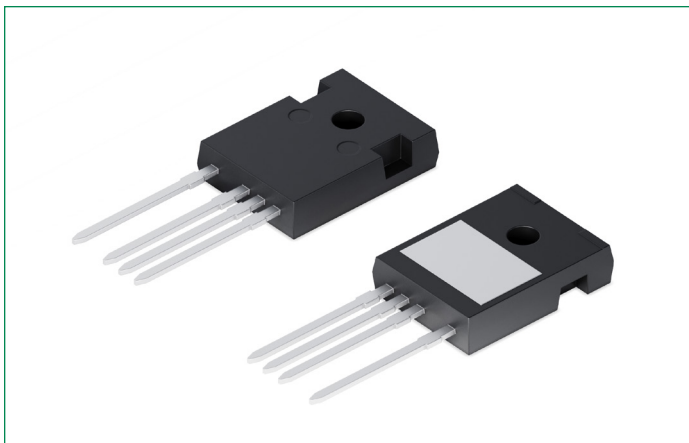
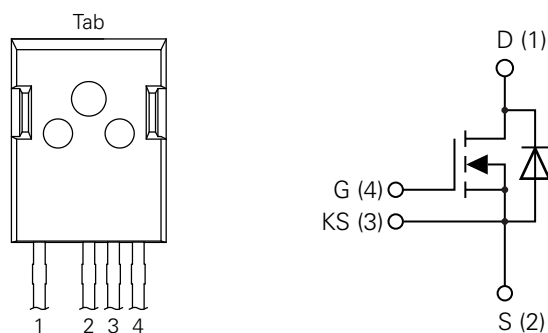


IXSJ80N120R1K

1200 V, 18 mΩ, 80 A SiC Power MOSFET

RoHS HF UL E153432

**Pinout Diagram** (ISO247-4L)**1:** Drain; **2:** Source; **3:** Kelvin Source; **4:** Gate; **Tab:** Isolated**Features**

- Up to 1200 V blocking voltage with low $R_{DS(on)}$ of 18 mΩ
- Low gate charge of 155 nC and low input capacitance of 4556 pF
- Flexible gate voltage range (15–18 V) and 0 V recommended turn-off gate voltage

Benefits

- Low conduction losses and reduced heat dissipation
- Low gate drive power requirements
- Supports high-speed switching with reduced gate drive losses

ISO247-4L Package

- High performance ceramic based isolated package improves overall thermal resistance $R_{th(j-h)}$ and power handling capability
- Isolation voltage 2500 V AC (RMS), 1 minute
- Reduced EMI attributed to the small chip-to-heatsink stray capacitance
- Industry standard package outline
- Optimized package with separate driver source pin

Applications

- EV charging infrastructure
- Solar inverters
- Switch mode power supplies
- Uninterruptible power supply
- Motor drives
- DC/DC converters
- Battery chargers
- Induction heating
- High-frequency applications

Product Summary

Characteristic	Value	Unit
I_{D25}	80	A
V_{DSS}	1200	V
$R_{DS(on)}$ typ	18	mΩ

Maximum Ratings ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristics	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{DS}	Drain-source voltage	$V_{GS} = 0\text{ V}$, $I_D = 9.9\text{ mA}$, $T_{vj} = 25\text{ }^{\circ}\text{C}$	–	1200	–	V
V_{GSM}	Maximum gate-source voltage	Gate-source voltage (DC)	–4	–	+21	V
	Transient gate-source voltage	Transient, $t_{transient} < 300\text{ ns}$	–4	–	+23	V
I_D	Drain current	$V_{GS} = 18\text{ V}$	$T_c = 25\text{ }^{\circ}\text{C}$	–	85	A
			$T_c = 80\text{ }^{\circ}\text{C}$	–	63	
			$T_c = 100\text{ }^{\circ}\text{C}$	–	54	
I_{DM}	Peak drain current	$T_c = 25\text{ }^{\circ}\text{C}$, pulse width limited by $T_{vj(max)}$	–	157	–	A
I_S	Diode forward current	$V_{GS} = 0\text{ V}$, $T_c = 25\text{ }^{\circ}\text{C}$	–	37	–	A
I_{SM}	Body-diode surge forward current	Pulse width limited by $T_{vj(max)}$	–	85	–	A
P_{tot}	Total power dissipation	$T_c = 25\text{ }^{\circ}\text{C}$	–	223.2	–	W
T_{vj}	Virtual junction temperature range	–	–40	–	+150	$^{\circ}\text{C}$
$T_{vj(max)}$	Maximum virtual junction temperature	–	–	150	–	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	–	–40	–	+150	$^{\circ}\text{C}$
F_C	Mounting force with clip	–	0.8	–	1.2	Nm
T_{sold}	Soldering temperature	3 mm (1/8 in.) from case 10 s	–	260	–	$^{\circ}\text{C}$
$d_{Spp/App}$ $d_{Spb/Apb}$	Creepage distance on surface / Clearance distance through air	Terminal to terminal	Between pin 1 to 2	3.88	–	mm
			Between pin 2 to 3	1.34	–	
			Between pin 3 to 4	1.34	–	
	Clearance distance through air	Terminal to backside plane	For all Terminals	2.4	–	
	Creepage distance on surface	Terminal to backside tab		5.26	–	
V_{ISOL}	Isolation voltage	50/60 Hz; RMS; $I_{ISOL} < 1\text{ mA}$, $t = 1\text{ second}$	–	3000	–	V
		50/60 Hz; RMS; $I_{ISOL} < 1\text{ mA}$, $t = 1\text{ minute}$	–	2500	–	
M	Package weight	–	8			g

Recommended Values

Symbol	Characteristics	Conditions	Value	Unit
$V_{GS(on)}$	Recommended turn-on gate-source voltage	–	18	V
$V_{GS(off)}$	Recommended turn-off gate-source voltage	–	0	V

Thermal Characteristics

Symbol	Characteristics	Conditions	Value			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal resistance, junction-to-case	–	–	–	0.56	K/W

Electrical Characteristics – Static ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristics	Conditions	Ratings			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Breakdown voltage, drain-source	$V_{GS} = 0\text{ V}$, $I_D = 9.9\text{ mA}$, $T_{vj} = 25\text{ }^{\circ}\text{C}$	1200	–	–	V
$V_{GS(TH)}$	Gate threshold voltage	$V_{DS} = 0\text{ V}$, $I_D = 22.2\text{ mA}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$	2.8	–	V
			$T_{vj} = 150\text{ }^{\circ}\text{C}$	–	2.8	
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	1	μA
			$T_{vj} = 150\text{ }^{\circ}\text{C}$	–	35	
$I_{GSS,F}$	Gate leakage current	$V_{GS} = 21\text{ V}$, $V_{DS} = 0\text{ V}$	–	–	100	nA
$I_{GSS,R}$		$V_{GS} = -4\text{ V}$, $V_{DS} = 0\text{ V}$	–	–	–100	
$R_{DS(on)}$	Drain-source on-state resistance	$I_D = 40\text{ A}$, $V_{GS} = 18\text{ V}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	18	m Ω
			$T_{vj} = 150\text{ }^{\circ}\text{C}$	–	36	
$R_{g(int)}$	Internal gate resistance	Resonance method, drain-source shorted ¹	–	1	–	Ω
g_{fs}	Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 42\text{ A}$	–	27	–	S

Note 1: For a description of the resonance method for measuring R_g , refer to the JEDEC Standard JESD24-11 test method

Electrical Characteristics – Dynamic ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristics	Conditions	Ratings			Unit	
			Min.	Typ.	Max.		
C _{iss}	Input capacitance	V _{DD} = 800 V, V _{GS} = 0 V, f = 1 MHz	–	4556	–	pF	
C _{oss}	Output capacitance		–	135	–		
C _{rss}	Reverse transfer capacitance		–	9	–		
Q _g	Total gate charge	V _{DD} = 800 V, I _D = 42 A, V _{GS} = 0/+18 V, R _{g(ext)} = 3.3 Ω, L = 250 μH FWD: Body diode	–	155	–	nC	
Q _{gs}	Gate-source charge		–	44	–		
Q _{gd}	Gate-drain Charge		–	30	–		
E _{oss}	Output capacitance charge energy	V _{DS} = 800 V, V _{GS} = 0 V, f = 1 MHz	–	43	–	μJ	
t _{d(on)}	Turn-on delay time	Inductive Switching Free Wheeling Diode: Body Diode V _{DD} = 800 V, V _{GS} = 0/+18 V, I _D = 42 A, R _{g(ext)} = 3.3 Ω	T _{vj} = 25 °C	–	18	–	ns
			T _{vj} = 150 °C	–	17	–	
t _r	Rise time		T _{vj} = 25 °C	–	22	–	
			T _{vj} = 150 °C	–	20	–	
t _{on}	Turn-on time		T _{vj} = 25 °C	–	41	–	μJ
			T _{vj} = 150 °C	–	36	–	
E _{on}	Turn-on energy		T _{vj} = 25 °C	–	504	–	
			T _{vj} = 150 °C	–	459	–	
t _{d(off)}	Turn-off delay time		T _{vj} = 25 °C	–	48	–	ns
			T _{vj} = 150 °C	–	58	–	
t _f	Fall time		T _{vj} = 25 °C	–	10	–	
			T _{vj} = 150 °C	–	10	–	
t _{off}	Turn-off time		T _{vj} = 25 °C	–	59	–	μJ
			T _{vj} = 150 °C	–	68	–	
E _{off}	Turn-off energy		T _{vj} = 25 °C	–	205	–	
			T _{vj} = 150 °C	–	212	–	
E _{tot}	Total switching energy		T _{vj} = 25 °C	–	709	–	μJ
			T _{vj} = 150 °C	–	671	–	

Reverse Diode Characteristics ($T_{vj} = 25\text{ °C}$ unless otherwise specified)

Symbol	Characteristics	Conditions		Ratings			Unit
				Min.	Typ.	Max.	
V _{SD}	Forward voltage drop	I _{SD} = 42 A, V _{GS} = 0 V		–	3.4	–	V
		I _{SD} = 42 A, V _{GS} = 0 V, T _{vj} = 150 °C		–	3.7	–	
t _{rr}	Reverse recovery time	V _R = 800 V, V _{GS} = 0 V, I _F = 40 A MOSFET gate drive: V _{GS} = 0 / +18 V; R _{g(ext)} = 3.3 Ω	T _{vj} = 25 °C	–	13	–	ns
	T _{vj} = 150 °C		–	13	–		
Q _{rr}	Reverse recovery charge		T _{vj} = 25 °C	–	303	–	nC
			T _{vj} = 150 °C	–	328	–	
I _{rrm}	Max. reverse recovery current		T _{vj} = 25 °C	–	40	–	A
			T _{vj} = 150 °C	–	41	–	
di _F /dt	Current slew rate		T _{vj} = 25 °C	–	4918	–	A/μs
			T _{vj} = 150 °C	–	5398	–	
E _{rec(off)}	Turn-off energy of intrinsic diode per pulse	Inductive load, V _{DD} =800 V, V _{GS} = 0/+18 V, I _S =42 A, R _{g(ext)} = 3.3 Ω, L = 250 μH	T _{vj} = 25 °C	–	121	–	μJ
			T _{vj} = 150 °C	–	139	–	

Note 1: Pulse width limited by $T_{vj(max)}$

Characteristic Curves

Fig. 1. Typical Transfer Characteristics

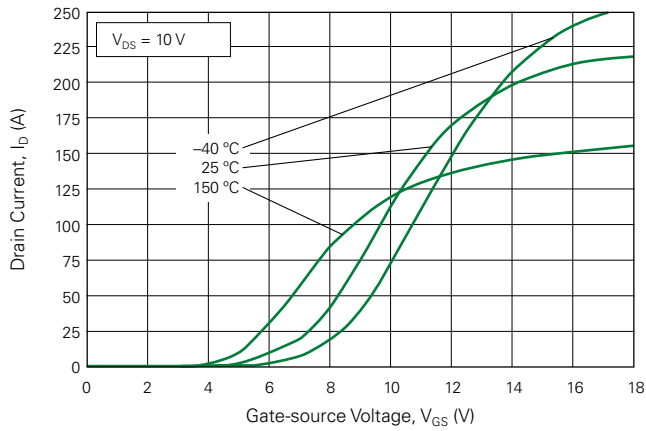


Fig. 2. Typical Transconductance

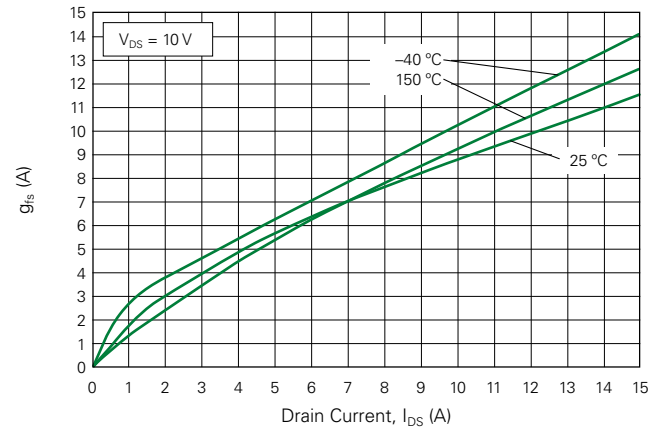
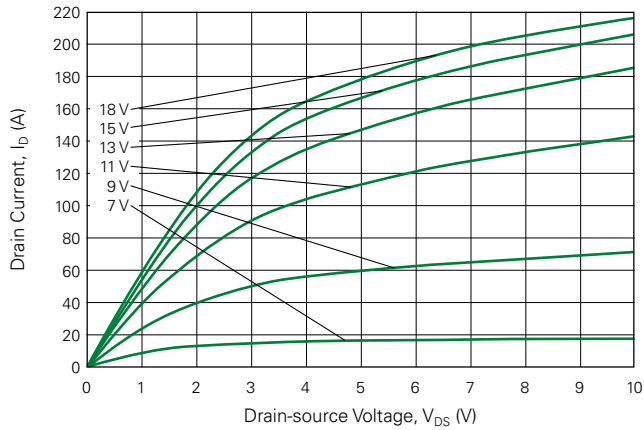
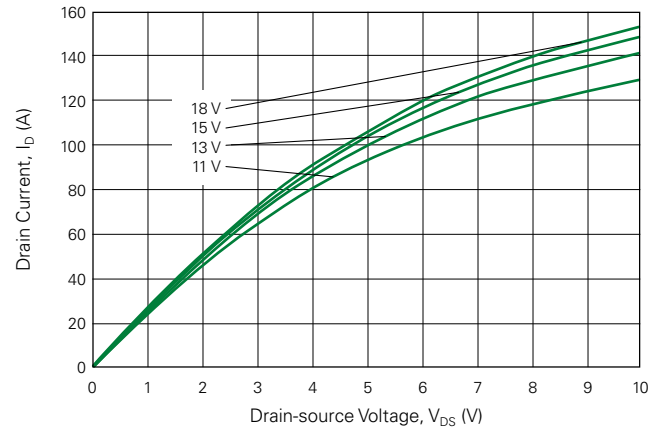
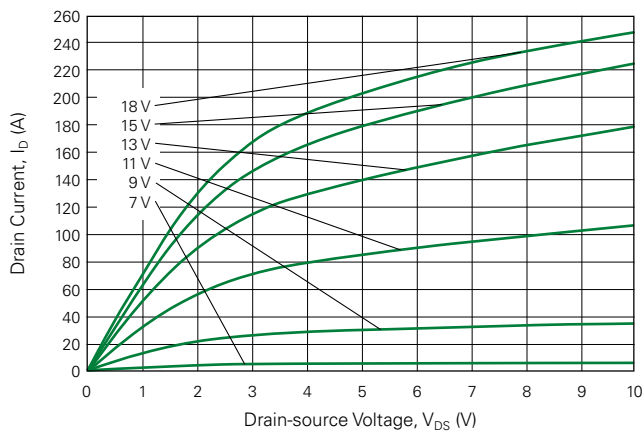
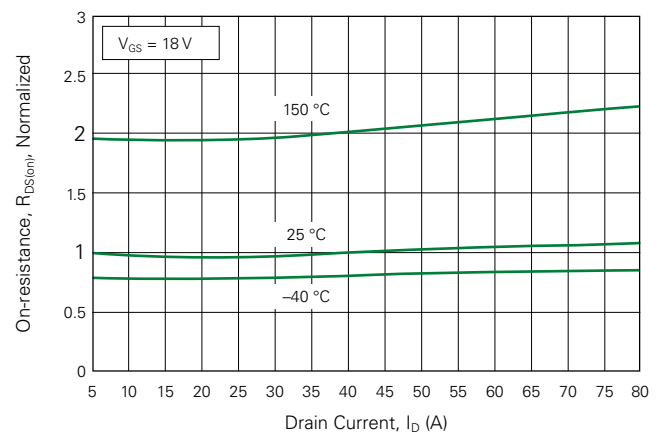
Fig. 3. Typical Output Characteristics @ $T_{vj} = 25$ °CFig. 4. Typical Output Characteristics @ $T_{vj} = 150$ °CFig. 5. Typical Output Characteristics @ $T_{vj} = -40$ °CFig. 6. $R_{DS(on)}$ Normalized to $I_D = 12$ A vs. Drain Current

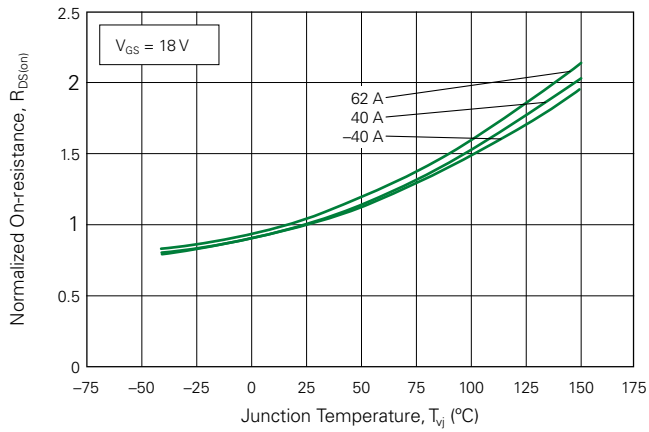
Fig. 7. $R_{DS(on)}$ Normalized to $I_D = 12\text{ A}$ vs. Junction Temperature

Fig. 8. Typical Drain-source On-state Resistance vs. Gate-source Voltage

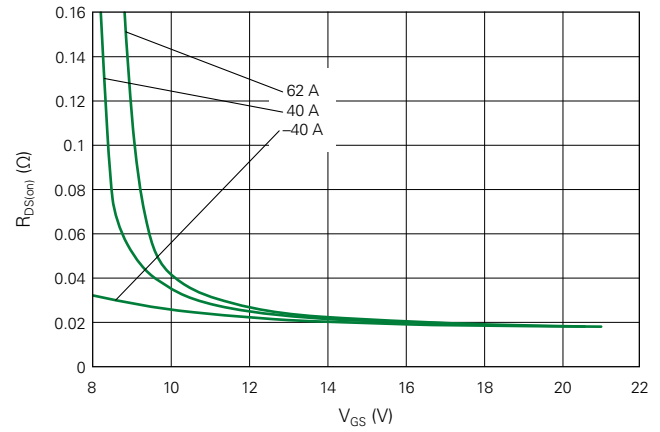
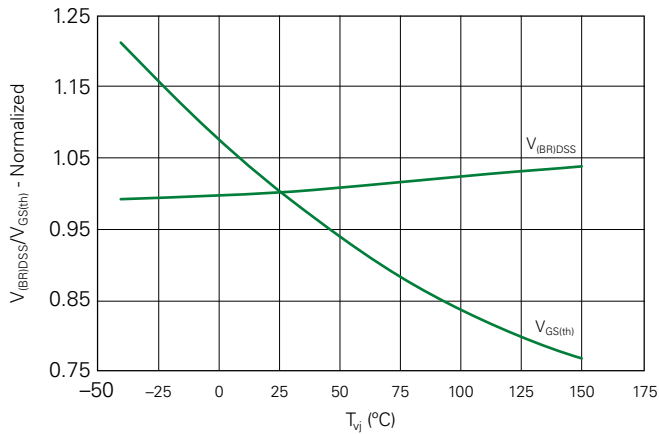
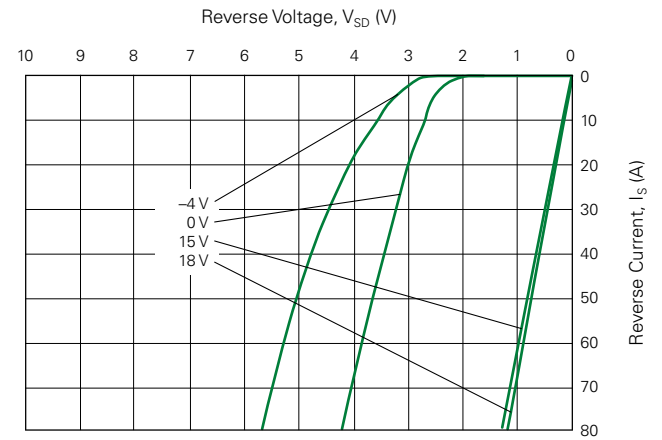
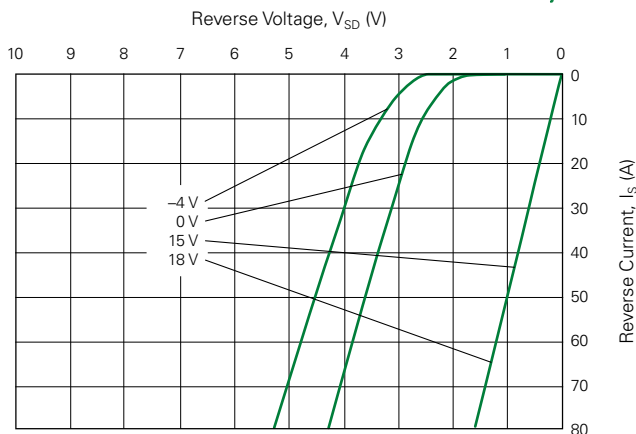
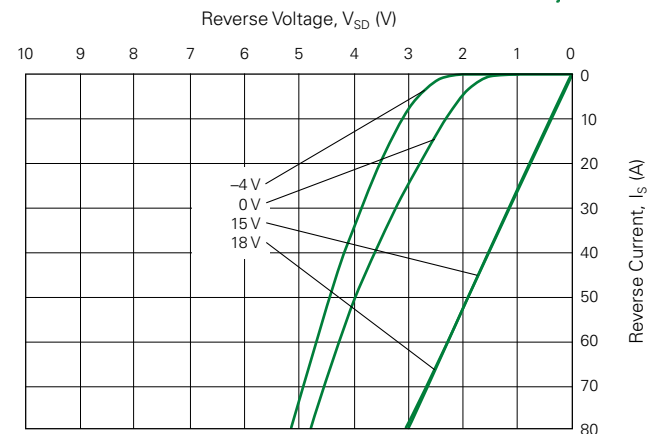
Fig. 9. Typical $V_{(BR)DSS}/V_{GS(th)}$ (Normalized) vs. Virtual Junction TemperatureFig. 10. Typical Reverse Conduction Characteristics @ $T_{vj} = -40\text{ °C}$ Fig. 11. Typical Reverse Conduction Characteristics @ $T_{vj} = 25\text{ °C}$ Fig. 12. Typical Reverse Conduction Characteristics @ $T_{vj} = 150\text{ °C}$ 

Fig. 13. Typical On-resistance vs. Junction Temperature

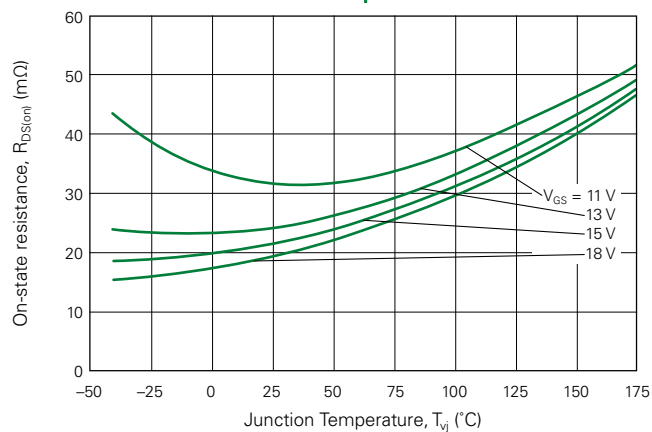


Fig. 14. Typical Threshold Voltage

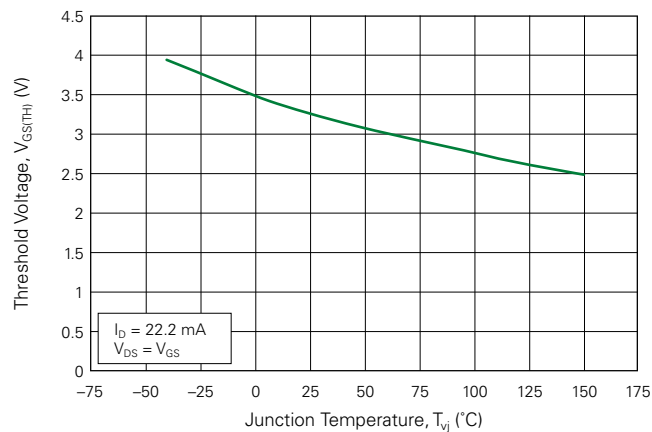


Fig. 15. Body Diode Forward Voltage vs. Gate-source Voltage

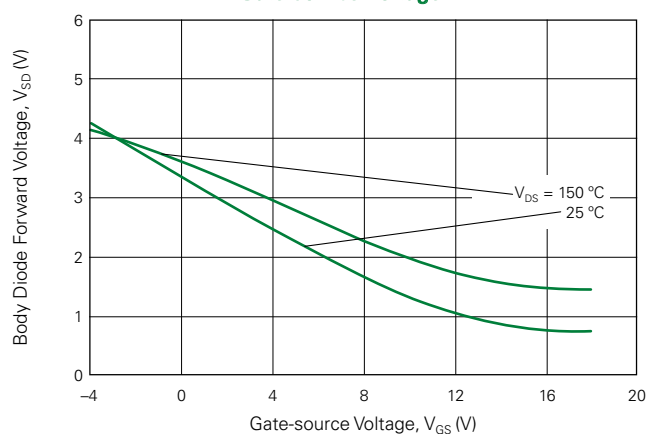


Fig. 16. Gate Charge Characteristics

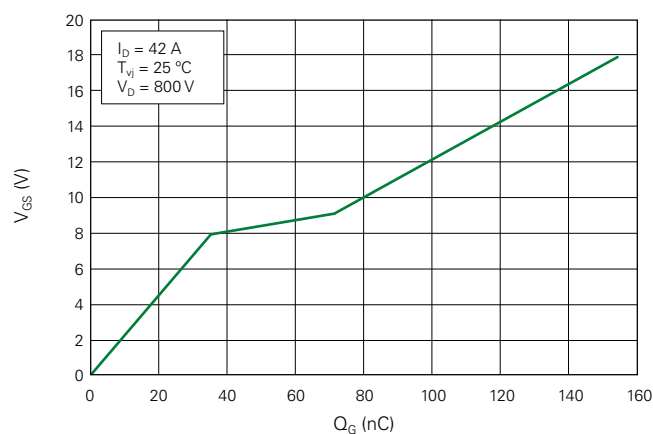
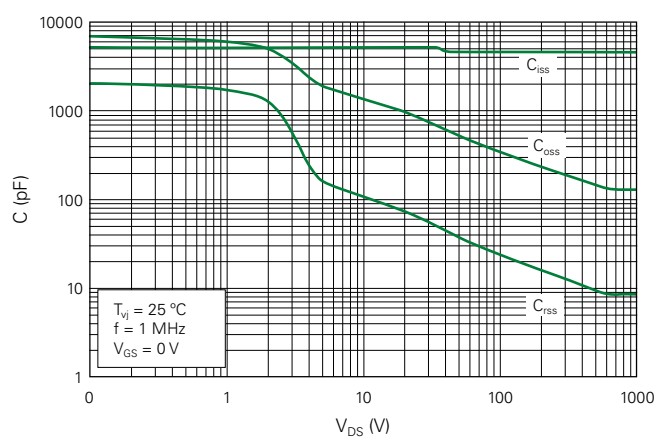
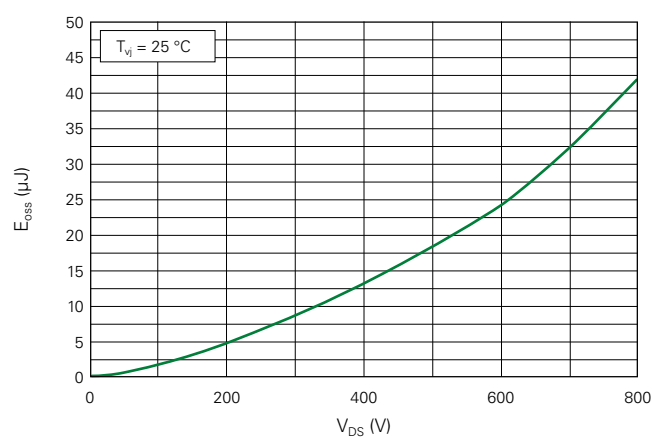
Fig. 17. Capacitance vs. V_{DS} Fig. 18. Output Capacitance C_{oss} Stored Energy

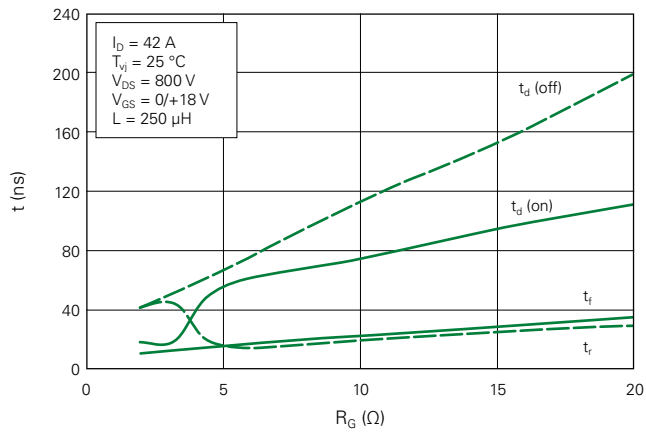
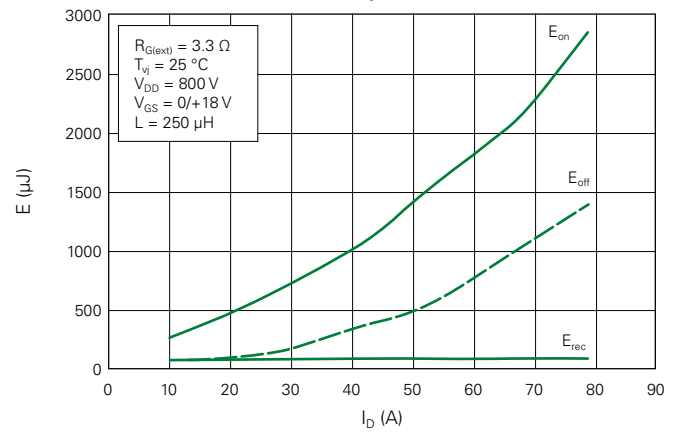
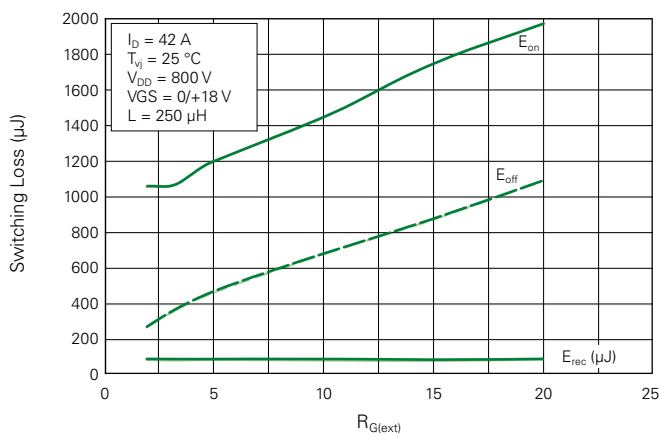
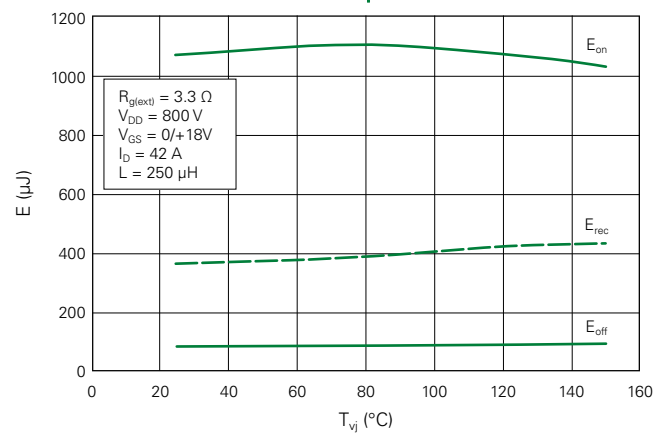
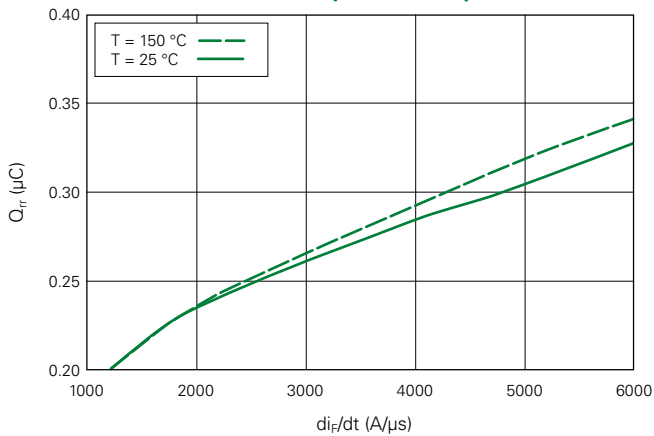
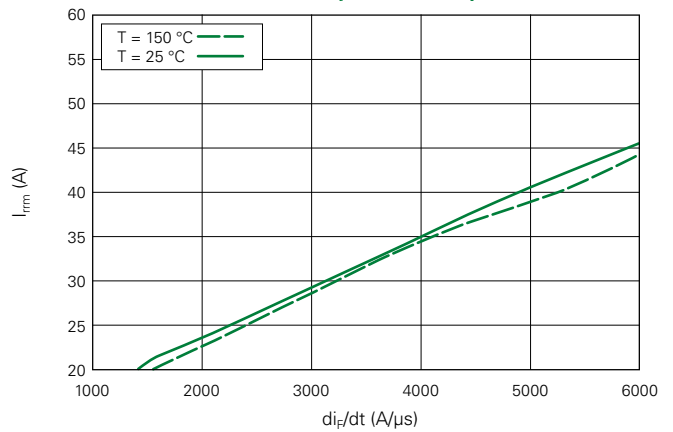
Fig. 19. Typical Switching Time vs. External Gate Resistor**Fig. 20. Typical Switching Energy vs. Junction Temperature****Fig. 21. Typical Switching Energy vs. External Gate Resistor****Fig. 22. Typical Switching Energy vs. Junction Temperature****Fig. 23. Typical Reverse Recovery Charge vs. Diode Recovery Current Slope****Fig. 24. Typical Reverse Recovery Current vs. Diode Recovery Current Slope**

Fig. 25. Thermal Impedance (Normalized)

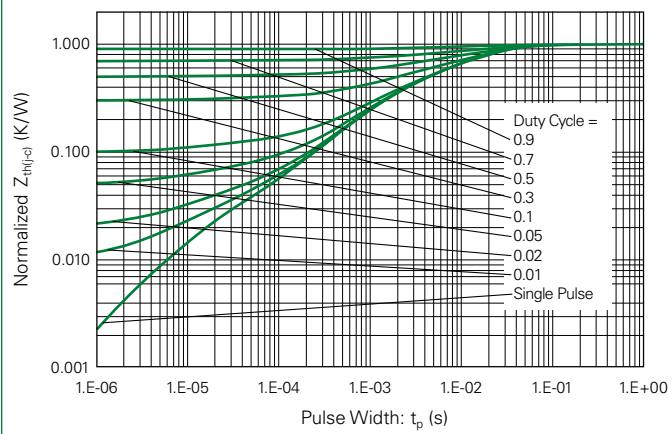
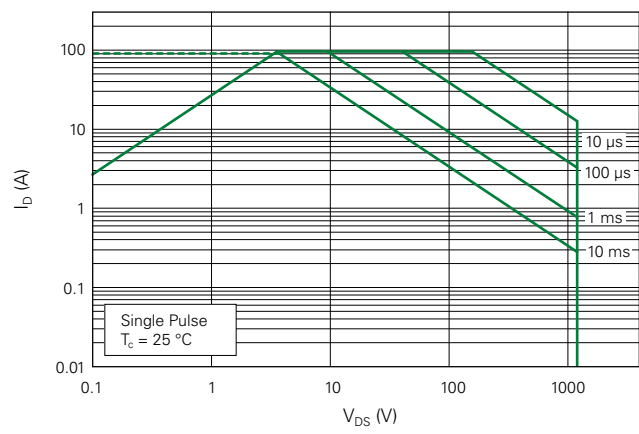
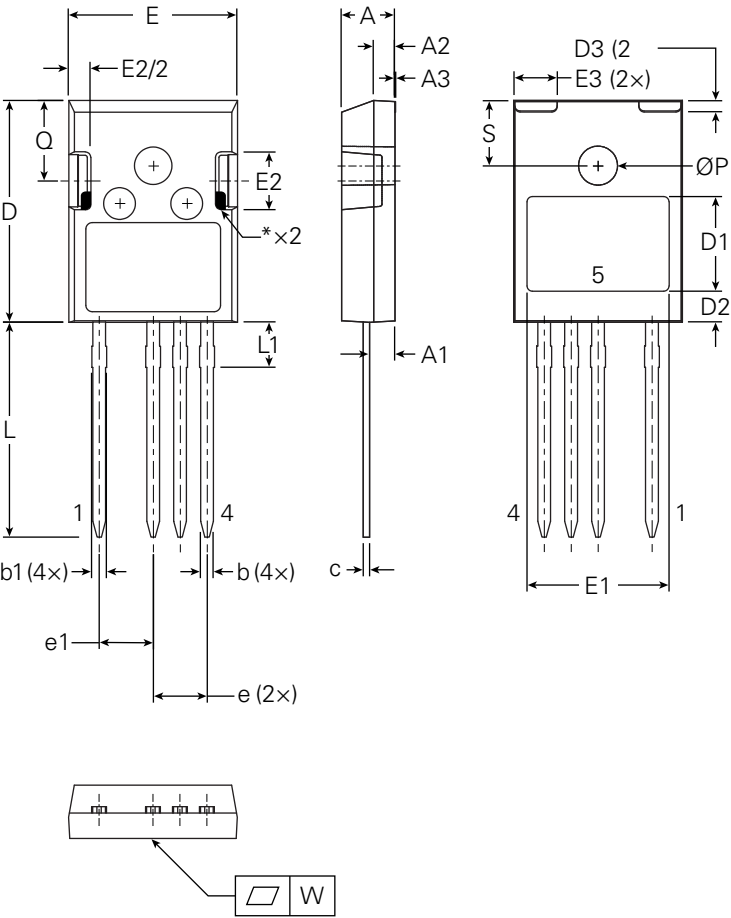


Fig. 26. Maximum Safe Operating Area ($T_c = 25\text{ }^{\circ}\text{C}$)



Part Outline Drawing (ISO247-4L)



- Note:**
1. Bottom Heatsink #5 is Pre-Ni Plated and electrically isolated from Pin #1, #2, #3, and #4.
 2. Dimensions are exclusive of burrs, mold flash and tie bar extrusions.
 3. Drawing conforms to ASME 14.5–2009.
- * Exposed metal, electrically isolated.

Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max
A	0.185	–	0.205	4.70	–	5.21
A1	0.087	–	0.102	2.21	–	2.59
A2	0.059	–	0.098	1.50	–	2.49
A3	0.002 TYP			0.05 TYP		
b	0.039	–	0.055	0.99	–	1.40
b1	0.043	–	0.059	1.10	–	1.50
c	0.015	–	0.035	0.38	–	0.89
D	0.819	–	0.844	20.80	–	21.45
D1	0.360 TYP			9.15 TYP		
D2	0.110 TYP			2.80 TYP		
D3	0.039 TYP			1.00 TYP		
E	0.610	–	0.639	15.49	–	16.24
E1	0.528 TYP			13.40 TYP		
E2	0.170	–	0.216	4.32	–	5.48
E3	0.157 TYP			4.00 TYP		
e	0.100 BSC			2.54 BSC		
e1	0.200 BSC			5.08 BSC		
L	0.780	–	0.799	19.81	–	20.30
L1	–	–	0.177	–	–	4.49
Q	0.290	–	0.306	7.36	–	7.76
ØP	0.140	–	0.144	3.56	–	3.65
S	0.242 BSC			6.15 BSC		
W	0.004 TYP			0.10 TYP		

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Part of:

