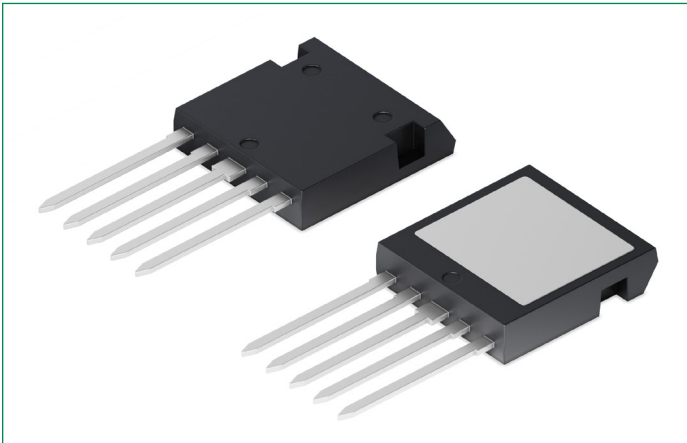


# MXB12R600DPHFC

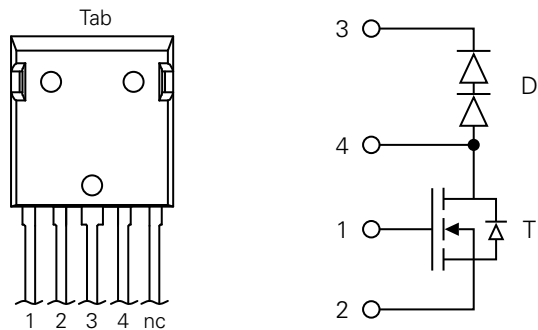
## 600 V, 160 mΩ, 18 A X2-Class Power MOSFET with Co-Pack FRED Diode

### Boost Configuration

Littelfuse 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	$V_{GS} = 0 V, I_D = 250 \mu A, T_{VJ} = 25^\circ C$	650	-	-	V	
$V_{GS}$	Gate Source Voltage	Continuous	-30	-	30	V	
		Transient	-40	-	40	V	
$I_{D25}$	Continuous Drain Current	$V_{GS} = 10 V$	$T_C = 25^\circ C$	-	-	18	A
$I_{D90}$			$T_C = 25^\circ C$	-	-	12.5	A
$I_{D110}$			$T_C = 25^\circ C$	-	-	10	A
$E_{AS}$	Non-Repetitive Avalanche Energy	$I_D = 12 A$	-	-	600	mJ	
$d_v/dt$	Rate of Rise of Voltage	$I_S \leq 24 A, V_{DS} \leq 650 V$	$T_{VJ} \leq 25^\circ C$	-	-	50	V/ns
$R_{DS(on)}$	Drain-Source On-State Resistance	$I_D = 11 A; V_{GS} = 10 V$	$T_{VJ} = 25^\circ C$	-	-	160	mΩ
			$T_{VJ} = 125^\circ C$	-	320	-	
$V_{GS(th)}$	Gate Threshold Voltage	$I_D = 1.5 mA; V_{DS} = V_{GS}$	$T_{VJ} = 25^\circ C$	3.5	-	5.0	V
$I_{DSS}$	Drain Source Leakage Current	$V_{DS} = V_{DSS}; V_{GS} = 0 V$	$T_{VJ} = 25^\circ C$	-	-	10	μA
			$T_{VJ} = 125^\circ C$	-	-	1.5	mA
$I_{GSS}$	Gate Source Leakage Current	$V_{DS} = 0 V; V_{GS} = \pm 30 V$	-100	-	100	nA	
$R_G$	Internal Gate Resistance	-	-	1.0	-	Ω	
$C_{iss}$	Input Capacitance	$V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz$	$T_{VJ} = 25^\circ C$	-	2190	-	pF
$C_{oss}$	Output Capacitance			-	1450	-	
$C_{rss}$	Reverse Transfer Capacitance			-	1.3	-	
$Q_g$	Total Gate Charge	$V_{DS} = 320 V, I_D = 11 A, V_{GS} = 10 V$	$T_{VJ} = 25^\circ C$	-	37	-	nC
$Q_{gs}$	Gate Source Charge			-	12	-	
$Q_{gd}$	Gate Drain (Miller) Charge			-	14	-	
$t_{d(on)}$	Turn-on Delay Time	<b>Inductive Switching</b> $V_{DS} = 300 V, I_D = 11 A, V_{GS} = 10 V, R_G = 33 \Omega$	$T_{VJ} = 25^\circ C$	-	65	-	ns
			$T_{VJ} = 125^\circ C$	-	65	-	
$t_r$	Current Rise Time		$T_{VJ} = 25^\circ C$	-	70	-	ns
			$T_{VJ} = 125^\circ C$	-	65	-	
$t_{d(off)}$	Turn-Off Delay Time		$T_{VJ} = 25^\circ C$	-	95	-	ns
			$T_{VJ} = 125^\circ C$	-	110	-	
$t_f$	Current Fall Time		$T_{VJ} = 25^\circ C$	-	30	-	ns
			$T_{VJ} = 125^\circ C$	-	30	-	
$E_{on}$	Turn-on Energy per Pulse		$T_{VJ} = 25^\circ C$	-	0.26	-	mJ
			$T_{VJ} = 125^\circ C$	-	0.35	-	
$E_{off}$	Turn-off Energy per Pulse	$T_{VJ} = 25^\circ C$	-	0.05	-	mJ	
		$T_{VJ} = 125^\circ C$	-	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	$I_F = 24 A, V_{GS} = 0 V$	$T_{VJ} = 25^\circ C$	-	1.0	1.4	V
$t_{rr}$	Reverse Recovery Time	$I_F = 12 A, V_r = 100 V, -di_F/dt = 100 A/\mu s,$	$T_{VJ} = 25^\circ C$	-	145	-	ns
$Q_{rm}$	Reverse Recovery Charge (Intrinsic Diode)			-	0.89	-	μC
$I_{rm}$	Reverse Recovery Current			-	12	-	A

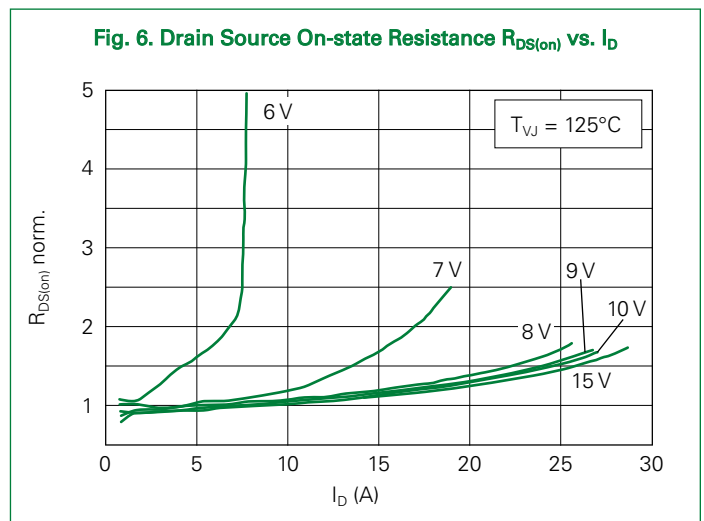
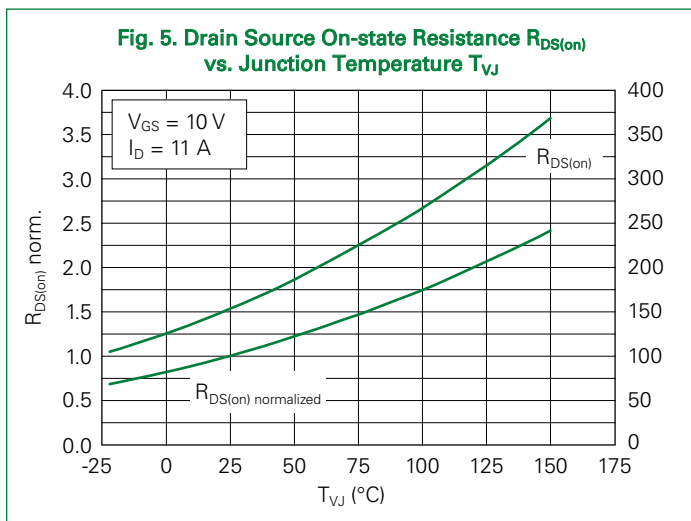
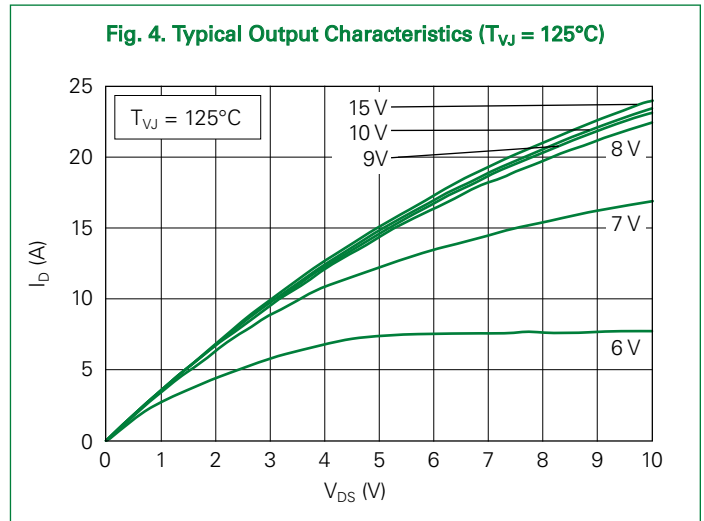
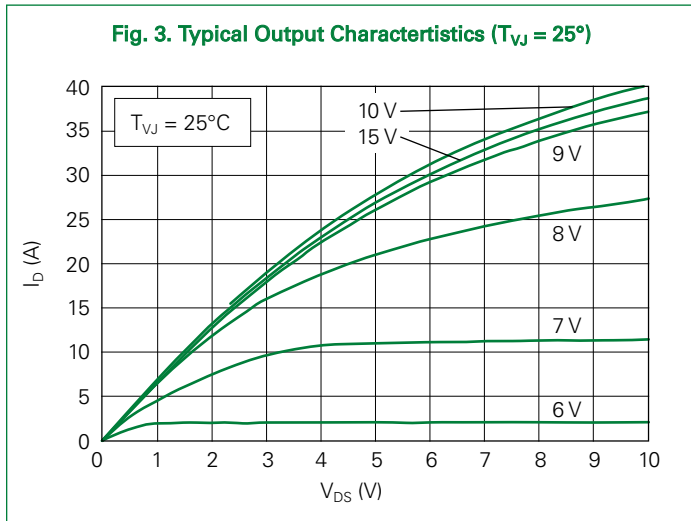
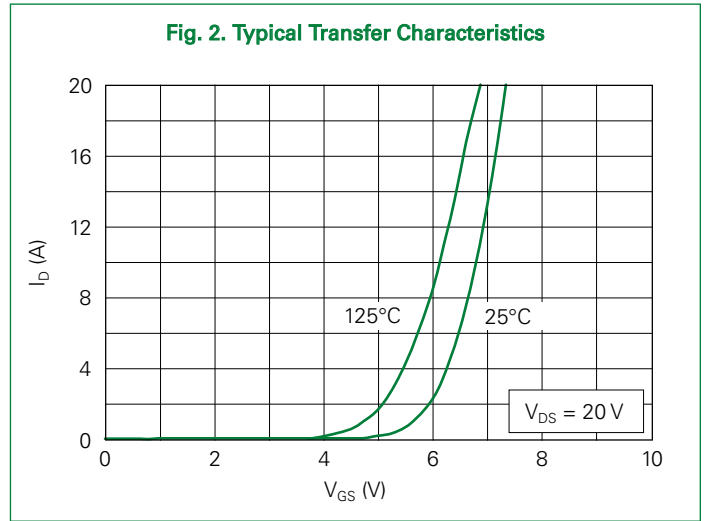
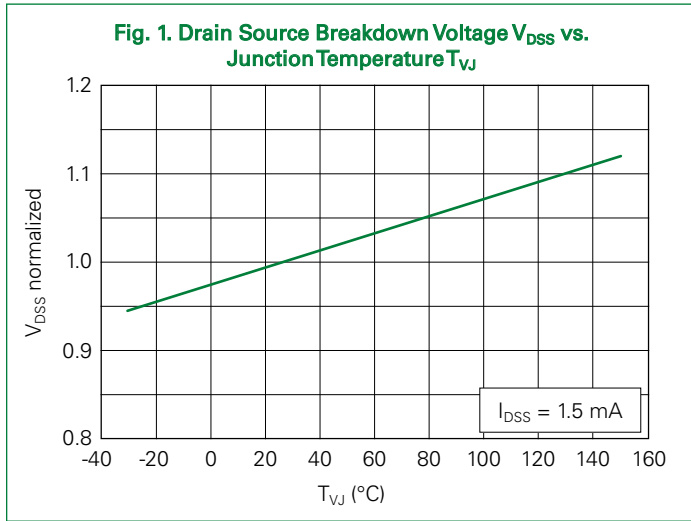
HiPerDynFRED D (Data for Series Connection)

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	$T_{VJ} = 25^{\circ}C$	–	–	600	V		
$I_R$	Reverse Current	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}C$	–	–	1	$\mu A$	
			$T_{VJ} = 150^{\circ}C$	–	–	0.08	mA	
$V_F$	Forward Voltage	$I_F = 11 A$	$T_{VJ} = 25^{\circ}C$	–	–	2.30	V	
				$I_F = 20 A$	–	–		2.60
		$I_F = 11 A$	$T_{VJ} = 150^{\circ}C$	–	–	1.76	V	
				$I_F = 20 A$	–	–		2.10
$I_{FAV}$	Average Forward Current	Rectangular, $d = 0.5$	$T_{VJ} = 150^{\circ}C$	$T_C = 25^{\circ}C$	–	–	22	A
				$T_C = 90^{\circ}C$	–	–	13	
				$T_C = 110^{\circ}C$	–	–	9.5	
$I_{F25}$	Forward Current	Based on max. $V_{F0}$ and $r_F$	$T_C = 25^{\circ}C$	–	–	27	A	
$I_{F90}$				$T_C = 90^{\circ}C$	–	–		15
$I_{F110}$				$T_C = 110^{\circ}C$	–	–		11
$I_{FSM}$	Non-repetitive Max Forward Surge Current	$t = 10 ms, (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$	–	–	150	A	
$V_{F0}$	Threshold Voltage	For Power Loss Calculation	$I_F = 11 A$	$T_{VJ} = 90^{\circ}C$	–	–	1.68	V
				$T_{VJ} = 125^{\circ}C$	–	–	1.52	V
$r_F$	Slope Resistance		$I_F = 11 A$	$T_{VJ} = 90^{\circ}C$	–	–	30.8	$m\Omega$
				$T_{VJ} = 125^{\circ}C$	–	–	31.8	$m\Omega$
di/dt	Rate of Change of Current	$V_{DS} = 300 V, I_D = 11 A$ Gate Drive of MOSFET T $V_{GS} = 0/10 V$ $R_G = 32 \Omega$	$T_{VJ} = 125^{\circ}C$	–	150	–	$A/\mu s$	
$Q_{rrm}$	Reverse Recovery Charge			–	0.18	–	$\mu C$	
$I_{rrm}$	Reverse Recovery Current			–	5.9	–	A	
$t_{rr}$	Reverse Recovery Time			–	60	–	ns	
$E_{rr}$	Reverse Recovery Energy			–	4.2	–	$\mu J$	
$R_{th,JC}$	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		

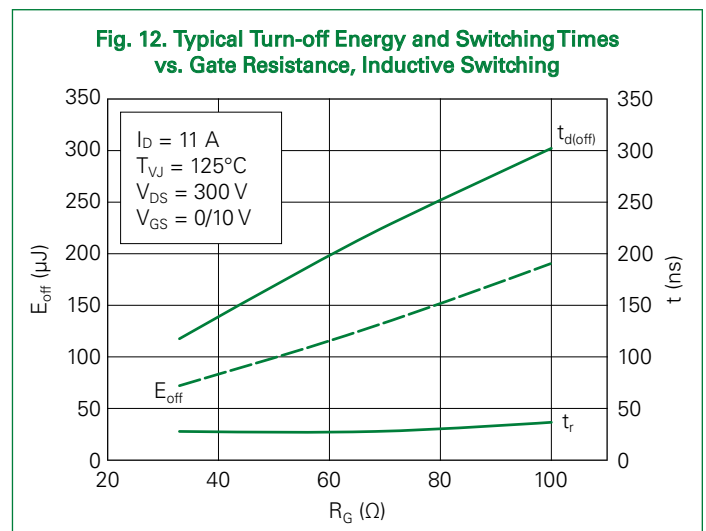
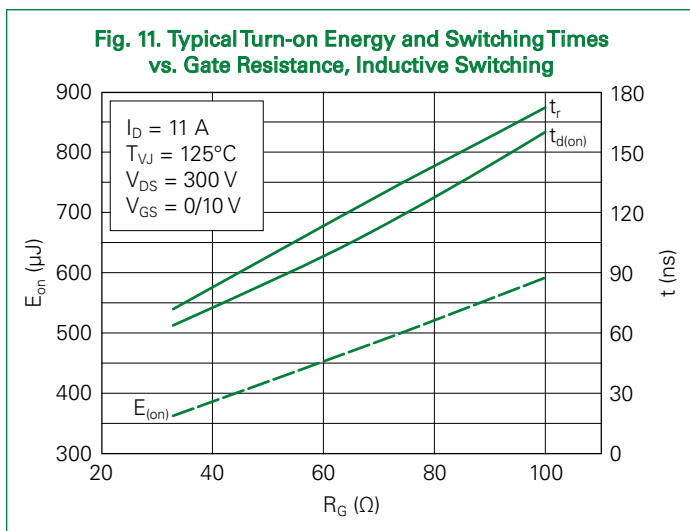
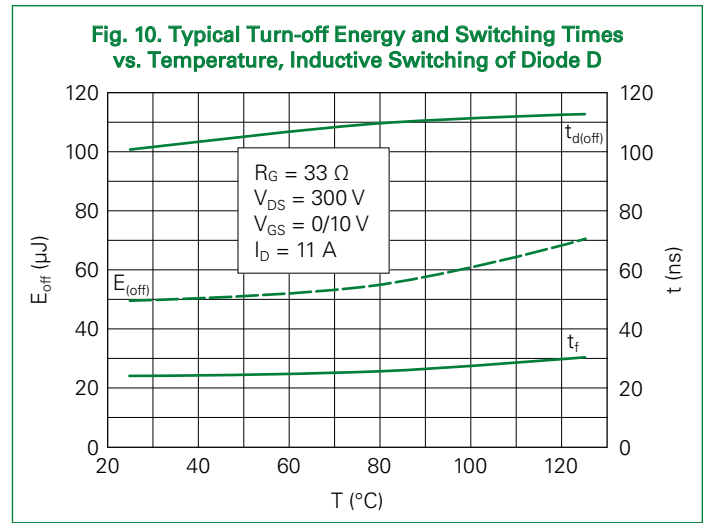
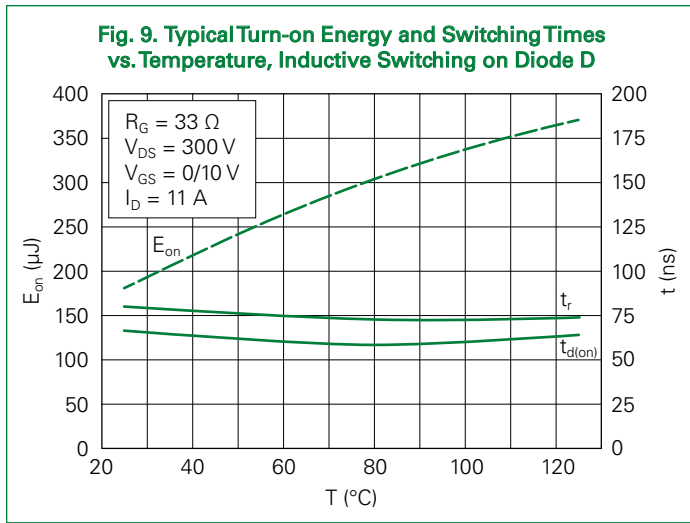
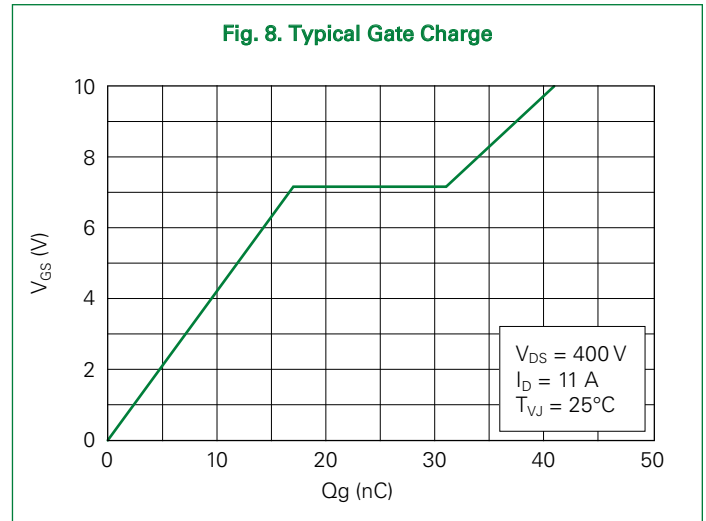
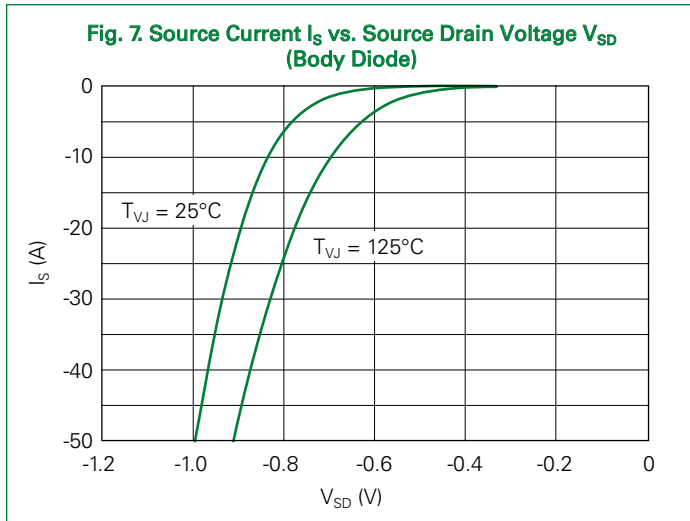
Package i4-Pac

Symbol	Characteristics	Conditions	Value			Unit
			Min.	Typ.	Max.	
$I_{rms}$	RMS Current	–	–	–	70	A
$T_{VJ}$	Virtual Junction Temperature	–	–40	–	150	$^{\circ}C$
$T_{op}$	Operation Temperature	–	–40	–	125	$^{\circ}C$
$T_{stg}$	Storage Temperature	–	–40	–	150	$^{\circ}C$
$F_C$	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

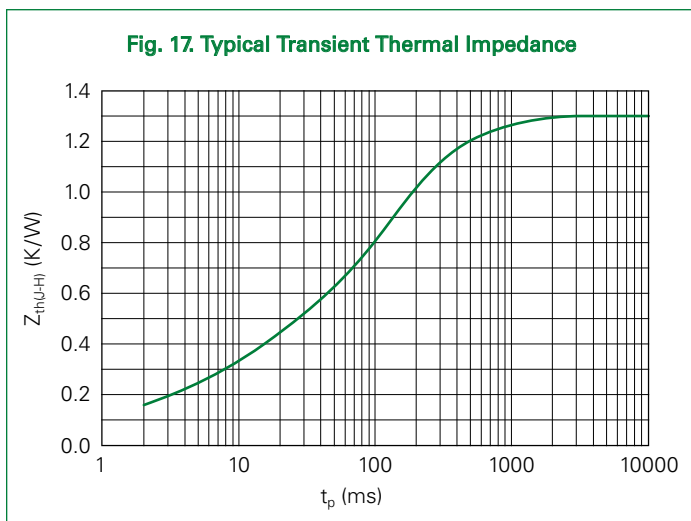
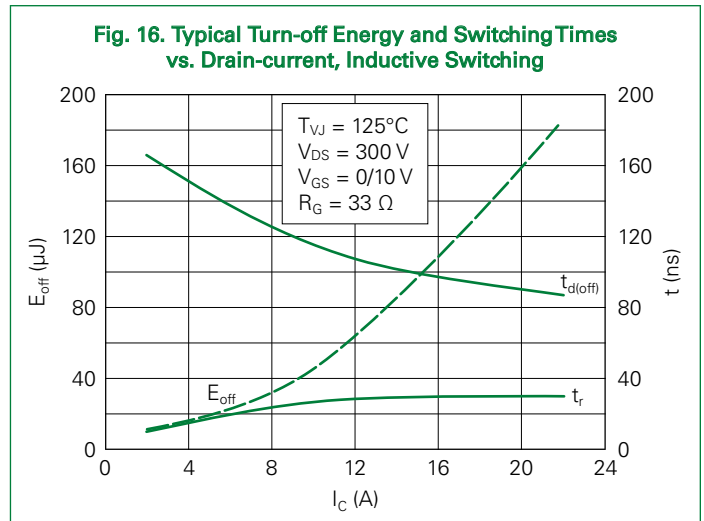
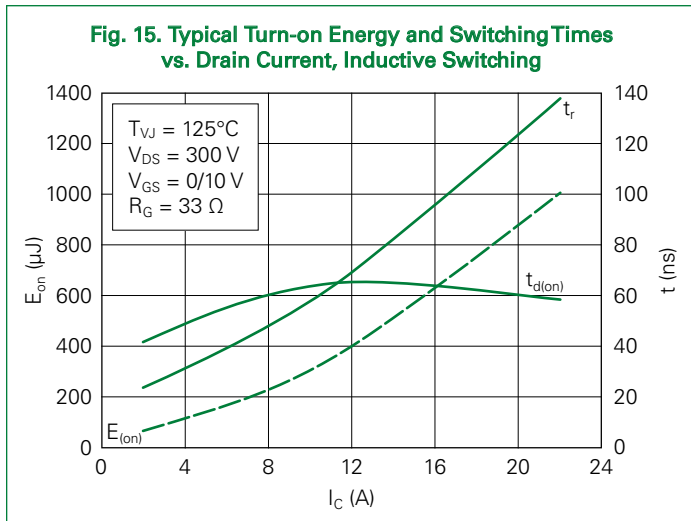
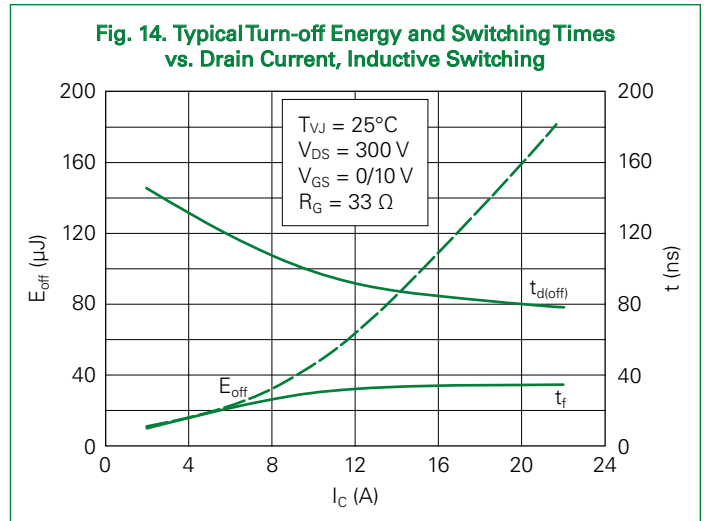
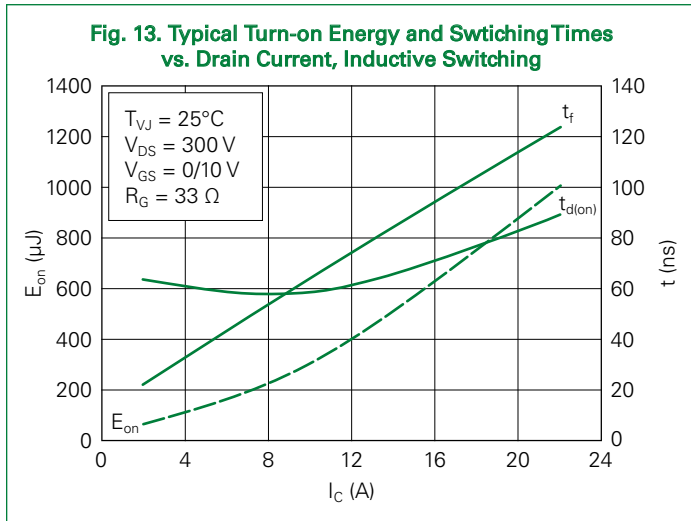
MOSFET T



MOSFET T



MOSFET T



Diode D

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

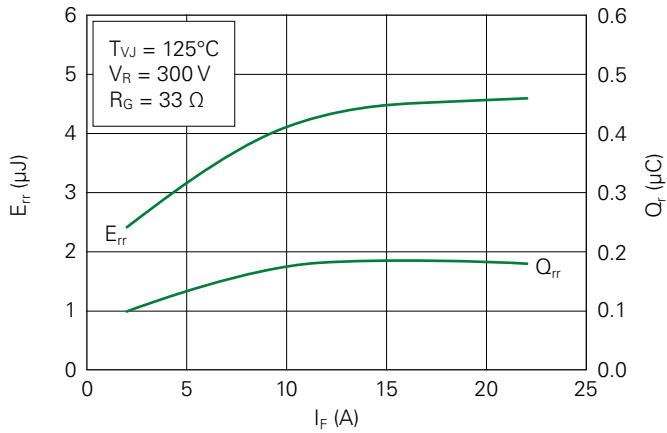


Fig. 19. Reverse Recovery Current  $I_{rrm}$  and Reverse Recovery Time  $t_{rr}$  vs. Forward Current

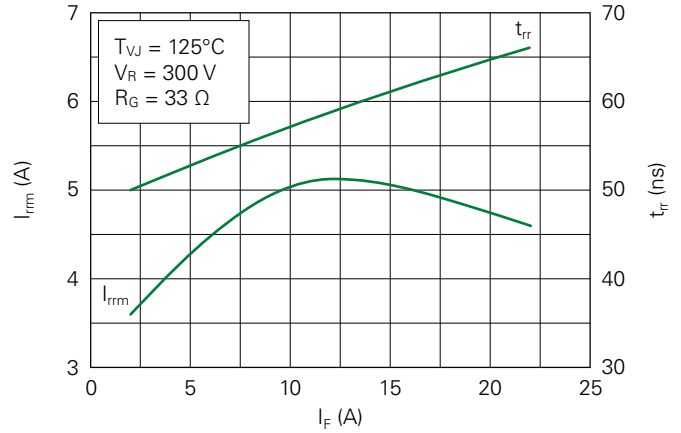


Fig. 20. Reverse Recovery Current Energy  $E_{rr}$  and Charge  $Q_{rr}$  vs. Commutation  $di_F/dt$

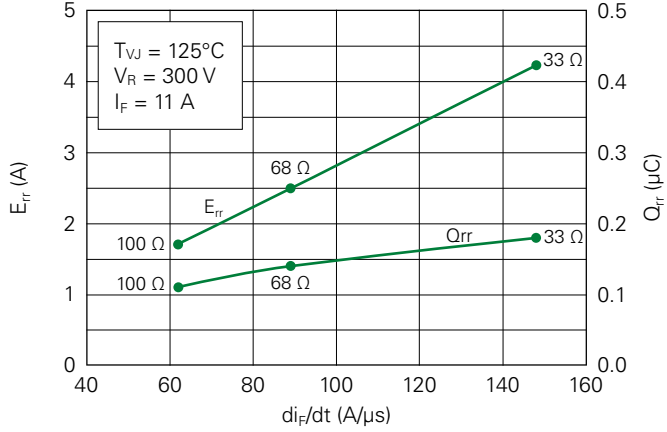


Fig. 21. Reverse Recovery Current  $I_{rrm}$  and Reverse Recovery Time  $t_{rr}$  vs. Commutation  $di_F/dt$

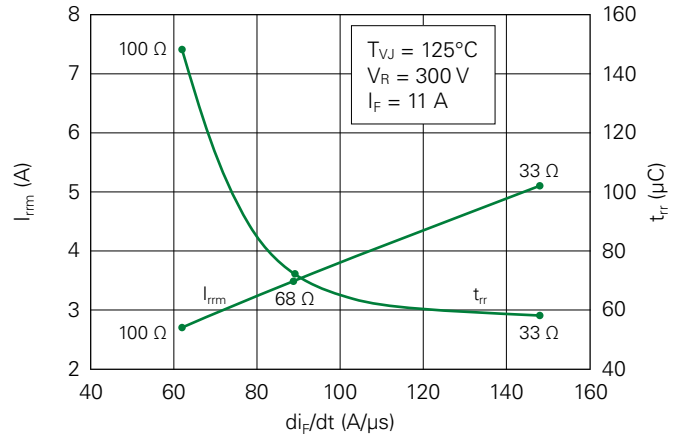


Fig. 22. Typical Forward Characteristics

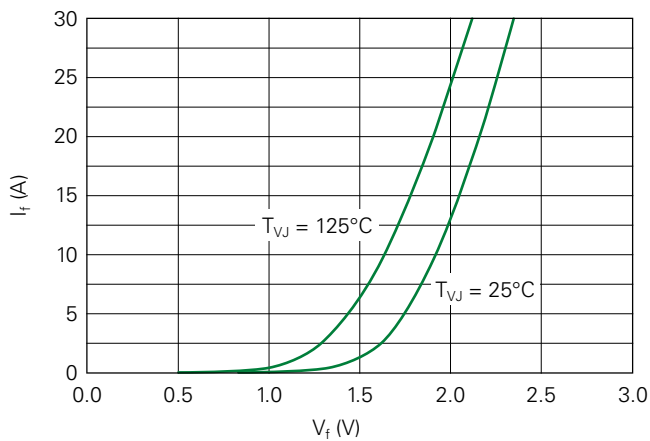
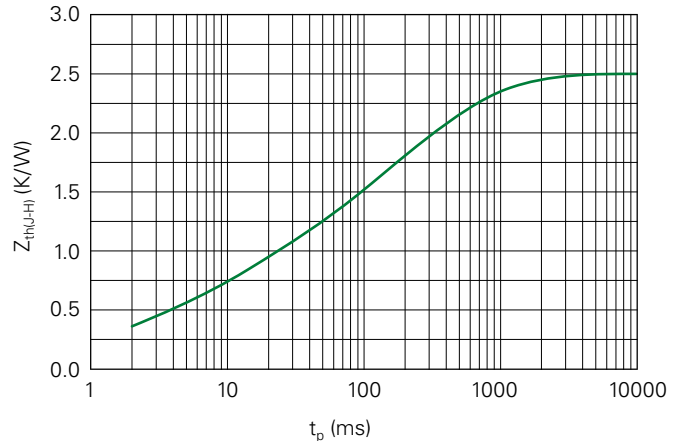
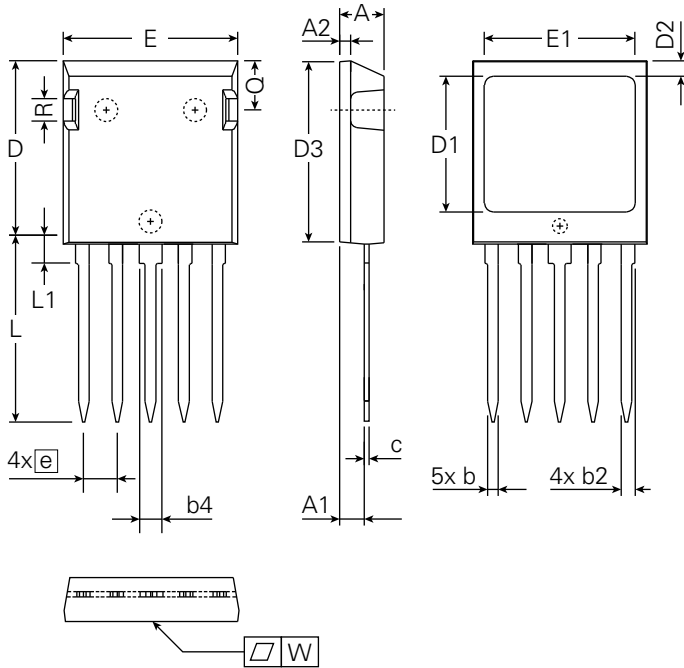


Fig. 23. Typical Transient Thermal Impedance



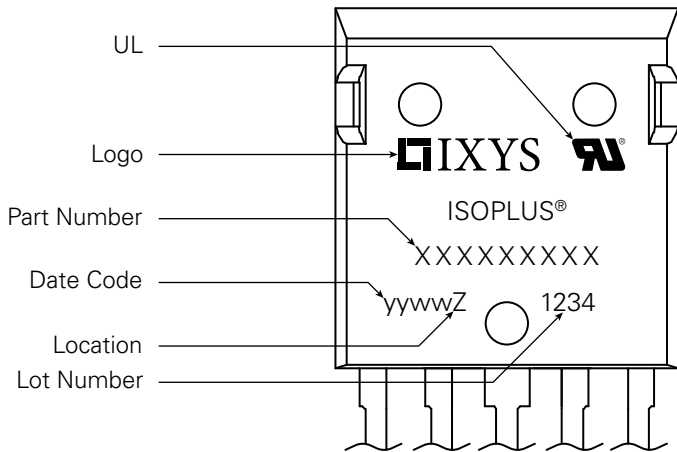
Part Outline Drawing (i4-Pac)



**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 = 2<sup>nd</sup> 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:

