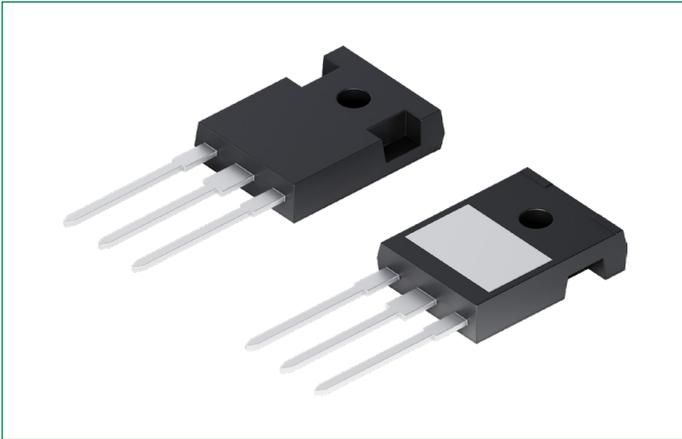
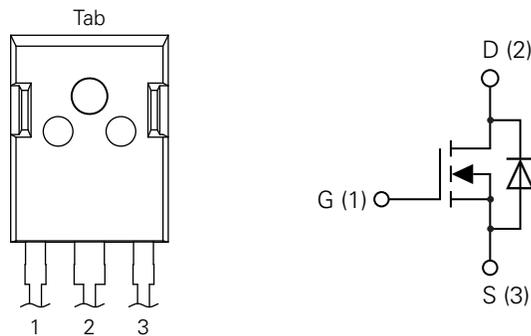


**IXSJ25N120R1**1200 V, 62 m $\Omega$ , 28 A SiC Power MOSFET

RoHS HF UL E153432

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

- Up to 1200 V blocking voltage with low  $R_{DS(on)}$  of 62 m $\Omega$
- Low gate charge of 52 nC and low input capacitance of 1498 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

**ISO247-3L 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

**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
$I_{D25}$	28	A
$V_{DSS}$	1200	V
$R_{DS(on) typ}$	62	m $\Omega$

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

Symbol	Characteristics	Conditions	Value			Unit	
			Min.	Typ.	Max.		
$V_{DSS}$	Drain-source voltage	$V_{GS} = 0\text{ V}, I_D = 5.3\text{ mA}, T_{vj} = 25\text{ °C}$	–	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	$V_{GS} = 18\text{ V}$	$T_c = 25\text{ °C}$	–	28	–	A
			$T_c = 80\text{ °C}$	–	23	–	
			$T_c = 100\text{ °C}$	–	21	–	
$I_{DM}$	Peak drain current	$T_c = 25\text{ °C}$ , pulse width limited by $T_{vj(max)}$	–	49	–	A	
$I_S$	Diode forward current	$V_{GS} = 0\text{ V}, T_c = 25\text{ °C}$	–	22	–	A	
$I_{SM}$	Body-diode surge forward current	Pulse width limited by $T_{vj(max)}$	–	44	–	A	
$P_{tot}$	Total power dissipation	$T_c = 25\text{ °C}$	–	75.3	–	W	
$T_{vj}$	Virtual junction temperature range	–	–40	–	+150	°C	
$T_{vj(max)}$	Maximum virtual junction temperature	–	–	150	–	°C	
$T_{stg}$	Storage temperature range	–	–40	–	+150	°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	–	°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		–	–	
	Clearance distance through air	Terminal to backside plane	For all Terminals	2.4	–	–	
Creepage distance on surface	Terminal to backside tab	5.26		–	–		
G	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	–	–	–	1.66	K/W

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

Symbol	Characteristics	Conditions	Value			Unit	
			Min.	Typ.	Max.		
$V_{(BR)DSS}$	Breakdown voltage, drain-source	$V_{GS} = 0\text{ V}, I_D = 5.3\text{ mA}, T_{vj} = 25\text{ °C}$	1200	–	–	V	
$V_{GS(th)}$	Gate-source threshold voltage	$V_{GS} = V_{DS}, I_D = 5.3\text{ mA}$	$T_{vj} = 25\text{ °C}$	2.8	–	4.8	V
			$T_{vj} = 150\text{ °C}$	–	2.5	–	V
$I_{DSS}$	Drain-source leakage current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$	–	1	80	$\mu\text{A}$
			$T_{vj} \leq 150\text{ °C}$	–	10	–	
$I_{GSS,F}$	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	$I_D = 12\text{ A}, V_{GS} = 18\text{ V}$	$T_{vj} = 25\text{ °C}$	–	62	81	$\text{m}\Omega$
			$T_{vj} = 150\text{ °C}$	–	127	–	$\text{m}\Omega$
$R_{g(int)}$	Internal gate resistance	$f = 1\text{ MHz}, R_G$ , Resonance method, drain-source shorted <sup>1</sup>	–	4	–	$\Omega$	
$g_{fs}$	Transconductance	$V_{DS} = 10\text{ V}, I_D = 12\text{ A}$	–	8.3	–	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 ( $T_{vj} = 25\text{ °C}$ unless otherwise specified)

Symbol	Characteristics	Conditions	Value			Unit		
			Min.	Typ.	Max.			
$C_{iss}$	Input capacitance	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	–	1435	–	pF		
$C_{oss}$	Output capacitance		–	47	–			
$C_{riss}$	Reverse transfer capacitance		–	3	–			
$Q_G$	Total gate charge	$V_{DD} = 800\text{ V}, I_D = 12\text{ A}, V_{GS} = 0/+18\text{ V},$ $R_{g(ext)} = 0\ \Omega, L = 250\ \mu\text{H}$ FWD: Body Diode	–	52	–	nC		
$Q_{GS}$	Gate-source charge		–	11	–			
$Q_{GD}$	Gate-drain charge		–	13	–			
$E_{oss}$	Output capacitance charge energy	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	–	15	–	$\mu\text{J}$		
$t_{d(on)}$	Turn-on delay time	<b>Inductive Switching</b> Free Wheeling Diode: Body Diode $V_{DD} = 800\text{ V}, V_{GS} = 0/+18\text{ V}, I_D = 12\text{ A},$ $R_{g(ext)} = 0\ \Omega$	$T_{vj} = 25\text{ °C}$	–	10	–	ns	
$t_r$	Rise time		$T_{vj} = 150\text{ °C}$	–	10	–		
			$T_{vj} = 25\text{ °C}$	–	20	–		
$t_{on}$	Turn-on time		$T_{vj} = 150\text{ °C}$	–	18	–		
			$T_{vj} = 25\text{ °C}$	–	30	–		
$E_{on}$	Turn-on energy		$T_{vj} = 150\text{ °C}$	–	28	–		
			$T_{vj} = 25\text{ °C}$	–	167	–		
$t_{d(off)}$	Turn-off delay time		$T_{vj} = 25\text{ °C}$	–	162	–	$\mu\text{J}$	
			$T_{vj} = 150\text{ °C}$	–	25	–		
$t_f$	Fall time		$T_{vj} = 25\text{ °C}$	–	28	–		ns
			$T_{vj} = 150\text{ °C}$	–	8	–		
$t_{off}$	Turn-off time		$T_{vj} = 25\text{ °C}$	–	10	–		
		$T_{vj} = 150\text{ °C}$	–	34	–			
$E_{off}$	Turn-off energy	$T_{vj} = 25\text{ °C}$	–	39	–	$\mu\text{J}$		
		$T_{vj} = 150\text{ °C}$	–	44	–			
$E_{tot}$	Total switching energy	$T_{vj} = 25\text{ °C}$	–	50	–	$\mu\text{J}$		
		$T_{vj} = 150\text{ °C}$	–	211	–			
			$T_{vj} = 25\text{ °C}$	–	213	–	$\mu\text{J}$	

### Electrical Characteristics – Body Diode ( $T_{vj} = 25\text{ °C}$ unless otherwise specified)

Symbol	Characteristics	Conditions	Value			Unit	
			Min.	Typ.	Max.		
$V_{SD}$	Forward voltage drop	$I_{SD} = 12\text{ A}, V_{GS} = 0\text{ V}$	–	3.2	–	V	
		$I_{SD} = 12\text{ A}, V_{GS} = 0\text{ V}, T_{vj} = 150\text{ °C}$	–	3.3	–		
$t_{rr}$	Reverse recovery time	$V_{GS} = 0\text{ V}, I_F = 12\text{ A}, V_R = 800\text{ V}$ MOSFET Gate Drive: $R_{g(ext)} = 0\ \Omega$	$T_{vj} = 25\text{ °C}$	–	28	–	ns
			$T_{vj} = 150\text{ °C}$	–	30	–	
$Q_{rr}$	Reverse recovery charge		$T_{vj} = 25\text{ °C}$	–	121	–	nC
			$T_{vj} = 150\text{ °C}$	–	126	–	
$I_{rrm}$	Peak reverse recovery current		$T_{vj} = 25\text{ °C}$	–	8	–	A
			$T_{vj} = 150\text{ °C}$	–	8	–	
$di_f/dt$	Current slew rate		$T_{vj} = 25\text{ °C}$	–	1339	–	A/ $\mu\text{s}$
			$T_{vj} = 150\text{ °C}$	–	1596	–	
$E_{rec(off)}$	Turn-off energy of intrinsic diode per pulse	Inductive load, $V_{DD} = 800\text{ V}, V_{GS} = 0/+18\text{ V},$ $I_S = 12\text{ A}, R_{g(ext)} = 0\ \Omega, L = 250\ \mu\text{H}$	$T_{vj} = 25\text{ °C}$	–	52	–	$\mu\text{J}$
			$T_{vj} = 150\text{ °C}$	–	53	–	

Characteristic Curves

Fig. 1. Typical Transfer Characteristics

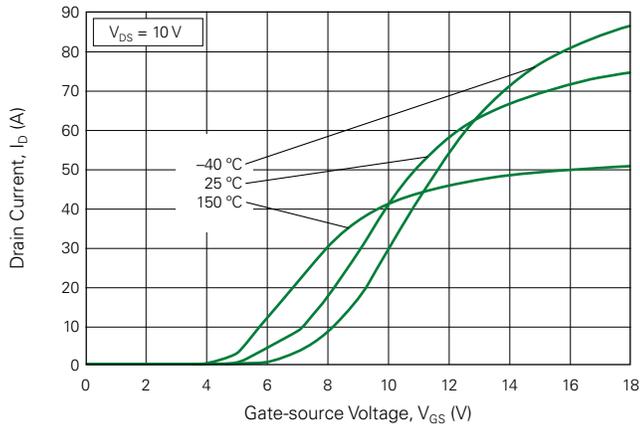


Fig. 2. Typical Transconductance

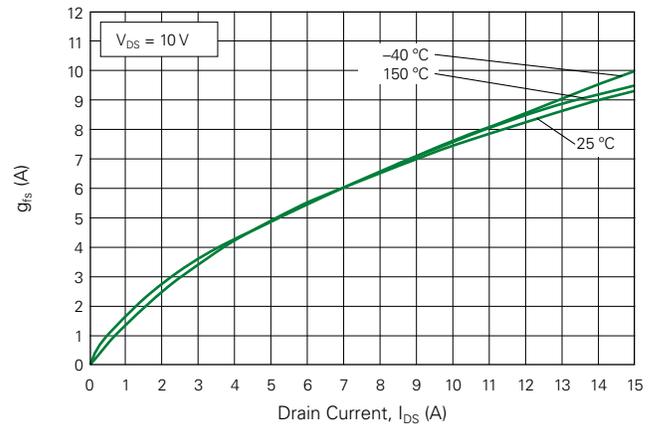


Fig. 3. Typical Output Characteristics @  $T_{vj} = 25^\circ C$

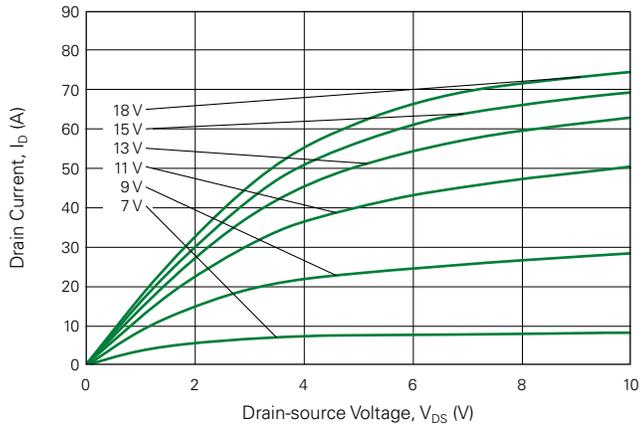


Fig. 4. Typical Output Characteristics @  $T_{vj} = 150^\circ C$

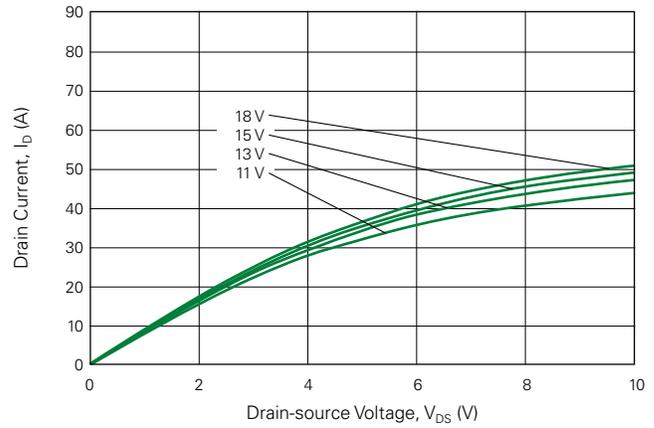


Fig. 5. Typical Output Characteristics @  $T_{vj} = -40^\circ C$

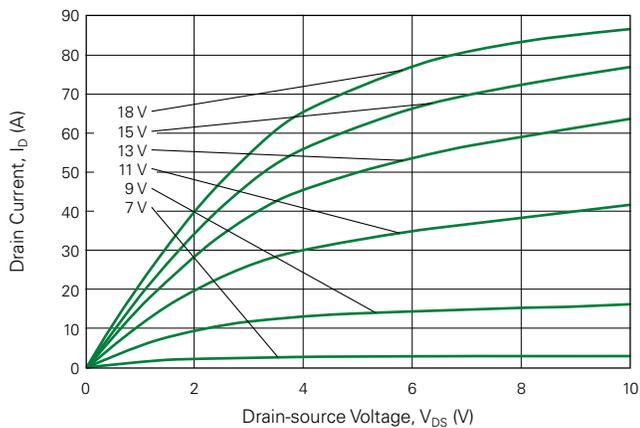


Fig. 6.  $R_{DS(on)}$  Normalized to  $I_D = 12A$  vs. Drain Current

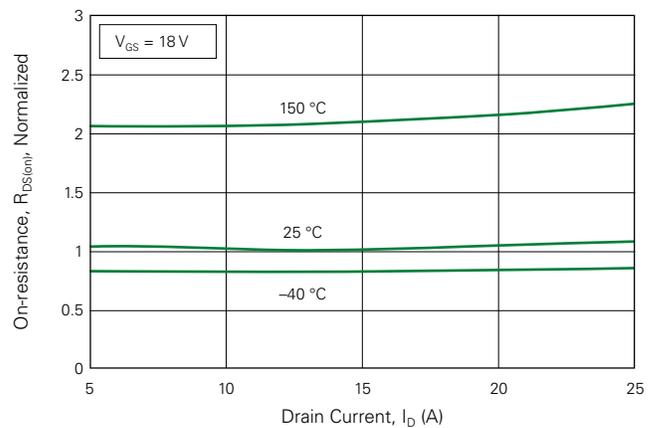


Fig. 7.  $R_{DS(on)}$  Normalized to  $I_D = 12\text{ A}$  vs. Junction Temperature

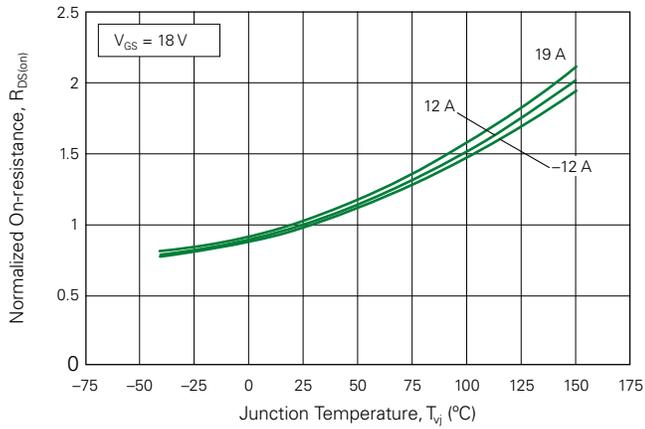


Fig. 8. Typical Drain-source On-state Resistance vs. Gate-source Voltage

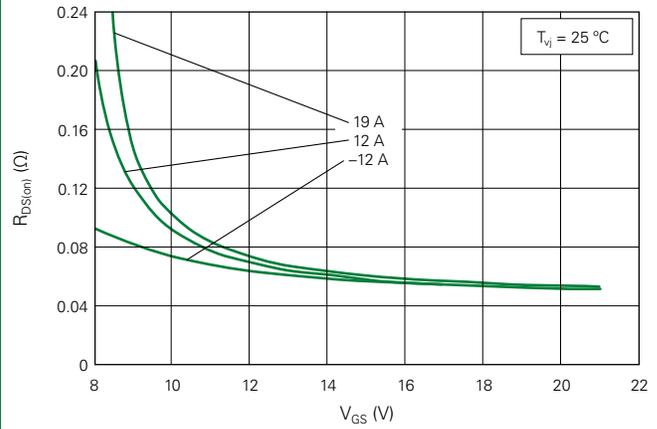


Fig. 9. Typical  $V_{(BR)DSS}/V_{GS(th)}$  (Normalized) vs. Virtual Junction Temperature

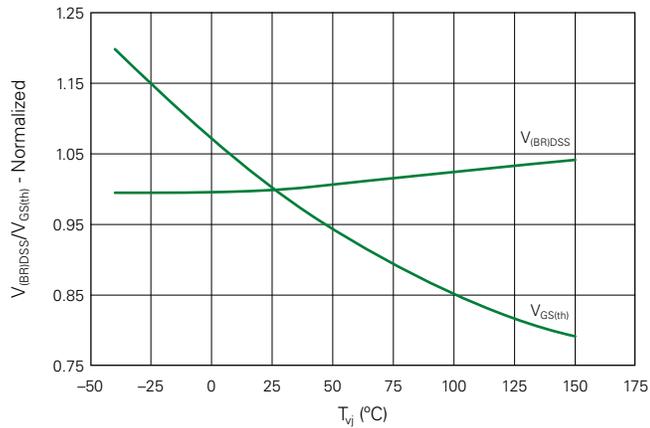


Fig. 10. Typical Reverse Conduction Characteristics @  $T_{vj} = -40\text{ °C}$

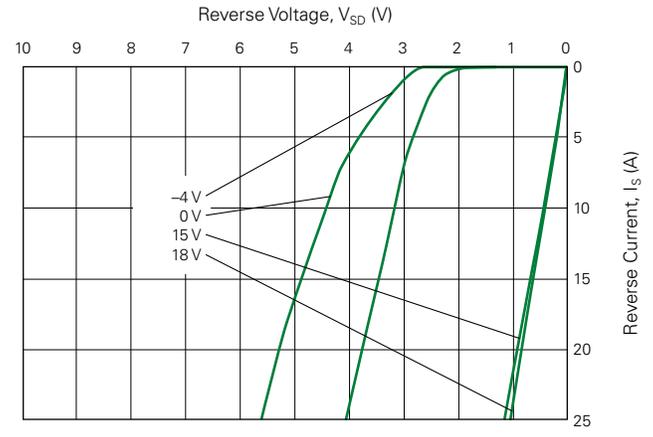


Fig. 11. Typical Reverse Conduction Characteristics @  $T_{vj} = 25\text{ °C}$

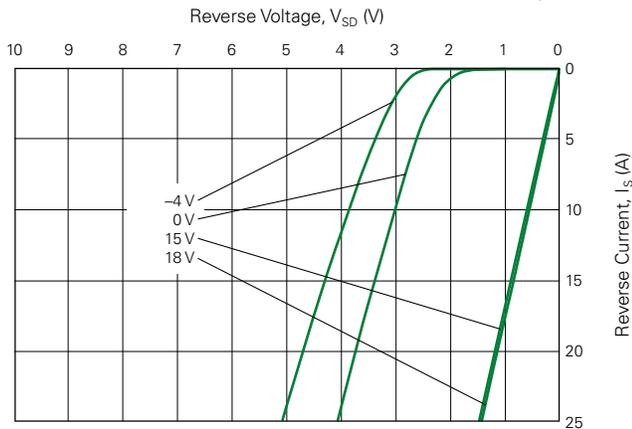
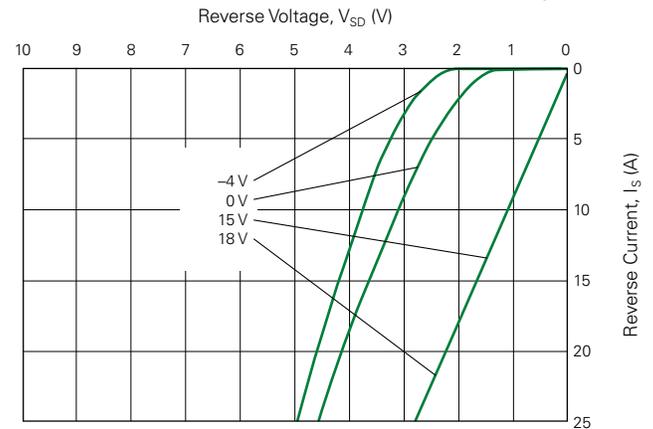
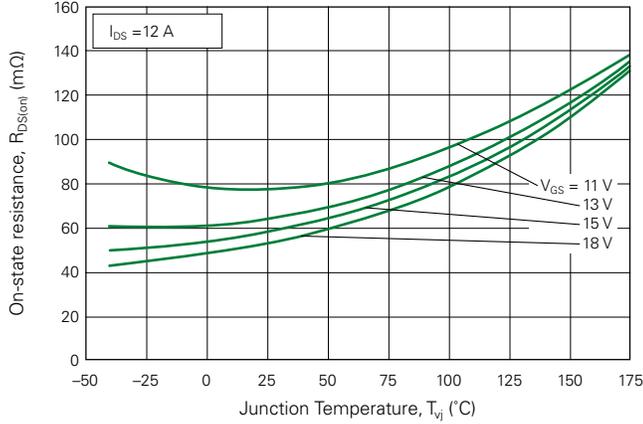


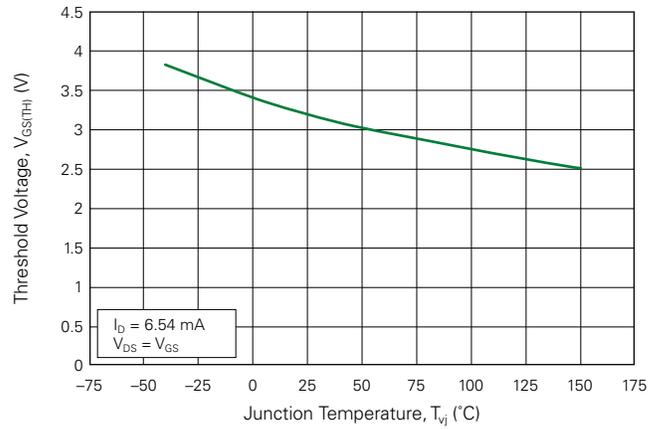
Fig. 12. Typical Reverse Conduction Characteristics @  $T_{vj} = 150\text{ °C}$



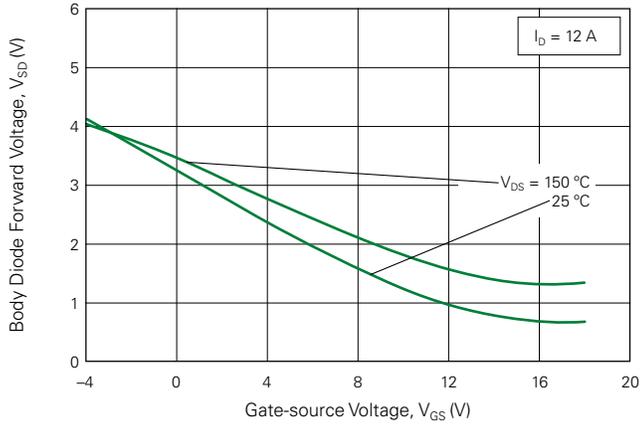
**Fig. 13. Typical On-resistance vs. Junction Temperature**



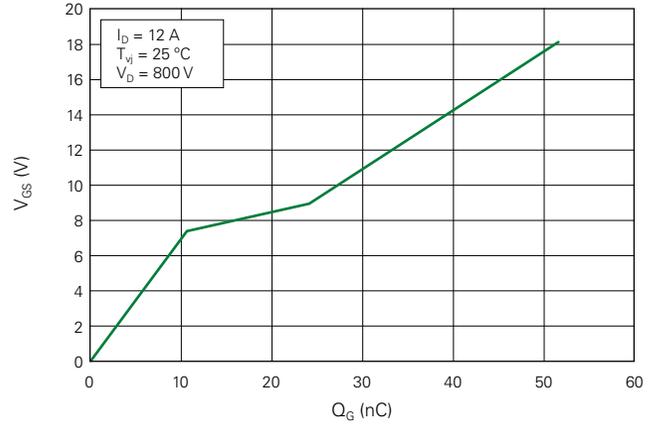
**Fig. 14. Typical Threshold Voltage**



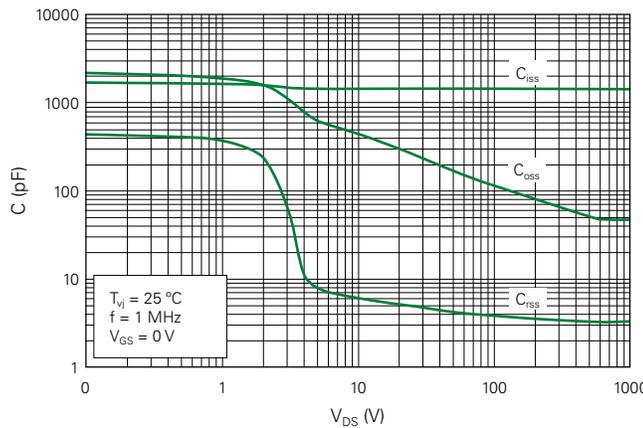
**Fig. 15. Body Diode Forward Voltage vs. Gate-source Voltage**



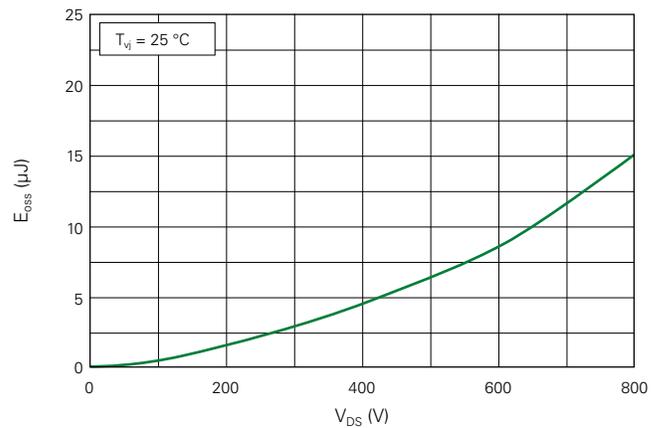
**Fig. 16. Gate Charge Characteristics**



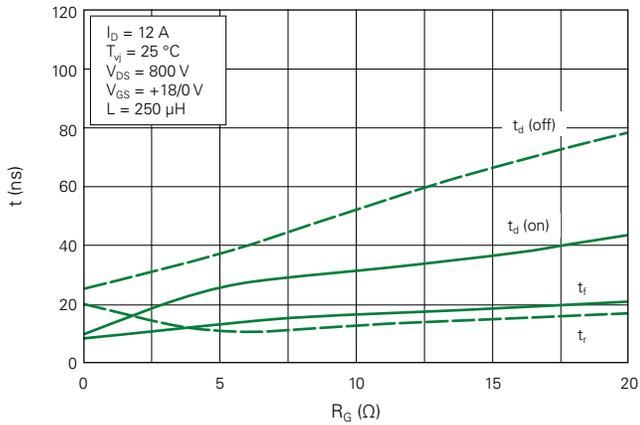
**Fig. 17. Capacitance vs.  $V_{DS}$**



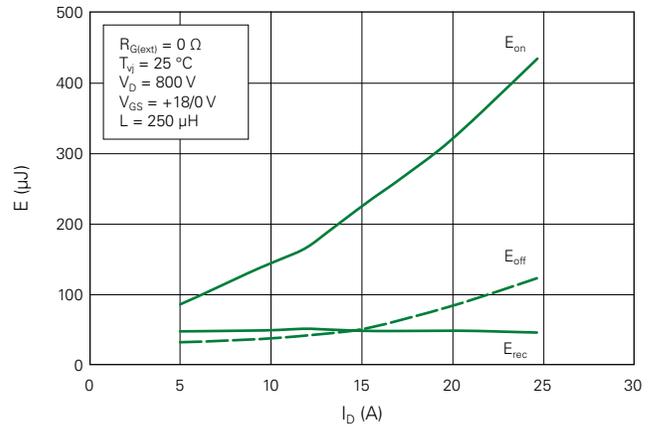
**Fig. 18. Output Capacitance  $C_{oss}$  Stored Energy**



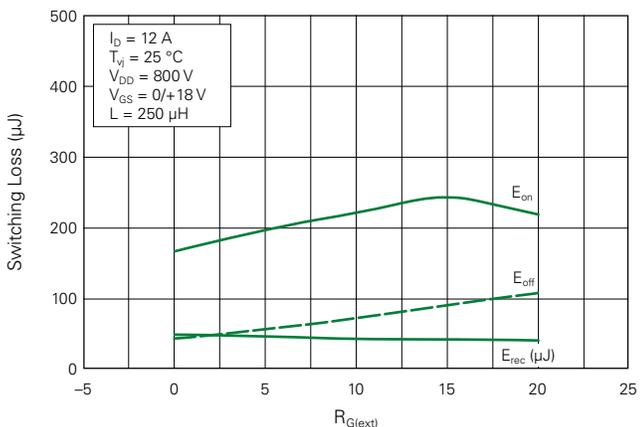
**Fig. 19. Typical Switching Time vs. External Gate Resistor**



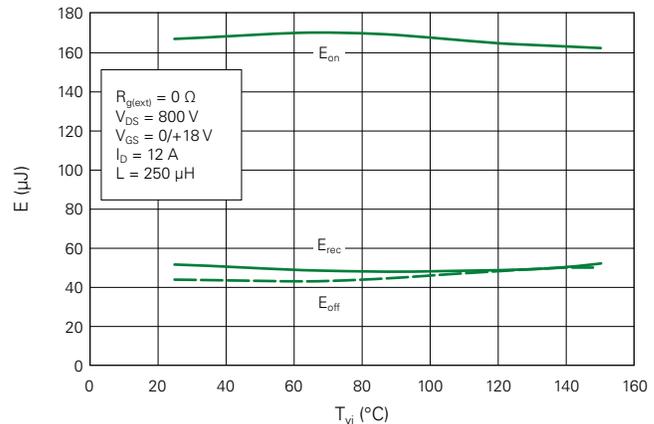
**Fig. 20. Typical Switching Energy vs. Drain Current**



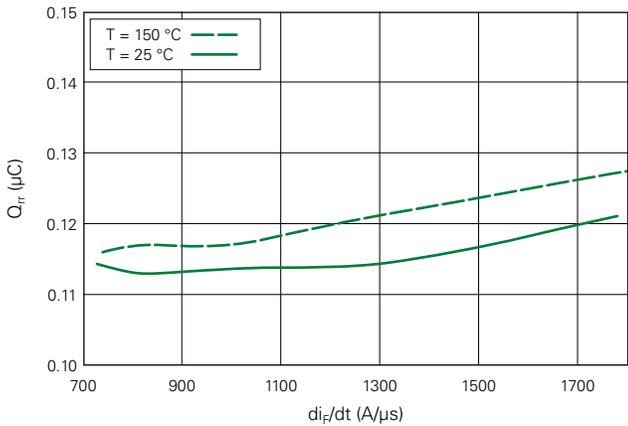
**Fig. 21. Typical Switching Energy vs. External Gate Resistor**



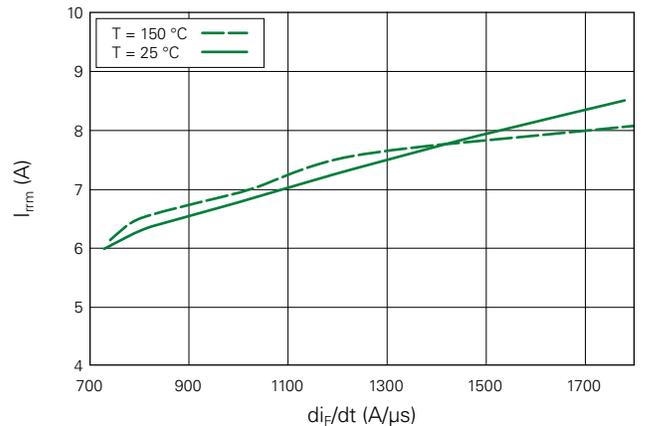
**Fig. 22. Typical Switching Energy vs. Junction Temperature**



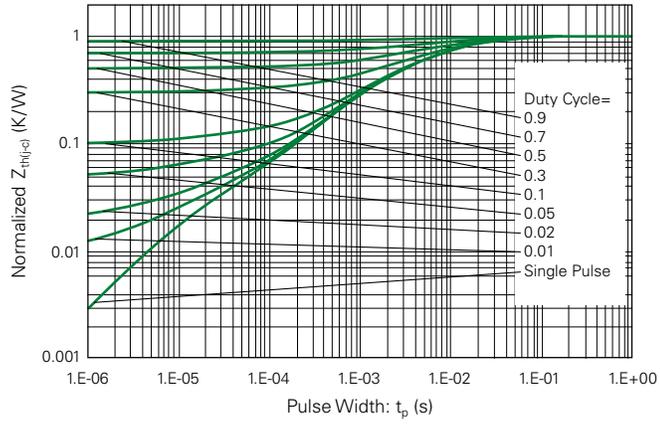
**Fig. 23. Typical Reverse Recovery Charge vs. Diode Recovery Current Slope**



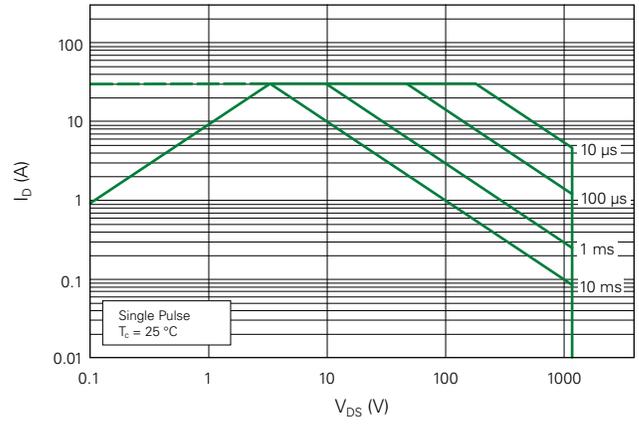
**Fig. 24. Typical Reverse Recovery Current vs. Diode Recovery Current Slope**



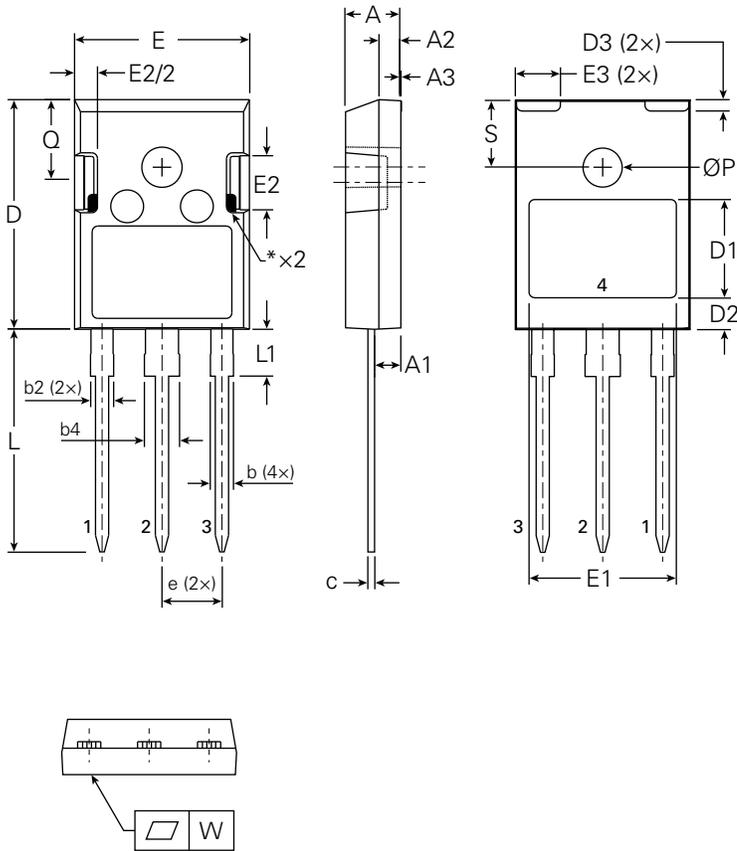
**Fig. 25. Thermal Impedance (Normalized)**



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



## Part Outline Drawing (ISO247-3L)

**Note:**

1. Bottom Heatsink #4 is Pre-Ni Plated and electrically isolated from Pin #1, #2, and #3.
  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
b2	0.065	–	0.094	1.65	–	2.39
b4	0.102	–	0.135	2.59	–	3.43
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	0.215 BSC			5.46 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:

