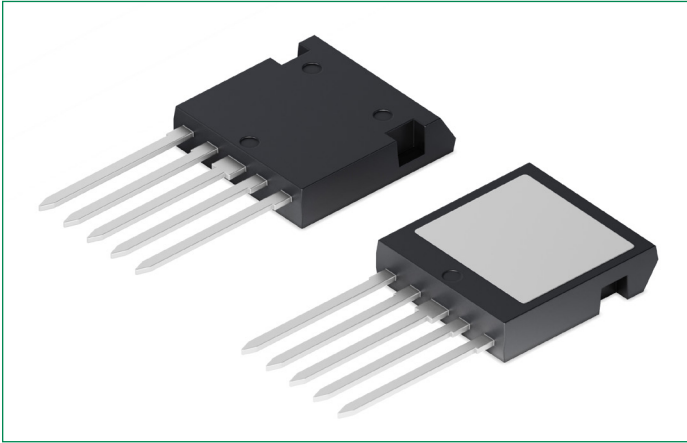


MXB12R600DPHFC

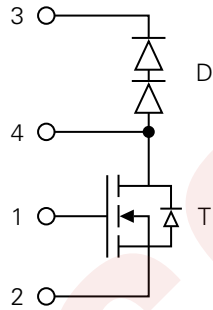
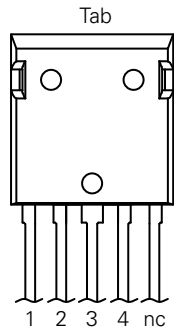
600 V, 160 mΩ, 18 A X2-Class Power MOSFET with Co-Pack FRED Diode

Boost Configuration

 E72873



Pinout Diagram (ISOPLUS i4-PAC™)



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

Tab: Electrically Isolated

Features:

- 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~
- Industry convenient Outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering Pins for PCB Mounting
- Backside: DCB Ceramic
- Reduced Weight
- Advanced Power Cycling
- 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 = 25°C	–	–	12.5	A	
I _{D110}			T _C = 25°C	–	–	10	A	
E _{AS}			Non-Repetitive Avalanche Energy		I _D = 12 A		–	–
d _V /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	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 = 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	–		
R _{th, JC}	Thermal Resistance, junction-to-case	–		–	–	0.95	K/W	
R _{th, JH}	Thermal Resistance, junction-to-heatsink	With Heatsink Compound, IXYS Test Setup		–	1.3	–	K/W	

Source-Drain Diode of MOSFET T

Symbol	Characteristics	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Forward Voltage Drop	$I_F = 24\text{ A}, V_{GS} = 0\text{ V}$	$T_{VJ} = 25^\circ\text{C}$	–	1.0	1.4 V
t_{rr}	Reverse Recovery Time	$I_F = 12\text{ A}, V_r = 100\text{ V},$ $-di_F/dt = 100\text{ A}/\mu\text{s},$	$T_{VJ} = 25^\circ\text{C}$	–	145	ns
Q_{rm}	Reverse Recovery Charge (Intrinsic Diode)			–	0.89	μC
I_{rm}	Reverse Recovery Current			–	12	A

HiPerDynFRED D (Data for Series Connection)

Symbol	Characteristics	Conditions		Value			Unit	
				Min.	Typ.	Max.		
V _{RSM}	Max. Non-repetitive Reverse Blocking Voltage	—		—	—	600	V	
V _{RRM}	Max. Repetitive Reverse Blocking Voltage	T _{VJ} = 25°C		—	—	600	V	
I _R	Reverse 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 Max 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
				T _{VJ} = 125°C	—	—	1.52	V
r _F	Slope Resistance		I _F = 11 A	T _{VJ} = 90°C	—	—	30.8	mΩ
				T _{VJ} = 125°C	—	—	31.8	mΩ
di/dt	Rate of Change of Current	V _{DS} = 300 V, I _D = 11 A Gate Drive of MOSFET T V _{GS} = 0/10 V R _G = 32 Ω		T _{VJ} = 125°C	—	150	—	A/μs
Q _{rm}	Reverse Recovery Charge				—	0.18	—	μC
I _{rm}	Reverse Recovery Current				—	5.9	—	A
t _{rr}	Reverse Recovery Time				—	60	—	ns
E _{rr}	Reverse Recovery Energy				—	4.2	—	μJ
R _{th, JC}	Thermal Resistance, junction-to-case	—			—	—	2	K/W
R _{th, JH}	Thermal Resistance, junction-to-heatsink	With Heatsink Compound, IXYS Test Setup			—	2.5	—	K/W

Package i4-Pac

Symbol	Characteristics	Conditions	Value			Unit
			Min.	Typ.	Max.	
I_{rms}	RMS Current	—	—	—	70	A
T_{VJ}	Virtual Junction Temperature	—	−40	—	150	$^{\circ}\text{C}$
T_{op}	Operation Temperature	—	−40	—	125	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	—	−40	—	150	$^{\circ}\text{C}$
F_C	Mounting Force with Clip	—	20	—	120	N
$d_{Spp/App}$	Creepage Distance on Surface	—	1.7	—	—	mm
$d_{Spb/Apb}$	Striking Distance through air	—	5.1	—	—	mm
V_{ISOL}	Isolation Voltage	50/60 Hz, $I_{ISOL} \leq 1\text{ mA}, t = 1\text{ min}$	—	2500	—	V
		50/60 Hz, $I_{ISOL} \leq 1\text{ mA}, t = 1\text{ s}$	—	3000	—	V
W	Weight	—	—	9	—	g

MOSFET T

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

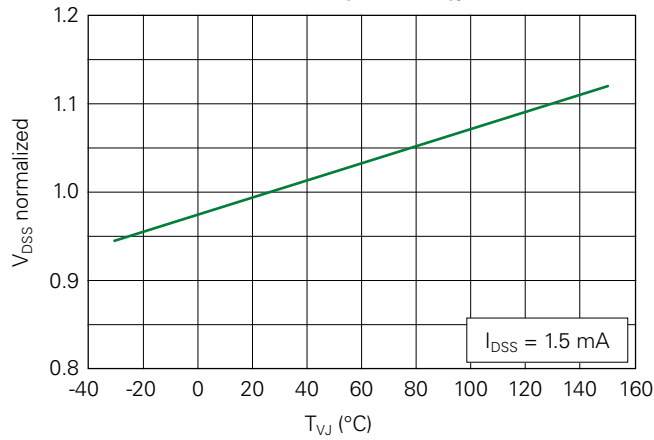


Fig. 2. Typical Transfer Characteristics

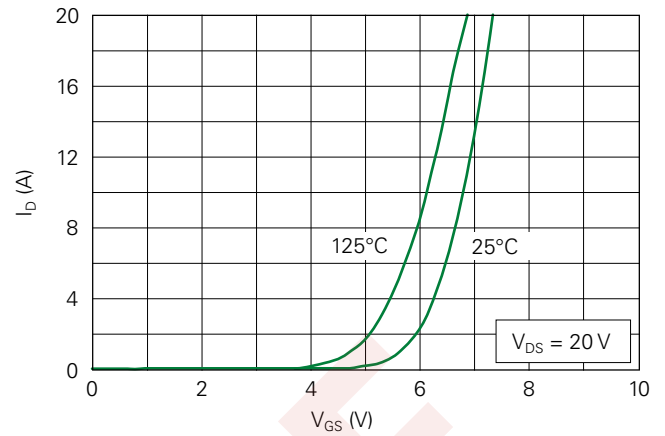


Fig. 3. Typical Output Characteristics ($T_{VJ} = 25^\circ\text{C}$)

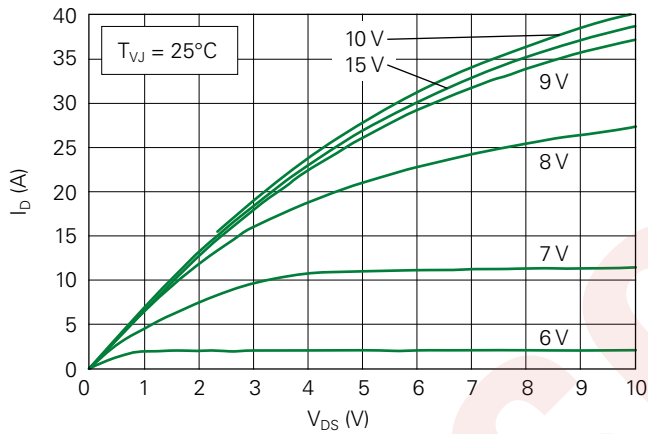


Fig. 4. Typical Output Characteristics ($T_{VJ} = 125^\circ\text{C}$)

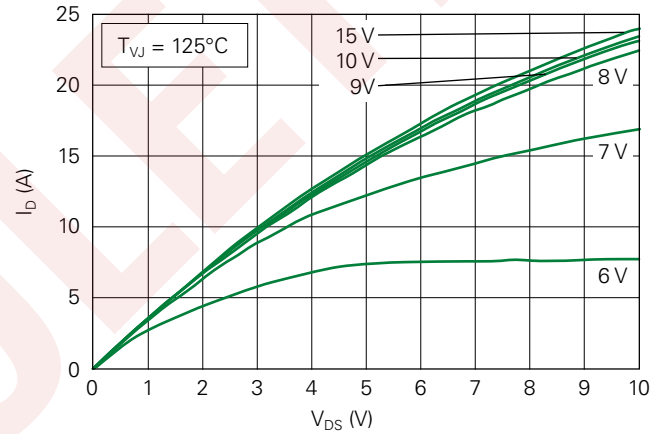


Fig. 5. Drain Source On-state Resistance $R_{DS(on)}$ vs. Junction Temperature T_{VJ}

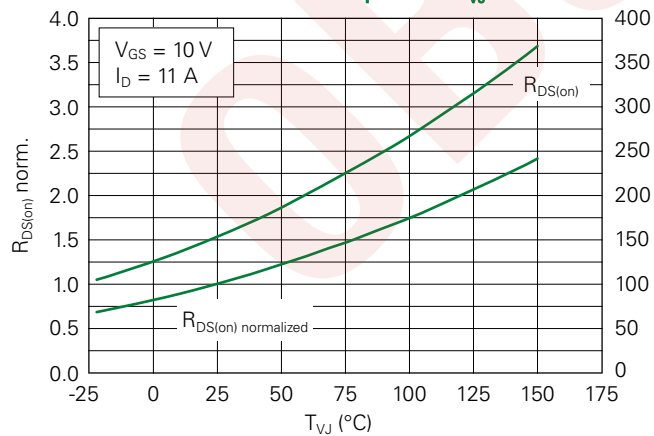
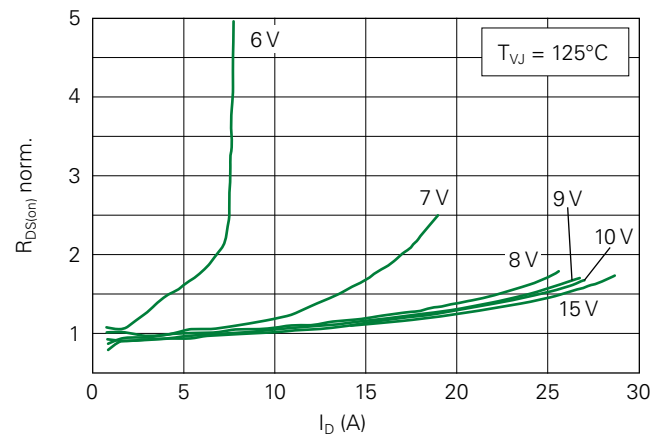


Fig. 6. Drain Source On-state Resistance $R_{DS(on)}$ vs. I_D



MOSFET T

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

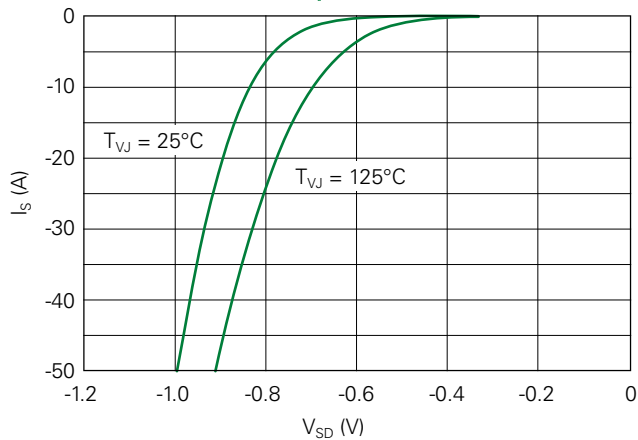


Fig. 8. Typical Gate Charge

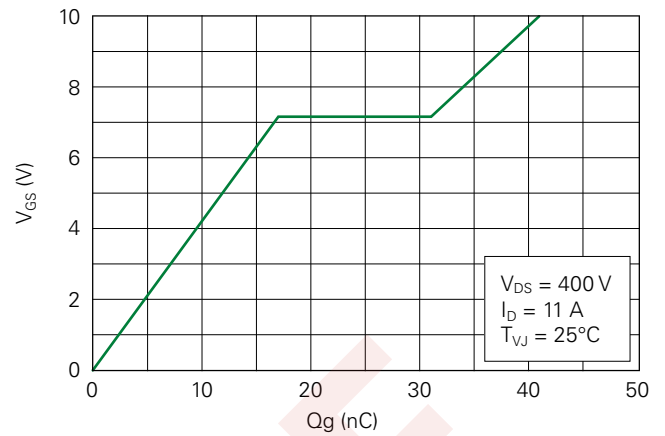


Fig. 9. Typical Turn-on Energy and Switching Times vs. Temperature, Inductive Switching on Diode D

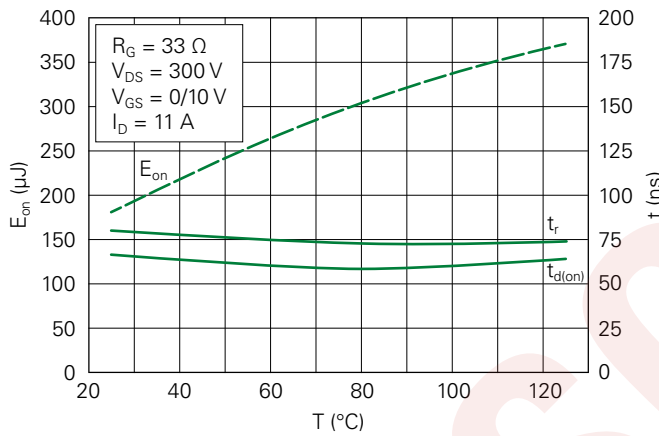


Fig. 10. Typical Turn-off Energy and Switching Times vs. Temperature, Inductive Switching of Diode D

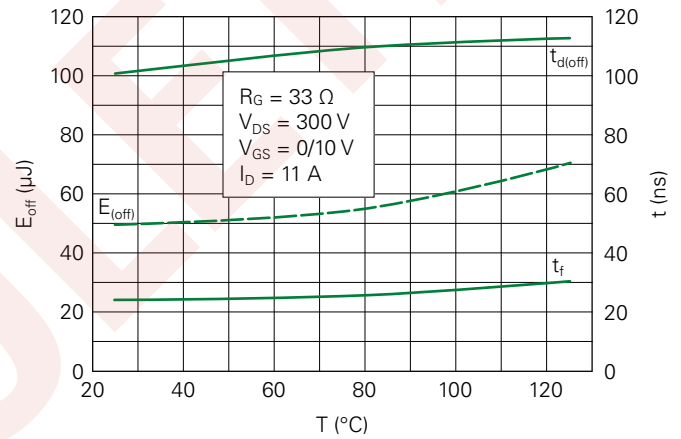


Fig. 11. Typical Turn-on Energy and Switching Times vs. Gate Resistance, Inductive Switching

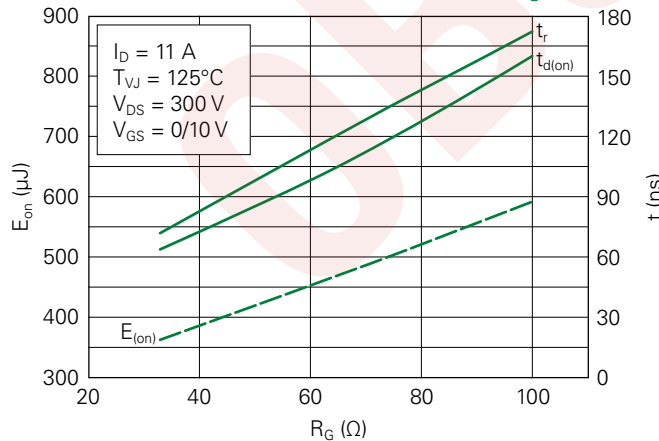
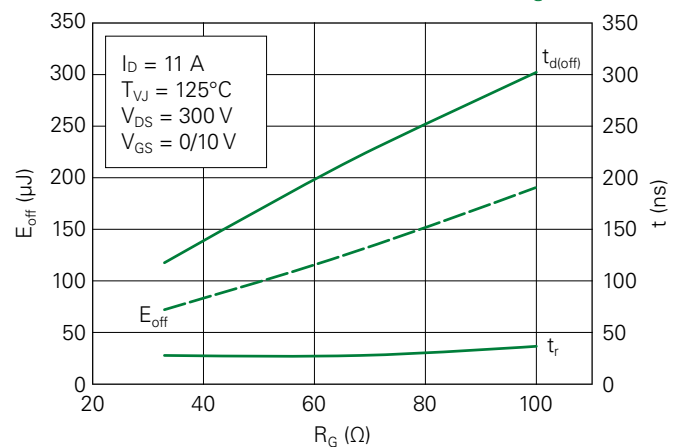


Fig. 12. Typical Turn-off Energy and Switching Times vs. Gate Resistance, Inductive Switching



MOSFET T

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

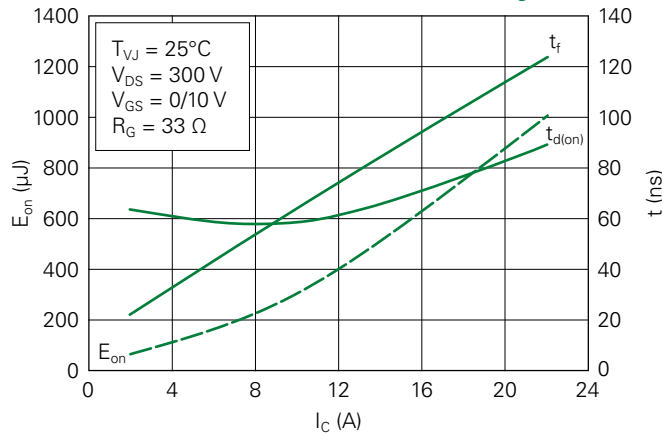


Fig. 14. Typical Turn-off Energy and Switching Times vs. Drain Current, Inductive Switching

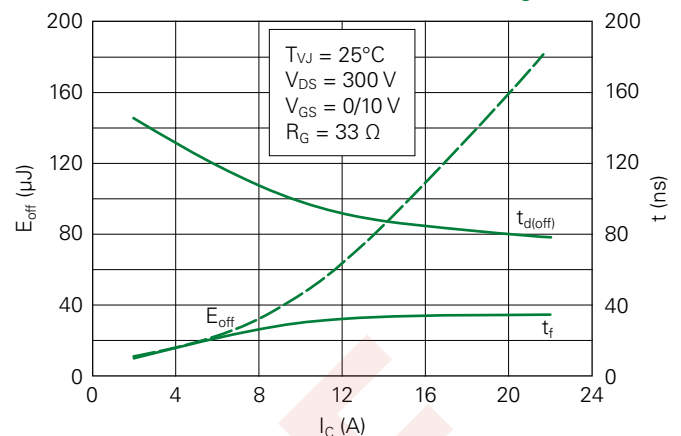


Fig. 15. Typical Turn-on Energy and Switching Times vs. Drain Current, Inductive Switching

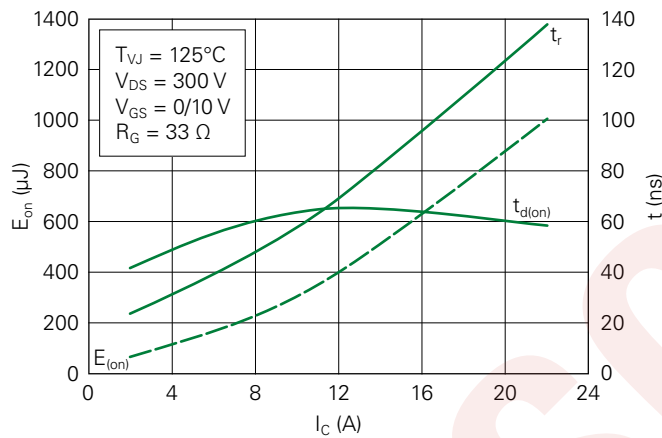


Fig. 16. Typical Turn-off Energy and Switching Times vs. Drain-current, Inductive Switching

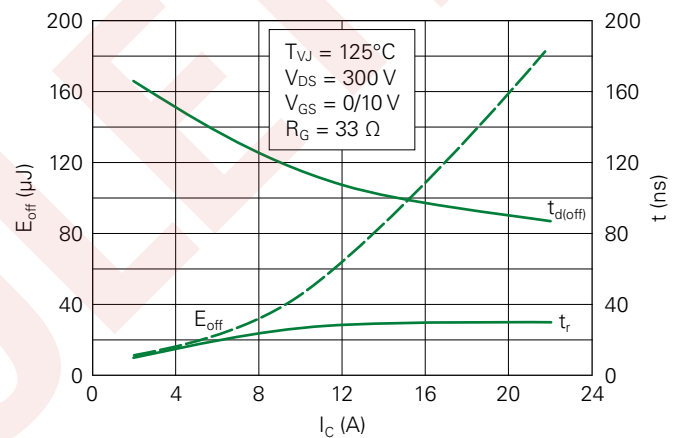
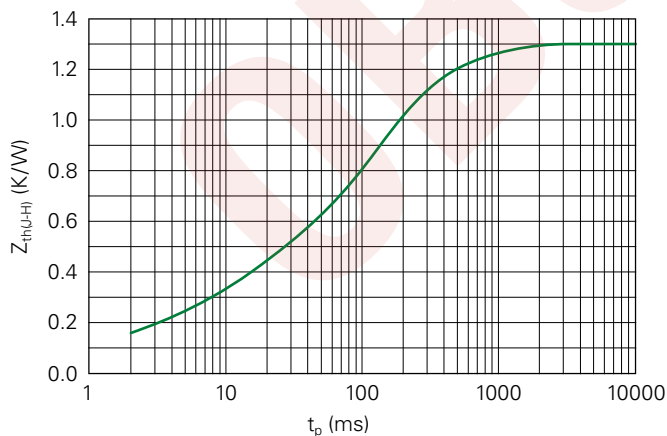


Fig. 17. Typical Transient Thermal Impedance



Diode D

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

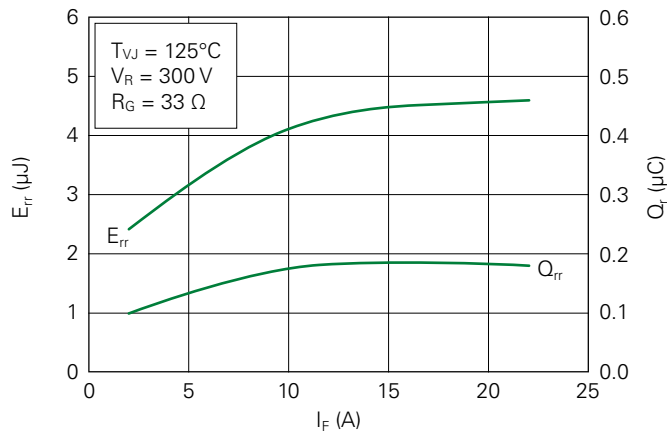


Fig. 19. Reverse Recovery Current I_{rrm} and Reverse Recovery Time t_{rr} vs. Forward Current

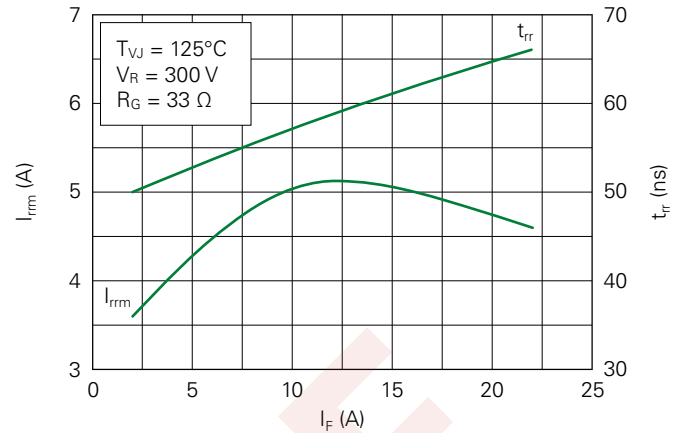


Fig. 20. Reverse Recovery Current Energy E_{rr} and Charge Q_{rr} vs. Commutation di_F/dt

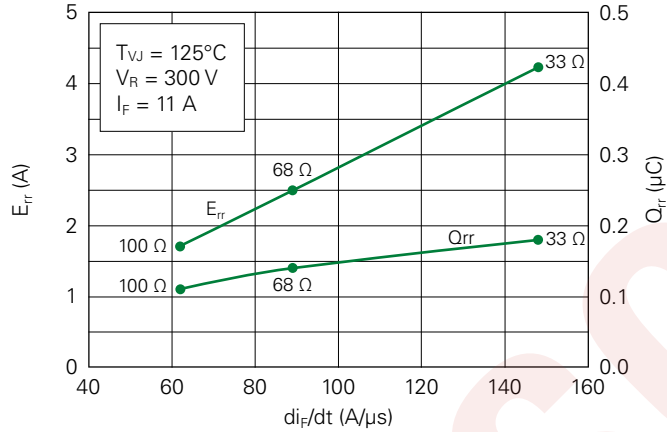


Fig. 21. Reverse Recovery Current I_{rrm} and Reverse Recovery Time t_{rr} vs. Commutation di_F/dt

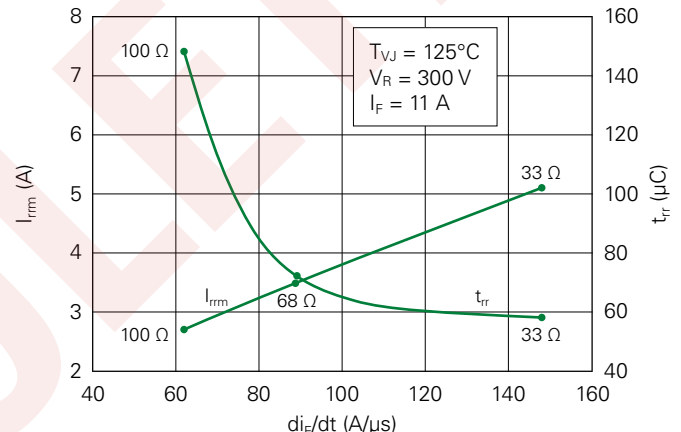


Fig. 22. Typical Forward Characteristics

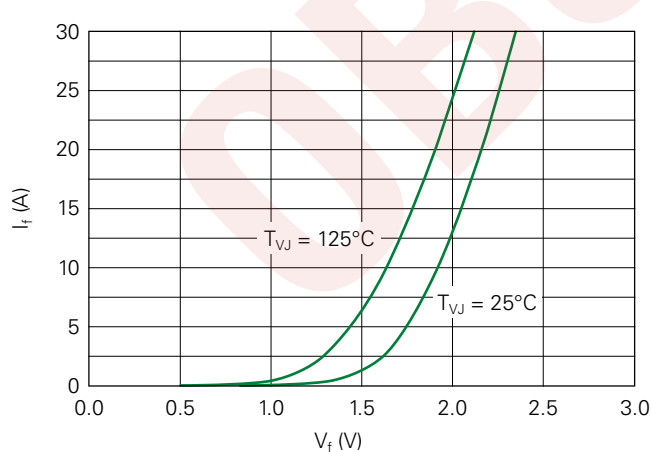
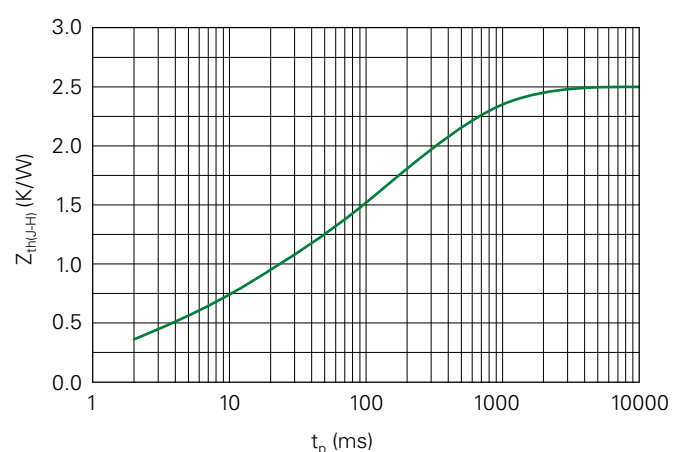
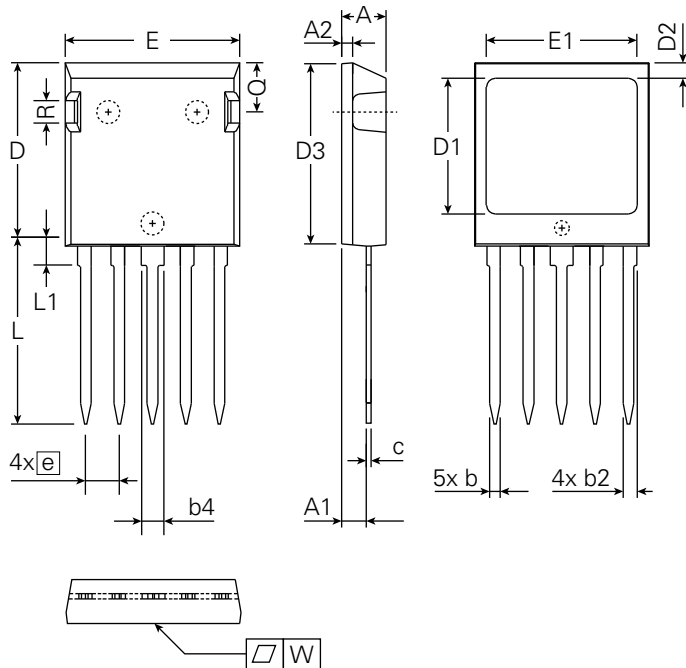


Fig. 23. Typical Transient Thermal Impedance



Part Outline Drawing (i4-Pac)

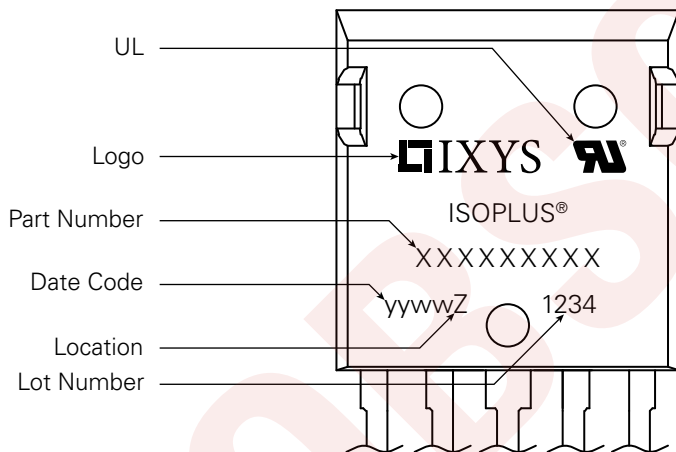


NOTE:

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

Disclaimer Notice

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at <http://www.littelfuse.com/disclaimer-electronics>.



Part of:

