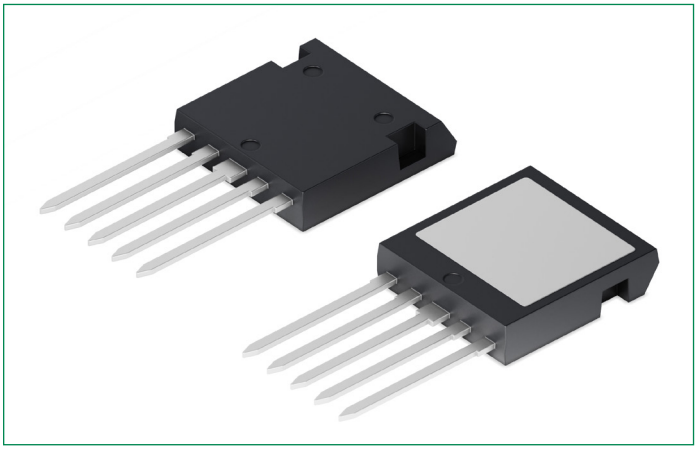
MXB12R600DPHFC

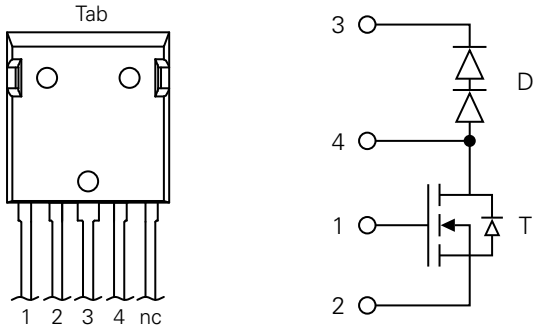
600 V, 160 mΩ, 18 A X2-Class Power MOSFET with Co-Pack FRED Diode

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 Suppies (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

© 2023 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: XZ 05/05/2023

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		–	–	600	mJ
d_V/dt	Rate of Rise of Voltage	$I_S \le 24$ A, $V_{DS} \le 650$ V	$T_{VJ} \le 25$°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 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_{rm}	Reverse Recovery Charge (Intrinsic Diode)			–	0.89	–	µC
I_{rm}	Reverse Recovery Current			–	12	–	A

© 2023 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: XZ 05/05/2023

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	°C
T_{op}	Operation Temperature	–	–40	–	125	°C
T_{stg}	Storage Temperature	–	–40	–	150	°C
F_C	Mounting Force with Clip	–	20	–	120	N
$d_{Spp/App}$	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 mA, t = 1 min	–	2500	–	V
		50/60 Hz, $I_{ISOL} \leq$ 1 mA, t = 1 s	–	3000	–	V
W	Weight		–	9	–	g

© 2023 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: XZ 05/05/2023

MOSFET T

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

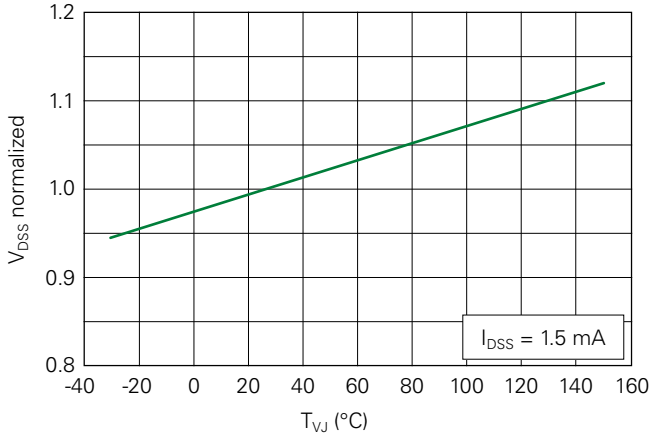


Fig. 2. Typical Transfer Characteristics

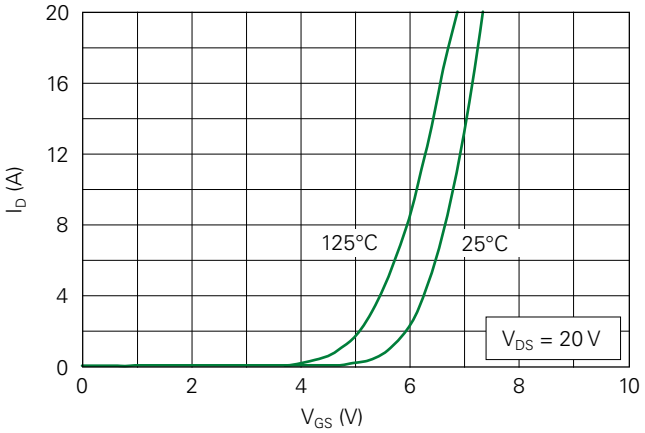


Fig. 3. Typical Output Charactertistics (T_{VJ} = 25°)

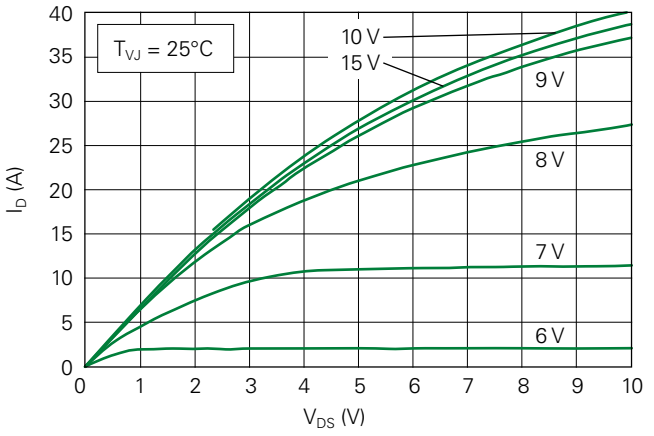


Fig. 4. Typical Output Characteristics (T_{VJ} = 125°C)

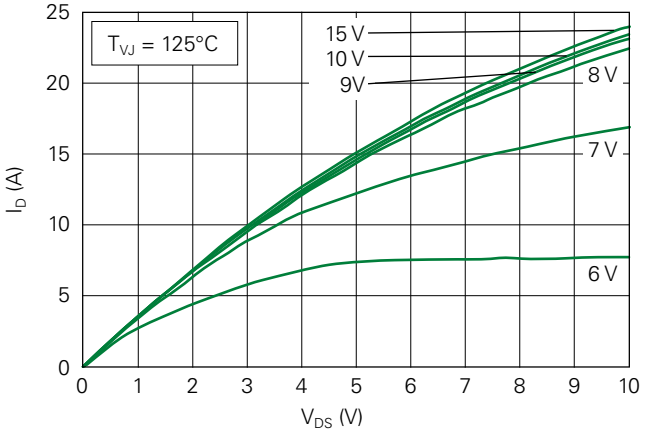


Fig. 5. Drain Source On-state Resistance $R_{DS(on)}$ vs. Junction Temperature T_{VJ}

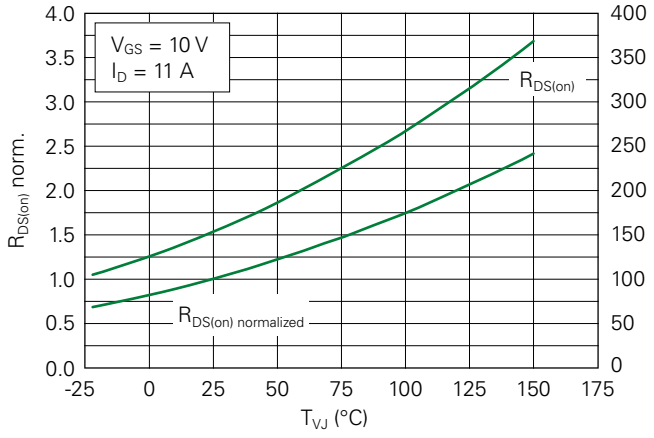
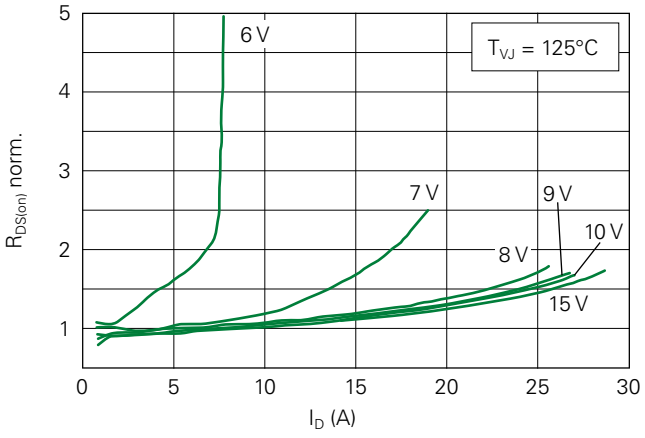


Fig. 6. Drain Source On-state Resistance $R_{DS(on)}$ vs. I_D



© 2023 Littelfuse, Inc.
Specifications are subject to change without notice.

MOSFET T

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

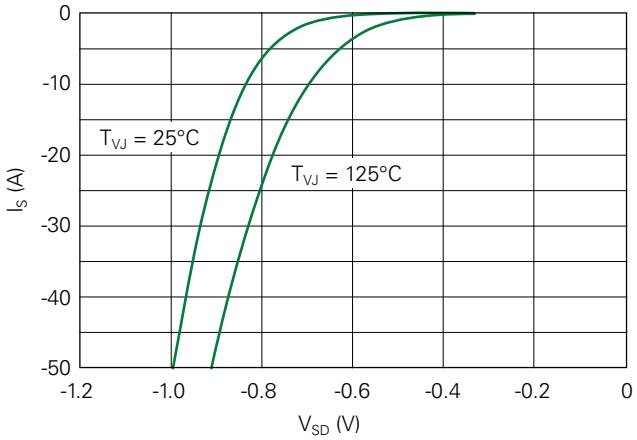


Fig. 8. Typical Gate Charge

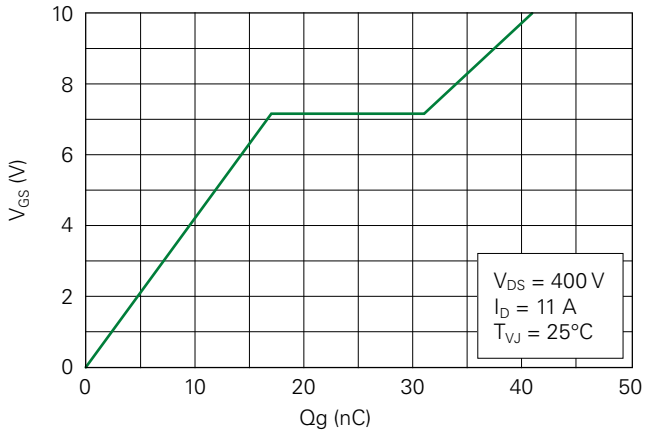


Fig. 9. Typical Turn-on Energy and Switching Times vs. Temperature, Inductive Switching on Diode D

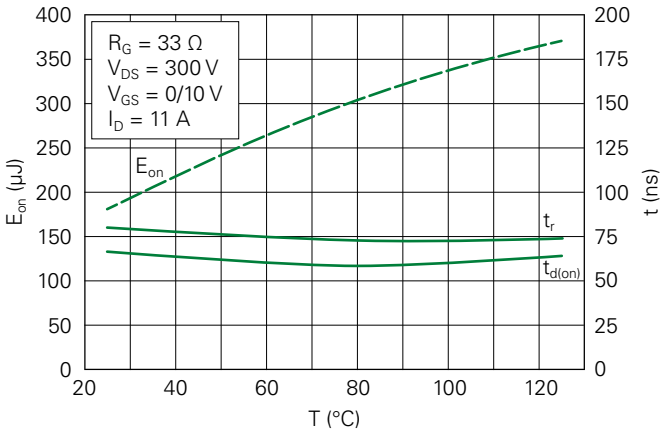


Fig. 10. Typical Turn-off Energy and Switching Times vs. Temperature, Inductive Switching of Diode D

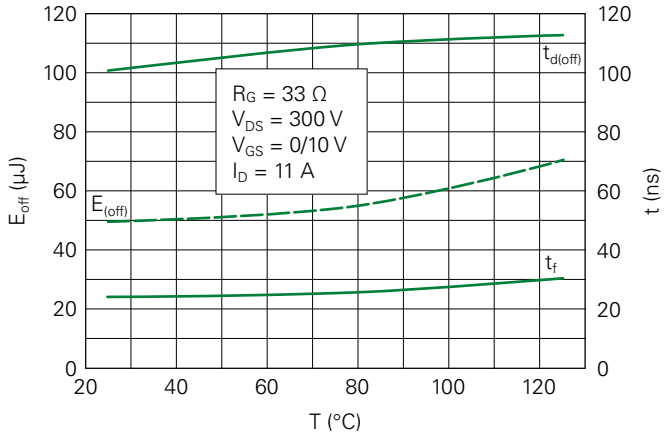


Fig. 11. Typical Turn-on Energy and Switching Times vs. Gate Resistance, Inductive Switching

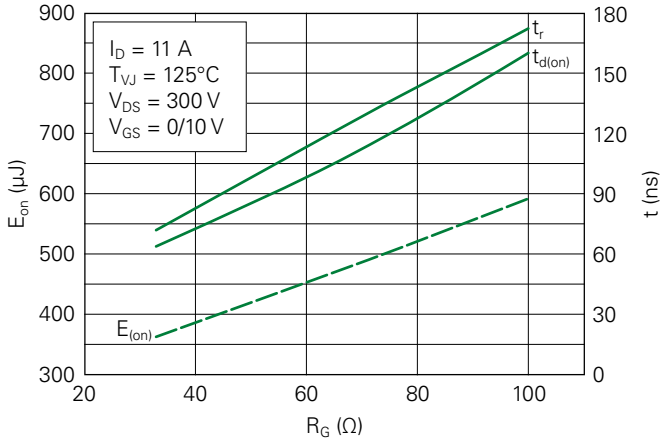
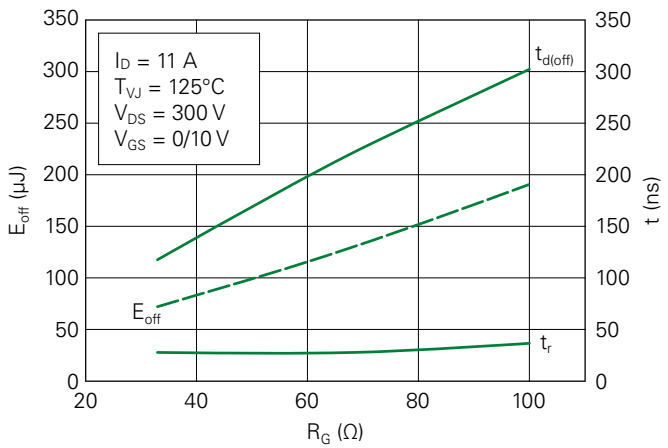


Fig. 12. Typical Turn-off Energy and Switching Times vs. Gate Resistance, Inductive Switching



© 2023 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: XZ 05/05/2023

MOSFET T

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

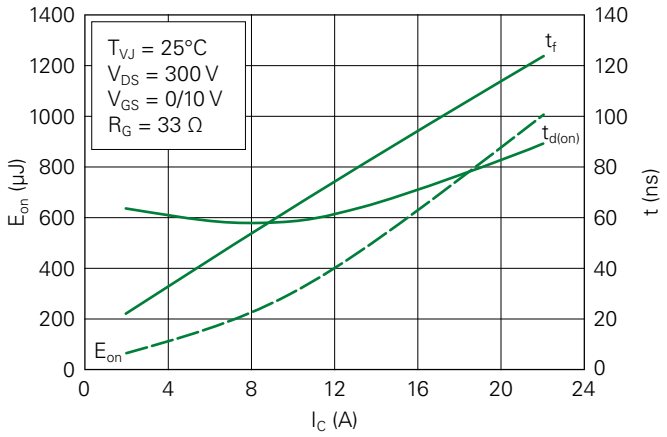


Fig. 14. Typical Turn-off Energy and Switching Times vs. Drain Current, Inductive Switching

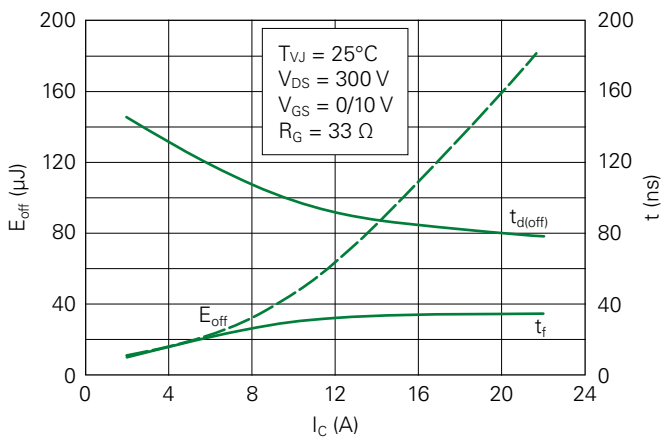


Fig. 15. Typical Turn-on Energy and Switching Times vs. Drain Current, Inductive Switching

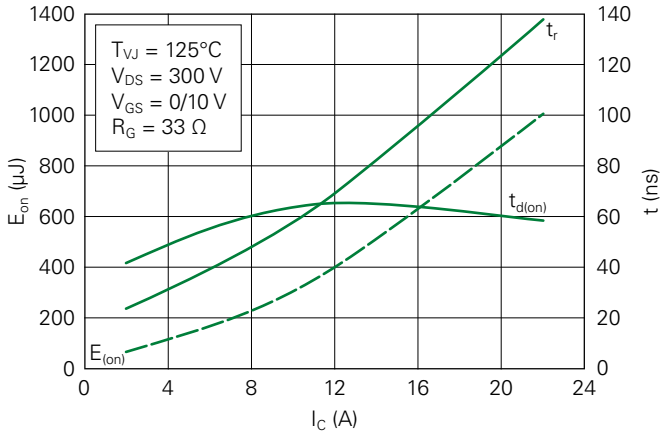


Fig. 16. Typical Turn-off Energy and Switching Times vs. Drain-current, Inductive Switching

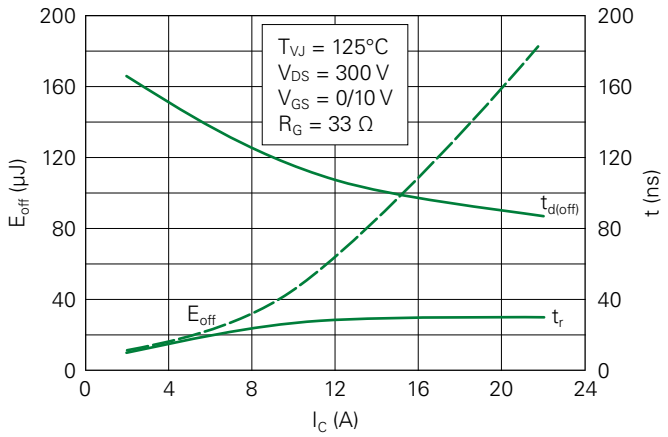
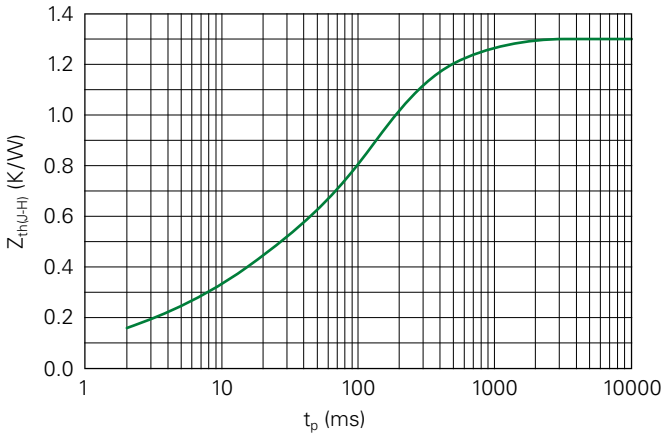


Fig. 17. Typical Transient Thermal Impedance



© 2023 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: XZ 05/05/2023

Diode D

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

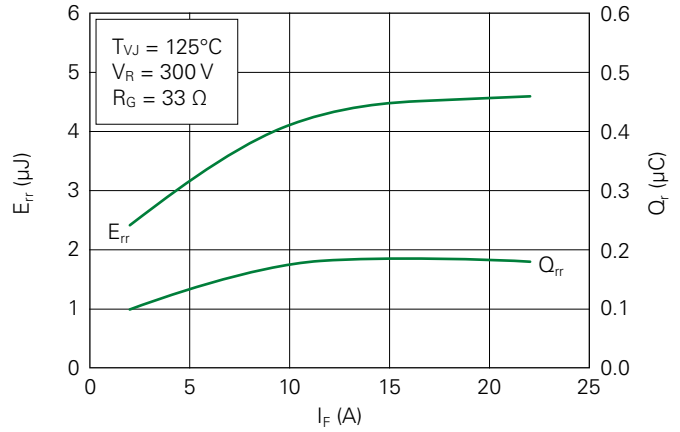


Fig. 19. Reverse Recovery Current I_{rrm} and Reverse Recovery Time t_{rr} vs. Forward Current

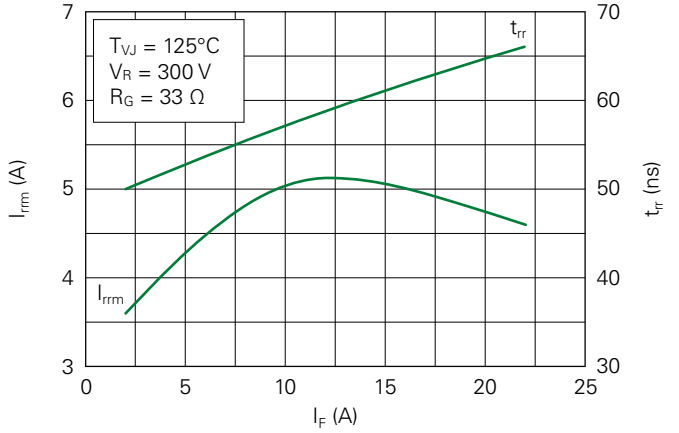


Fig. 20. Reverse Recovery Current Energy E_{rr} and Charge Q_{rr} vs. Commutation di/dt

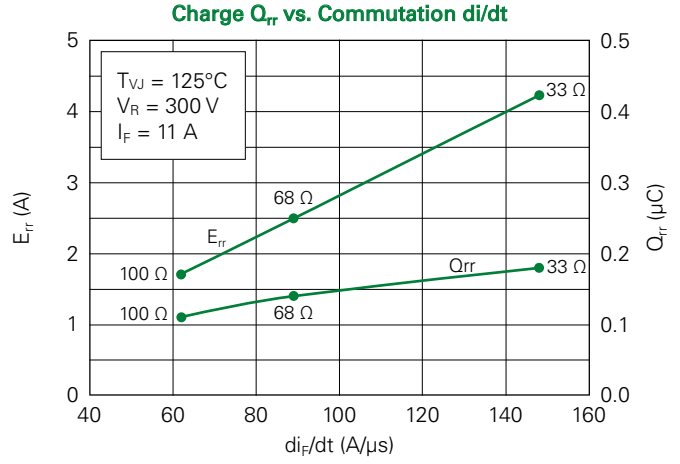


Fig. 21. Reverse Recovery Current I_{rrm} and Reverse Recovery Time t_{rr} vs. Commutation di/dt

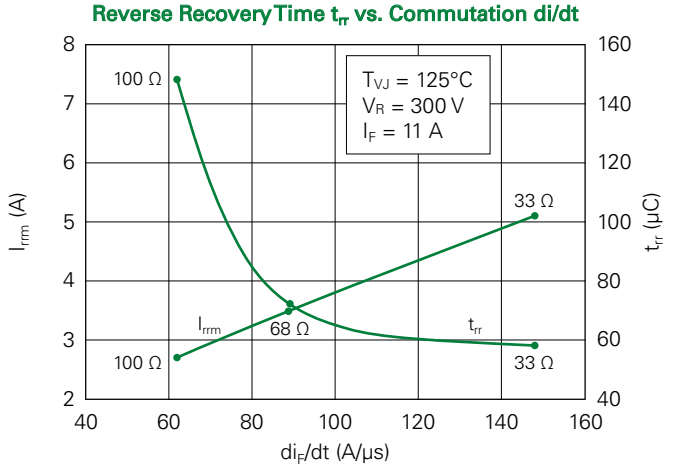


Fig. 22. Typical Forward Characteristics

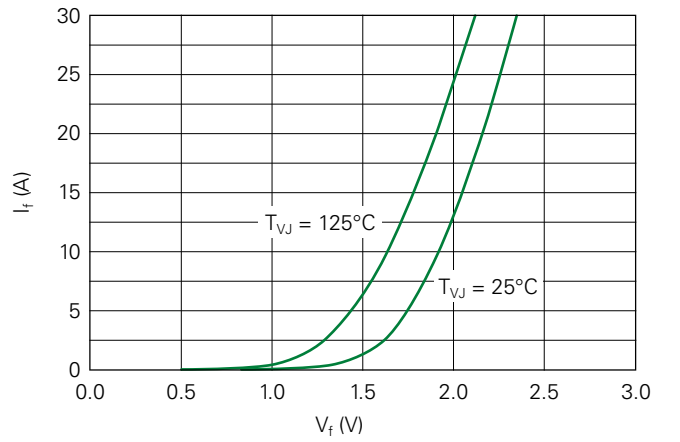
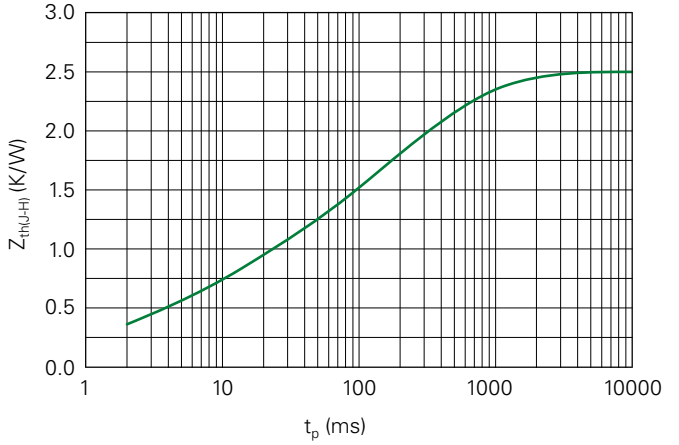
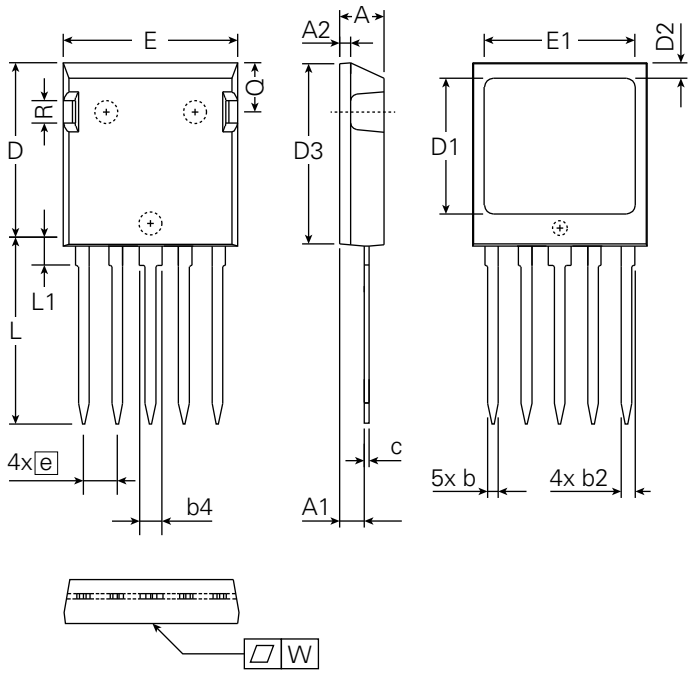


Fig. 23. Typical Transient Thermal Impedance



© 2023 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: XZ 05/05/2023

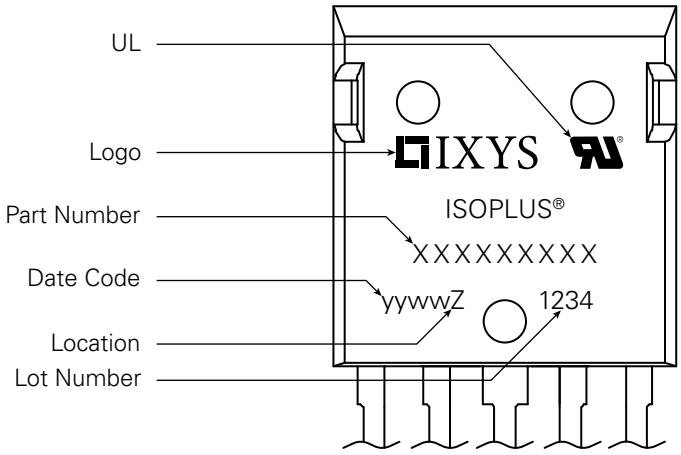
Part Outline Drawing (i4-Pac)



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

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

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.

IXYS Part of: Littelfuse Expertise Applied | Answers Delivered

© 2023 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: XZ 05/05/2023