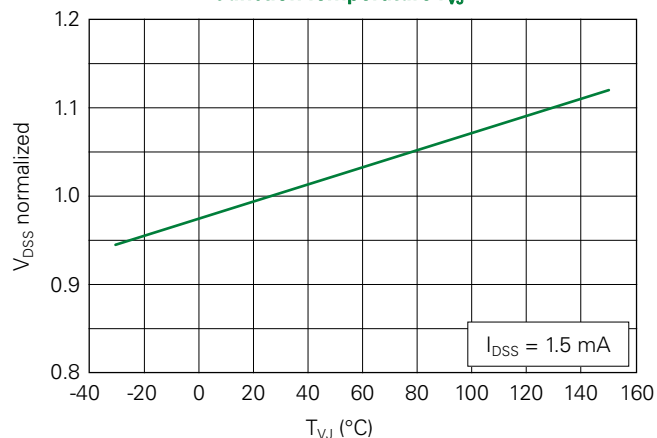


Fig. 2. Typical Transfer Characteristics

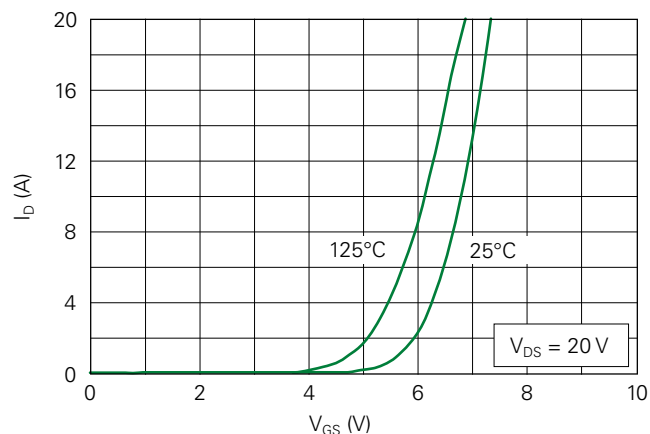


Fig. 3. Typical Output Characteristics ($T_{VJ} = 25^\circ$)

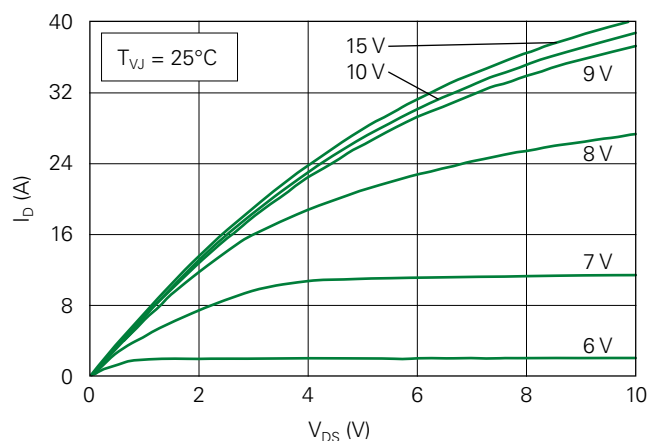


Fig. 4. Typical Output Characteristics ($T_{VJ} = 125^\circ$)

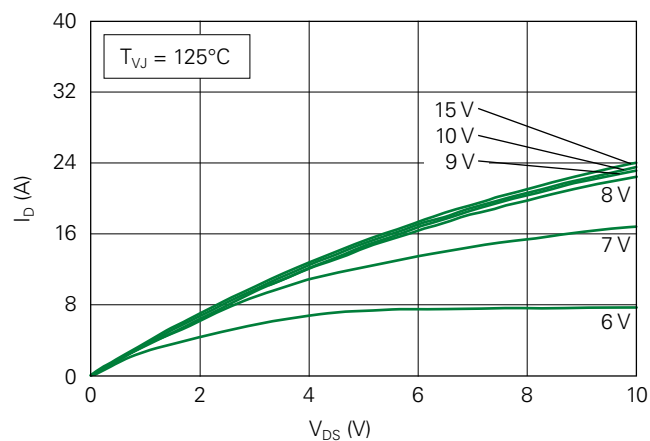


Fig. 5. Drain-Source On-state Resistance $R_{DS(on)}$ vs. Junction Temperature T_{VJ}

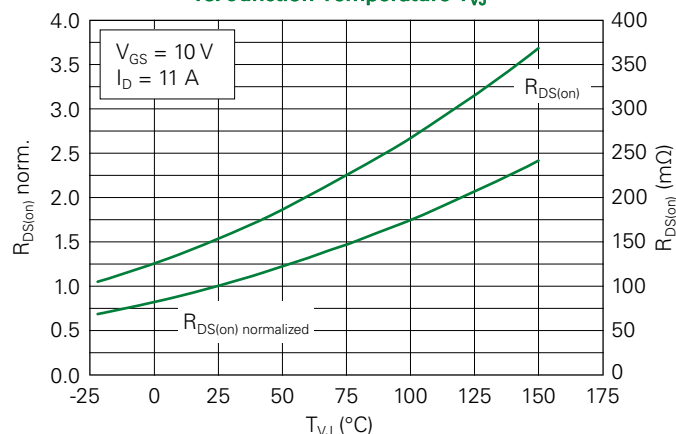
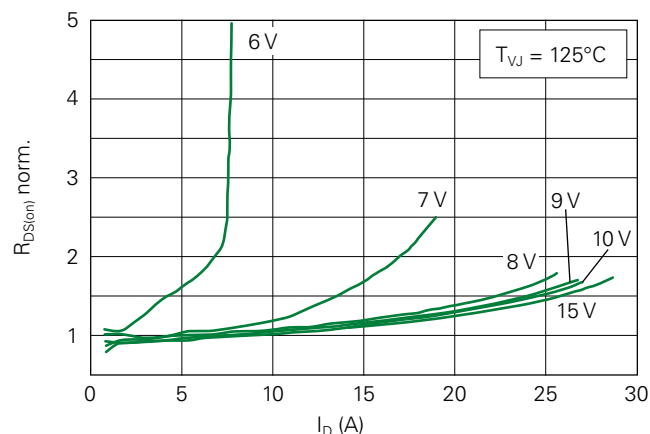


Fig. 6. Drain-Source On-state Resistance $R_{DS(on)}$ vs. I_D



MOSFET T

Fig. 7. Source Current I_S vs. Source Drain Voltage V_{SD} (Body Diode)

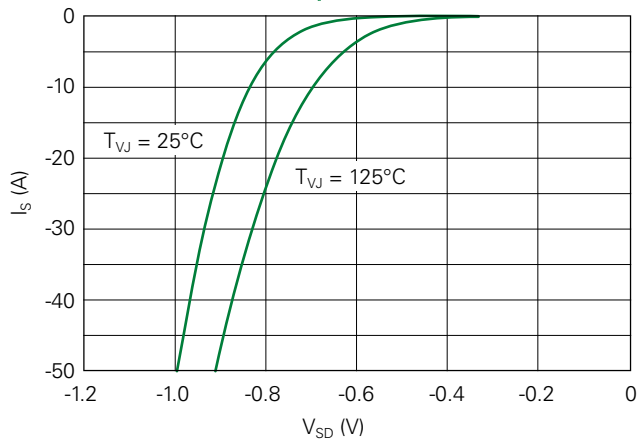


Fig. 8. Typical Gate Charge

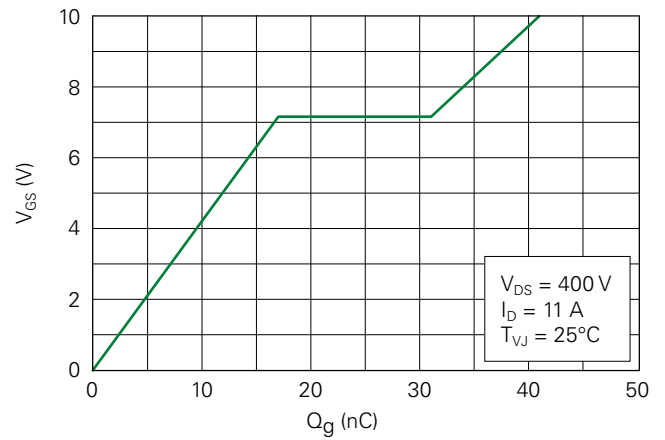


Fig. 9. Typical Turn-on Energy and Switching Times vs. Temperature, Inductive Switching on Diode D

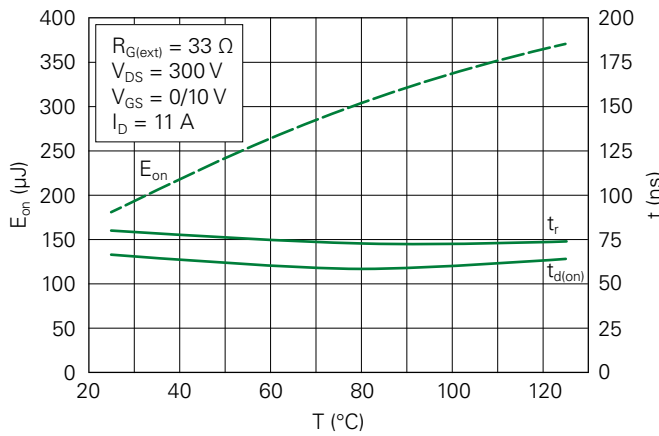


Fig. 10. Typical Turn-off Energy and Switching Times vs. Temperature, Inductive Switching of Diode D

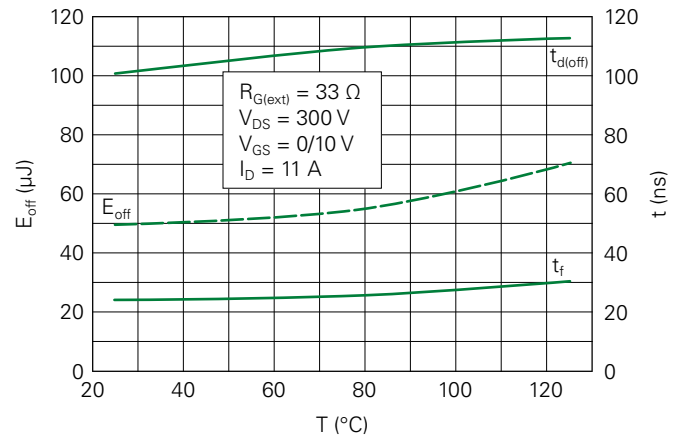


Fig. 11. Typical Turn-on Energy and Switching Times vs. Gate Resistance, Inductive Switching

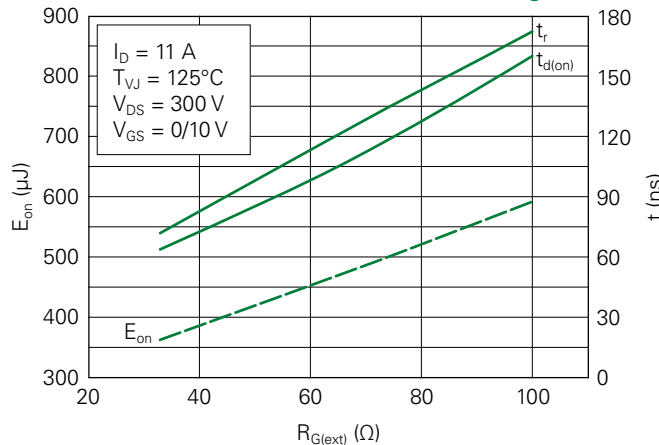
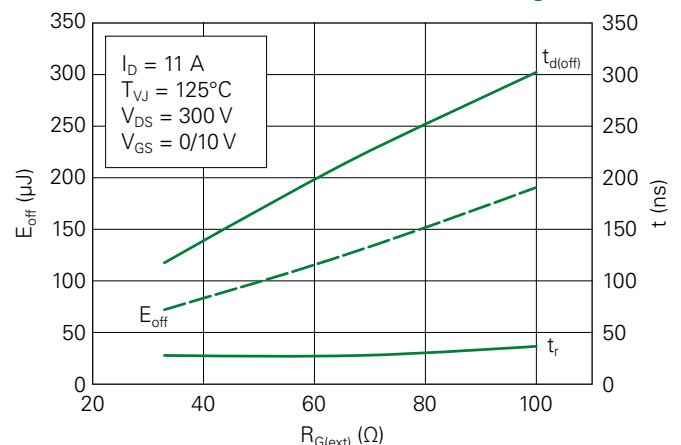


Fig. 12. Typical Turn-off Energy and Switching Times vs. Gate Resistance, Inductive Switching



MOSFET T

Fig. 13. Typical Turn-on Energy and Switching Times vs. Drain Current, Inductive Switching

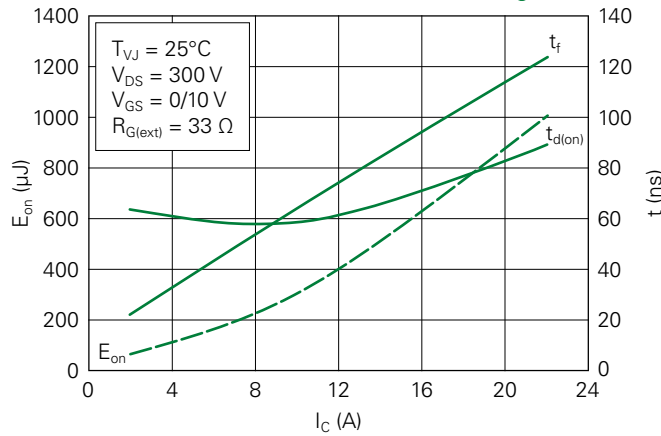


Fig. 14. Typical Turn-off Energy and Switching Times vs. Drain Current, Inductive Switching

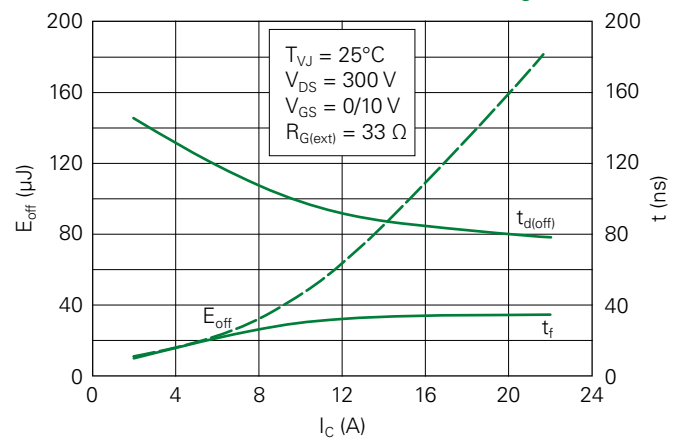


Fig. 15. Typical Turn-on Energy and Switching Times vs. Drain Current, Inductive Switching

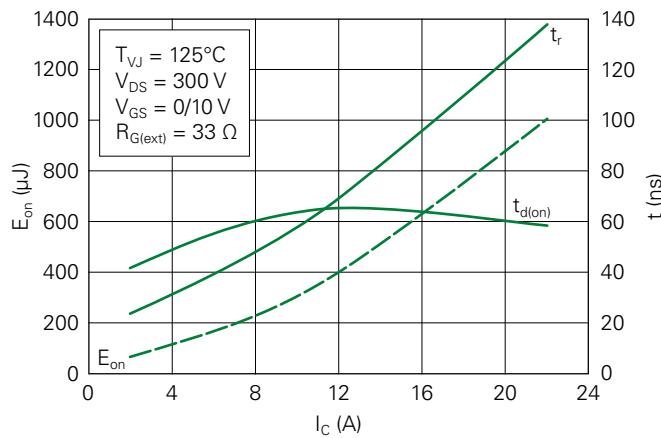


Fig. 16. Typical Turn-off Energy and Switching Times vs. Drain Current, Inductive Switching

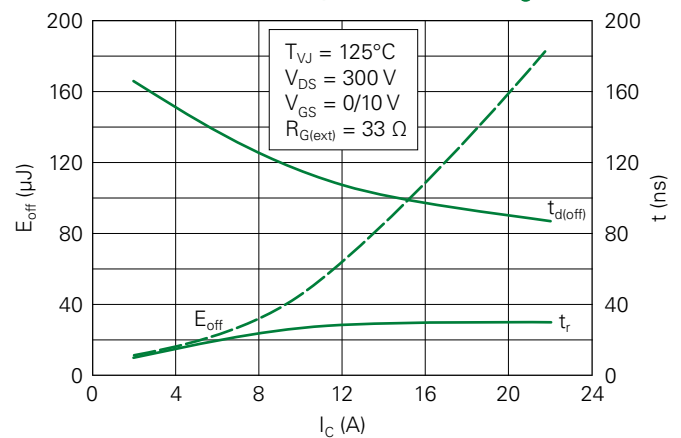
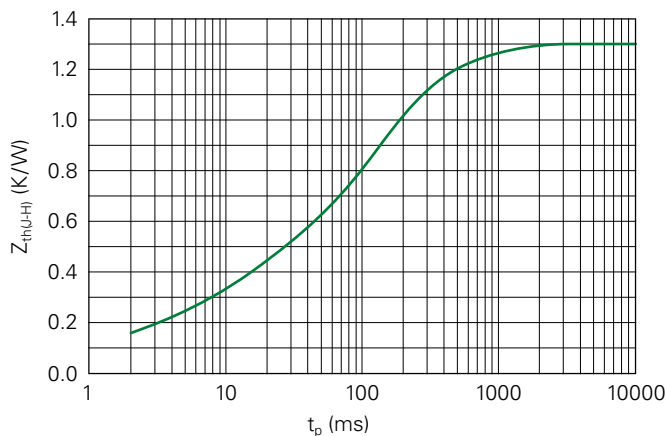


Fig. 17. Typical Transient Thermal Impedance



Diode D

Fig. 18. Reverse Recovery Energy E_{rr} and Charge Q_{rr} vs. Forward Current

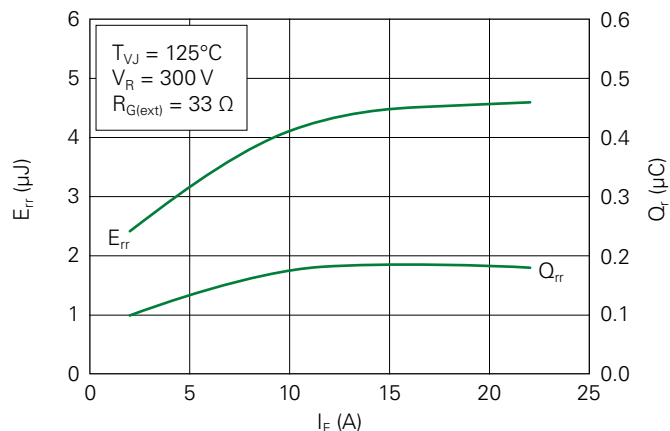


Fig. 19. Reverse Recovery Current I_{rrm} and Reverse Recovery Time t_{rr} vs. Forward Current

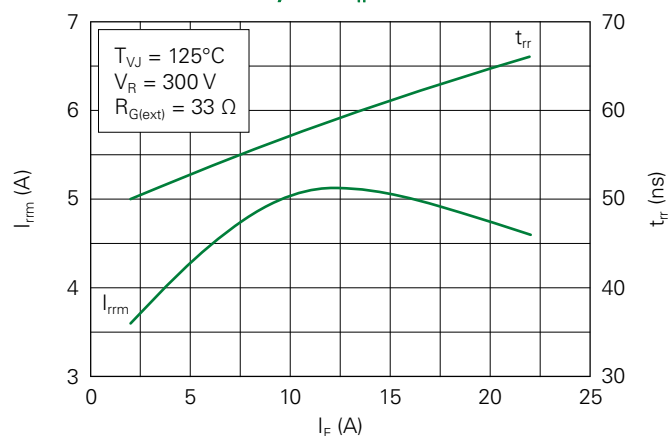


Fig. 20. Reverse Recovery Current Energy E_{rr} and Charge Q_{rr} vs. Commutation di_F/dt

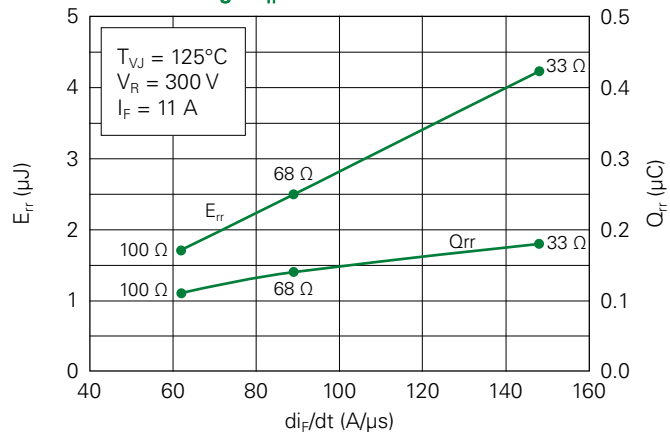


Fig. 21. Reverse Recovery Current I_{rrm} and Reverse Recovery Time t_{rr} vs. Commutation di_F/dt

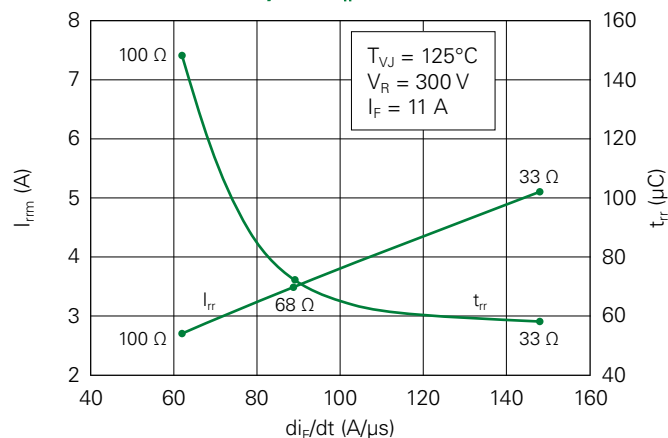


Fig. 22. Typical Forward Characteristics

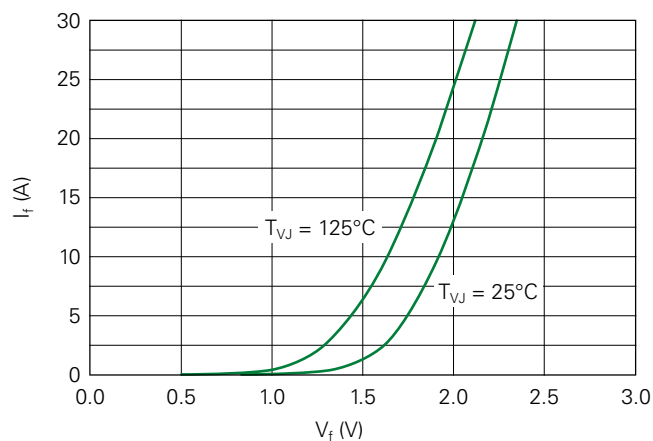
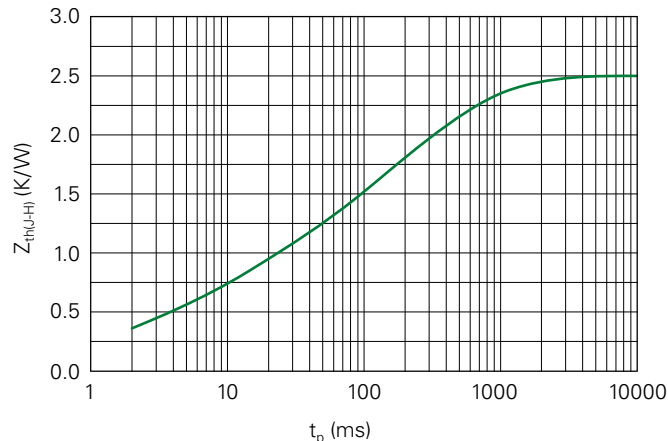
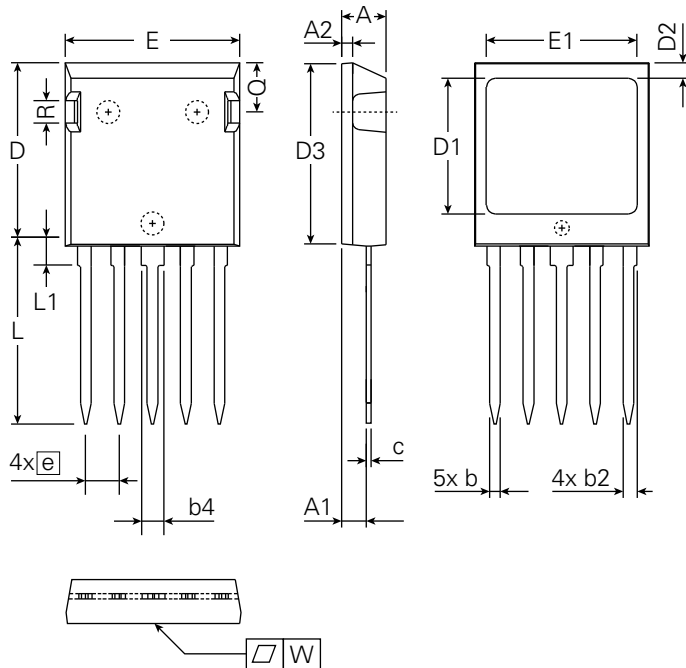


Fig. 23. Typical Transient Thermal Impedance



Part Outline Drawing (ISOPLUS i4-PAC™)

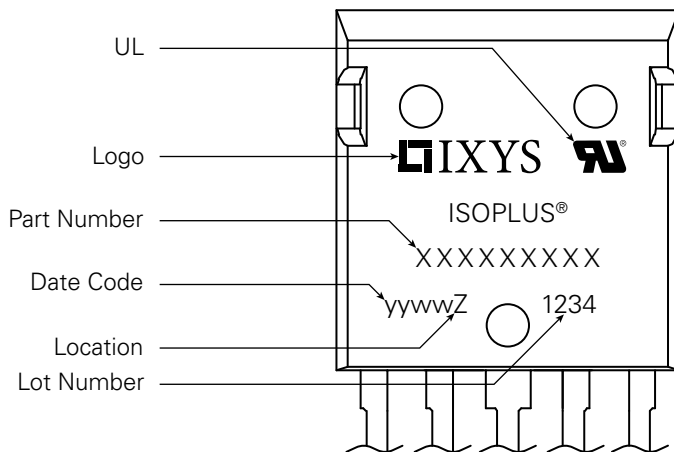


NOTE:

The convex bow of substrate is typ. < 0.05 mm over plastic surface level of device bottom side

Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max
A	0.190	–	0.205	4.83	–	5.21
A1	0.102	–	0.118	2.59	–	3.00
A2	0.046	–	0.085	1.17	–	2.16
b	0.045	–	0.055	1.14	–	1.40
b2	0.058	–	0.068	1.47	–	1.73
b4	0.100	–	0.110	2.54	–	2.79
c	0.020	–	0.029	0.51	–	0.74
D	0.819	–	0.840	20.80	–	21.34
D1	0.590	–	0.620	14.99	–	15.75
D2	0.065	–	0.080	1.65	–	2.03
D3	0.799	–	0.815	20.30	–	20.70
E	0.770	–	0.799	19.56	–	20.29
E1	0.660	–	0.690	16.76	–	17.53
e	0.150 BSC			3.81 BSC		
L	0.780	–	0.840	19.81	–	21.34
L1	0.083	–	0.102	2.11	–	2.59
Q	0.210	–	0.244	5.33	–	6.20
R	0.100	–	0.180	2.54	–	4.57
W	–	–	0.004	–	–	0.10

Part Number and Marking



M = MOSFET
 X = X-Class HipPerFET
 B = 2nd Gen
 12 = Current Rating (A)
 R = Boost
 600 = Reverse Voltage (V)
 DPH = HiPerDynFRED (Diode)
 FC = i4-Pac (5)

Ordering Information

Ordering	Part Number	Marking on Product	Delivering Mode	Base Quantity	Ordering Code
Standard	MXB12R600DPHFC	MXB12R600DPHFC	Tube	25	MXB12R600DPHFC

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Part of:

