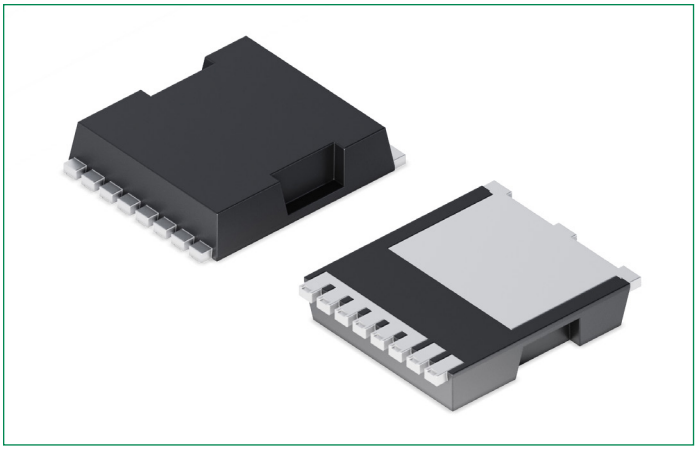
IXSG40N65L2K

650 V, 60 mΩ, 43 A SiC MOSFET

RoHS HF



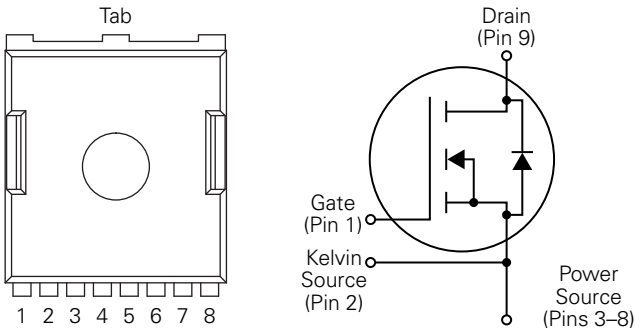
Features

- High blocking voltage with low on-state resistance
- High-speed switching with low capacitance
- High operating junction temperature capability
- Very fast intrinsic body diode
- Kelvin source contact
- MSL1 rated

Applications

- EV charging infrastructure
- Induction heating
- Motor drivers
- Solar inverters
- Switch mode power supplies
- Energy storage system

Pinout Diagram (TOLL)



G: Gate; **KS:** Kelvin Source; **S:** Power Source; **Tab:** Drain

Product Summary

Characteristic	Value	Unit
V_{DSS}	650	V
$R_{DS(on)}$	60	mΩ
I_D @ 25 °C	43	A

Revised: XZ 10/24/2025 (0.6)

Maximum Ratings (T_c = 25 °C unless otherwise specified)

Symbol	Characteristic	Conditions	Value	Unit
V_{DSS}	Drain-source voltage	V_{GS} = 0 V, I_D = 100 µA	650	V
V_{GSM}	Maximum gate-source voltage	–	–5 to +20	V
	Transient gate-source voltage	$t_{transient}$ = 200 ns, D < 1 %	–10 to +23	
I_D	Drain current (continuous) Fig.21	V_{GS} = 18 V, T_c = 25 °C	43	A
		V_{GS} = 18 V, T_c = 100 °C	32	A
I_{DM}	Peak drain current Fig. 25, 26	Pulse width limited by SOA and thermal impedance Z_{th}	108	A
I_{SM}	Diode pulsed forward current Fig. 25, 26	Pulse width limited by SOA and thermal impedance Z_{th}	108	A
P_{tot}	Total power dissipation Fig. 22	T_c = 25 °C	174	W
T_{vj}	Virtual junction temperature range	–	–55 to +175	°C
T_{stg}	Storage temperature range	–	–55 to +175	°C
T_{sold}	Soldering temperature	Wave soldering only allowed at leads, 1.6mm from case for 10 s	260	°C

Recommended Values

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
V_{GSon}	Recommended turn-on voltage	15	–	18	V
V_{GSoff}	Recommended turn-off voltage	–5	–3.5	–2	

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal resistance from junction to case Fig. 23	–	0.86	–	K/W

Electrical Characteristics – Static (T_c = 25 °C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
I_{DSS}	Drain-source leakage current	V_{DS} = 650 V, V_{GS} = 0 V	–	3	100	µA
I_{GSS}	Gate leakage current	V_{DS} = 0 V, V_{GS} = –5 ~ 20 V	–	–	±100	nA
$V_{GS(th)}$	Gate threshold voltage Fig. 8, 9	V_{GS} = V_{DS}, I_D = 5 mA	1.8	2.8	4.5	V
		V_{GS} = V_{DS}, I_D = 5 mA, T_{vj} = 175 °C	–	2.0	–	
$R_{DS(on)}$	Drain-source on-state resistance Fig. 4, 5, 6, 7	V_{GS} = 15 V, I_D = 15 A @ T_{vj} = 25 °C	–	79	–	mΩ
		V_{GS} = 15 V, I_D = 15 A @ T_{vj} = 175 °C	–	92	–	
		V_{GS} = 18 V, I_D = 15 A @ T_{vj} = 25 °C	–	60	78	
		V_{GS} = 18 V, I_D = 15 A @ T_{vj} = 175 °C	–	84	–	

Electrical Characteristics – Dynamic (T_{vj} = 25 °C unless otherwise specified)

Symbol	Characteristic	Conditions		Value			Unit
				Min.	Typ.	Max.	
C_{iss}	Input capacitance Fig. 16	V_{DS} = 600 V, V_{GS} = 0 V, f = 1 MHz, V_{AC} = 25 mV		–	1218	–	pF
C_{oss}	Output capacitance Fig. 16			–	118	–	
C_{rss}	Reverse transfer capacitance Fig. 16			–	7.6	–	
E_{oss}	C_{oss} stored energy Fig. 17			–	24.6	–	µJ
Q_G	Total gate charge Fig. 18	V_{DS} = 400 V, I_D = 15 A, V_{GS} = –3 to +18 V		–	64	–	nC
Q_{GS}	Gate-source charge Fig. 18			–	14	–	
Q_{GD}	Gate-drain charge Fig. 18			–	33	–	
$R_{g(int)}$	Gate input resistance	f = 1 MHz		–	4.7	–	Ω
E_{on}	Turn-on switching energy Fig. 19, 20	V_{DS} = 400 V, I_D = 15 A, V_{GS} = –3.5 to +18 V, $R_{G(ext)}$ = 3.3 Ω, L = 200 µH	T_{vj} = 25 °C	–	76.2	–	µJ
E_{off}	Turn-off switching energy Fig. 19, 20		T_{vj} = 25 °C	–	12.9	–	
$t_{d(on)}$	Turn-on delay time Fig. 19, 20		T_{vj} = 25 °C	–	4.3	–	ns
t_r	Rise time Fig. 19, 20		T_{vj} = 25 °C	–	12.2	–	
$t_{d(off)}$	Turn-off delay time Fig. 19, 20		T_{vj} = 25 °C	–	11.4	–	
t_f	Fall time Fig. 19, 20		T_{vj} = 25 °C	–	7.8	–	

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

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode forward voltage Fig. 10, 11, 12	I_{SD} = 15 A, V_{GS} = 0 V	–	4.2	–	V
		I_{SD} = 15 A, V_{GS} = 0 V, T_{vj} = 175 °C	–	3.9	–	V
I_s	Diode forward current (continuous)	V_{GS} = –2 V, T_c = 25 °C	–	–	33	A
		V_{GS} = –2 V, T_c = 100 °C	–	–	19	
t_{rr}	Reverse recovery time	V_{GS} = –3.5 V/+18 V, I_{SD} = 15 A, V_R = 400 V, $R_{G(ext)}$ = 13 Ω, L = 200 µH, di/dt = 3000 A/µs	–	26.4	–	ns
Q_{rr}	Reverse recovery charge		–	138.5	–	nC
I_{rrm}	Peak reverse recovery current		–	14.9	–	A

Characteristic Curves

Fig. 1. Typical Output Characteristics @ T_{vj} = –55 °C

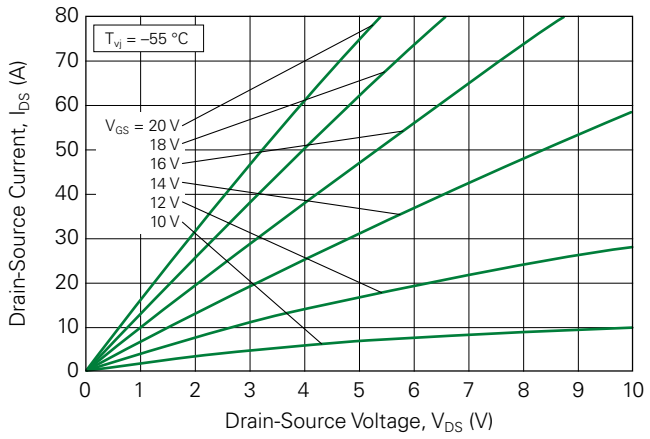


Fig. 2. Typical Output Characteristics @ T_{vj} = 25 °C

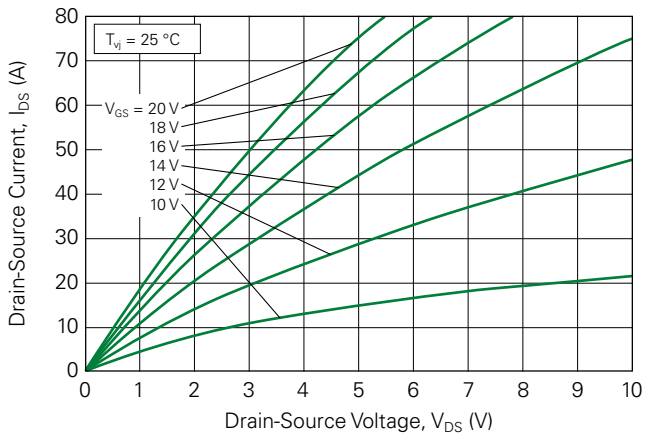


Fig. 3. Typical Output Characteristics @ T_{vj} = 175 °C

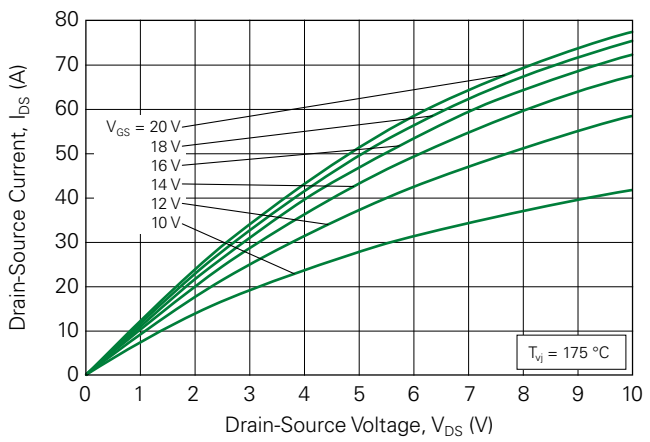


Fig. 4. Typical Drain-source On-state Resistance vs. Junction Temperature

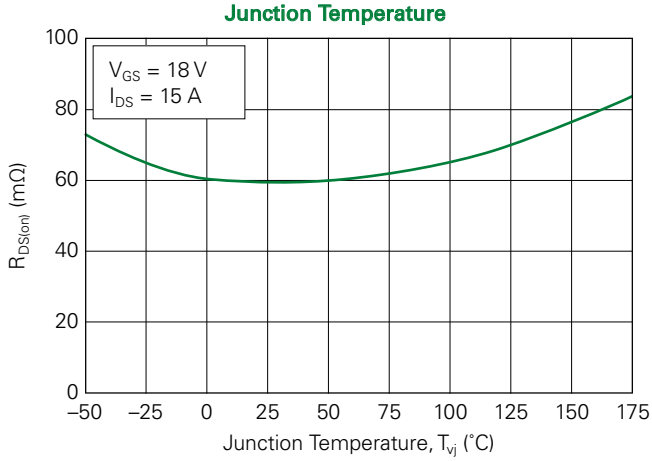


Fig. 5. Typical Drain-source On-State Resistance (Normalized) vs. Junction Temperature

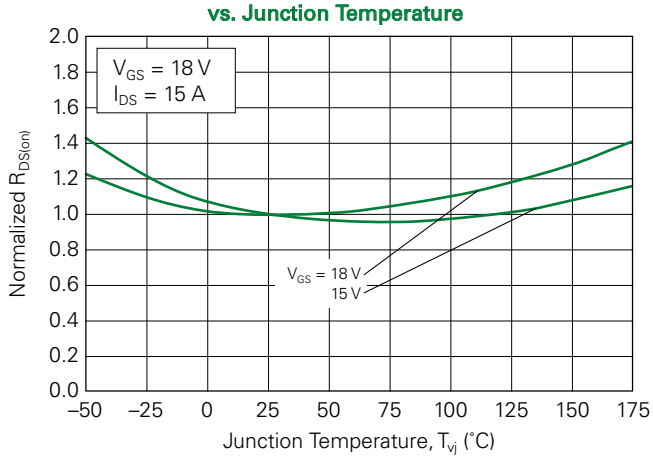


Fig. 6. Typical Drain-source On-state Resistance vs. Drain Current

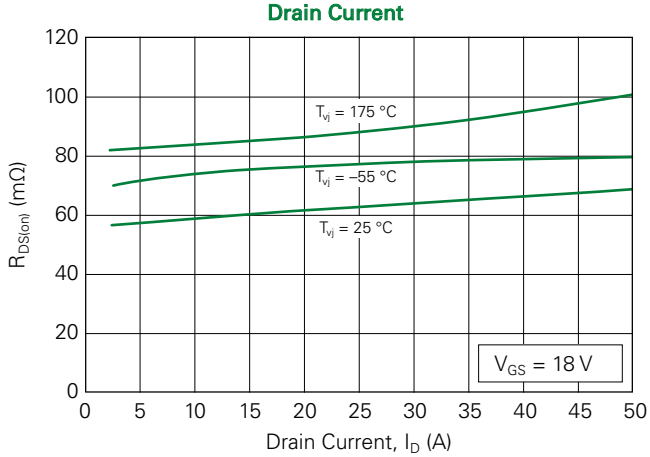


Fig. 7. $R_{DS(on)}$ vs. Temperature

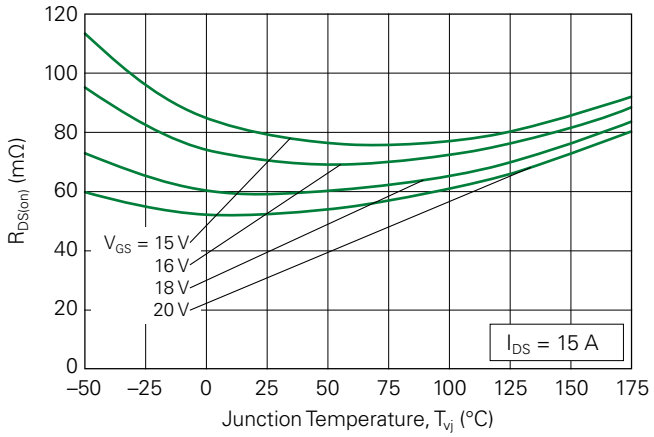


Fig. 8. Transfer Curves

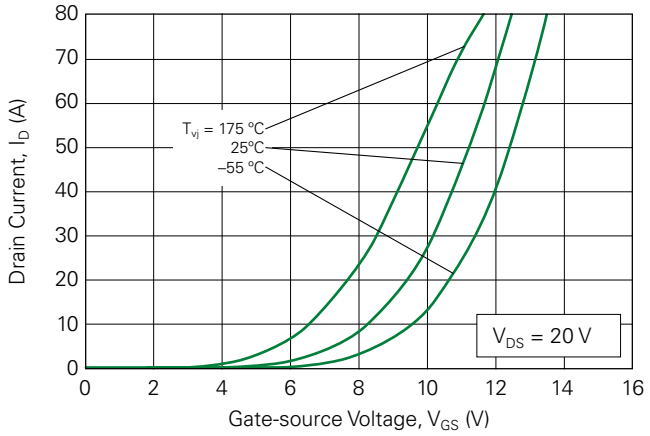


Fig. 9. Threshold Voltage vs. Temperature

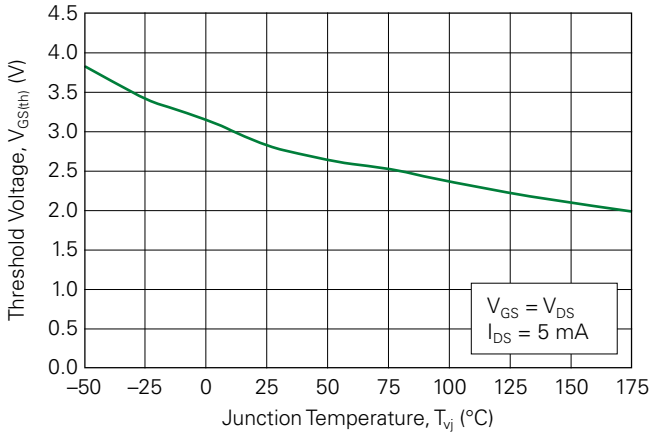


Fig. 10. Body Diode Curves @ T_{vj} = –55 °C

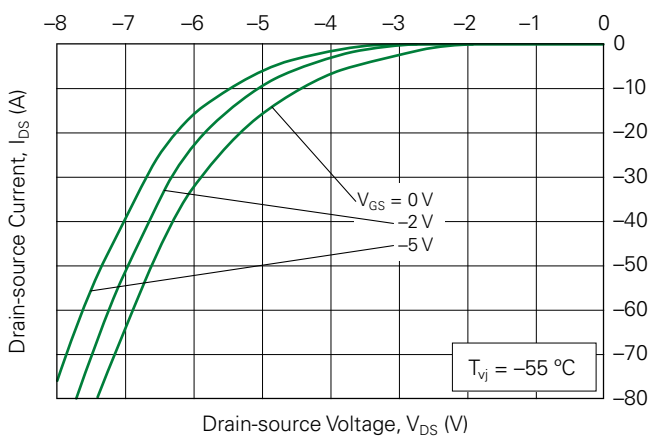


Fig. 11. Body Diode Curves @ T_{vj} = 25 °C

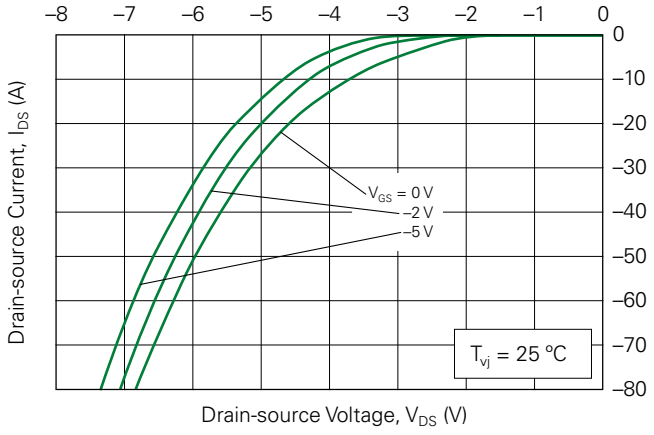


Fig. 12. Body Diode Curves @ T_{vj} = 175 °C

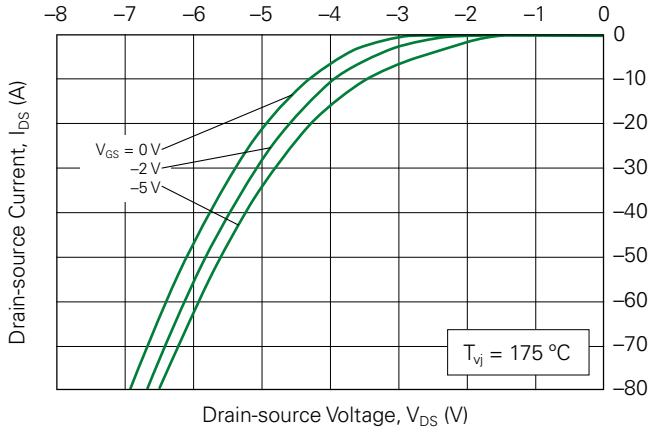


Fig. 13. Typical Reverse Conduction Characteristics @ T_{vj} = –55 °C

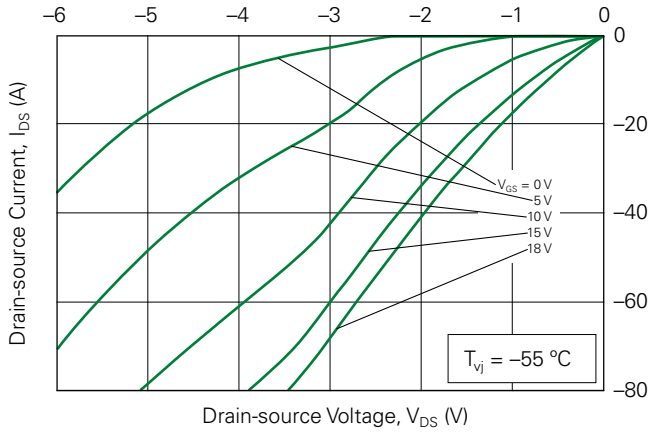


Fig. 14. Typical Reverse Conduction Characteristics @ T_{vj} = 25 °C

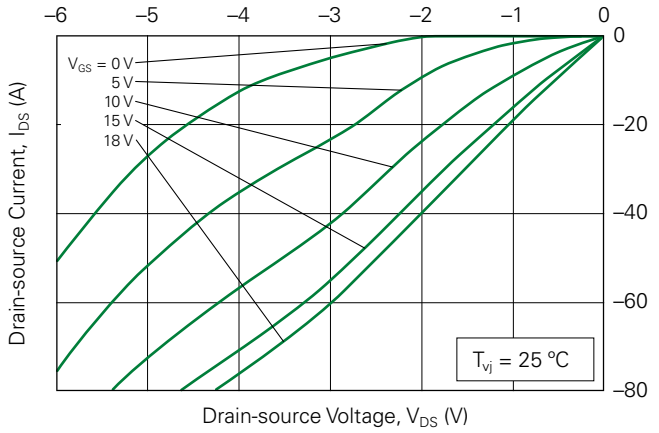


Fig. 15. Typical Reverse Conduction Characteristics @ T_{vj} = 175 °C

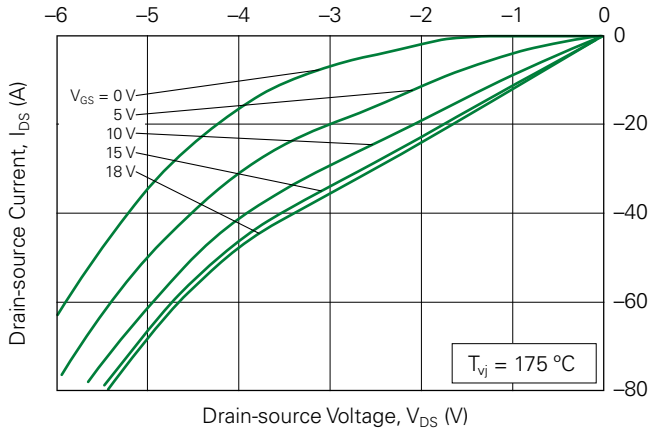


Fig. 16. Capacitance vs. V_{DS}

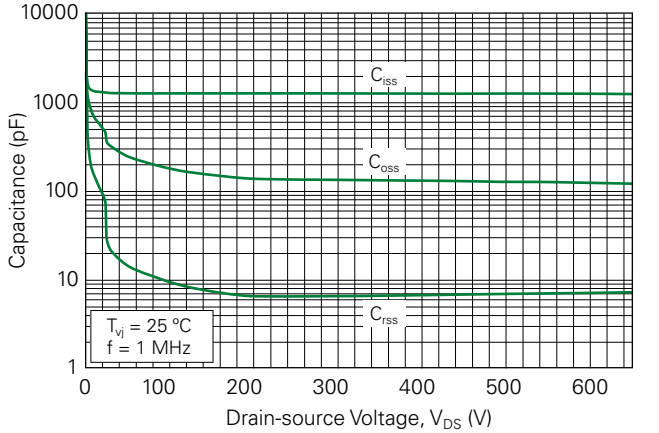


Fig. 17. Output Capacitor Stored Energy

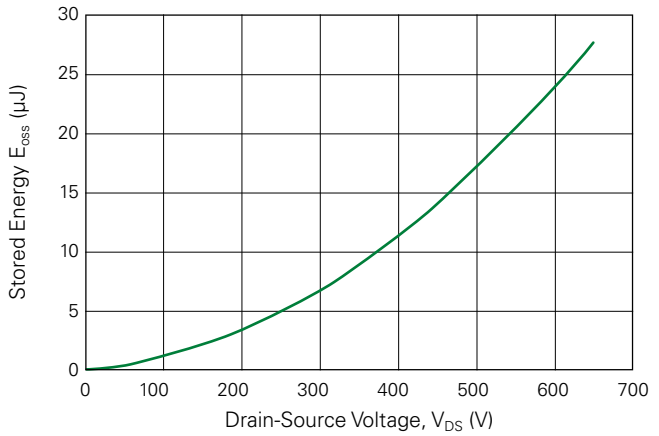


Fig. 18. Gate Charge Characteristics

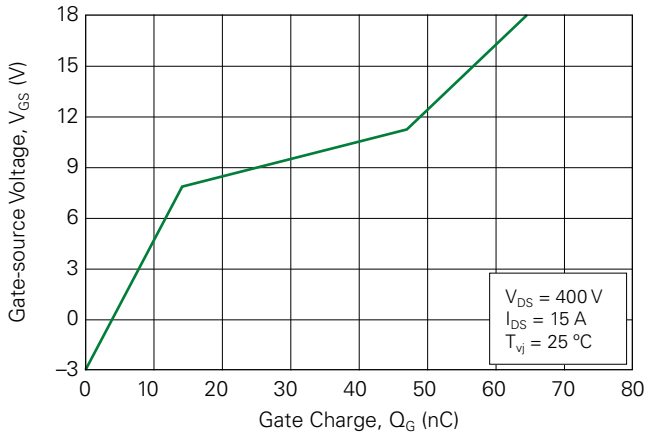


Fig. 19. Switching Energy vs. $R_{G(ext)}$

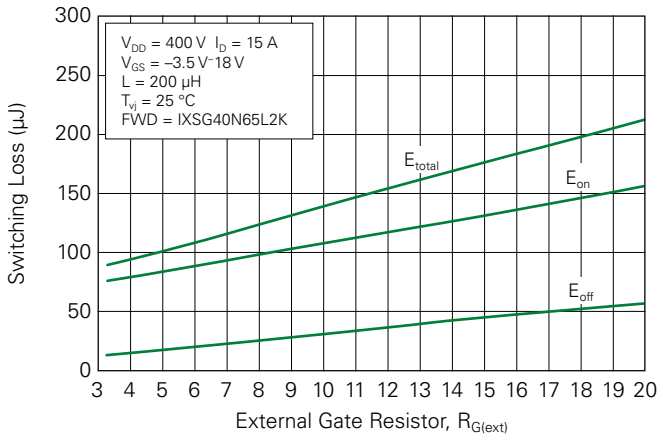


Fig. 20. Switching Times vs. $R_{G(ext)}$

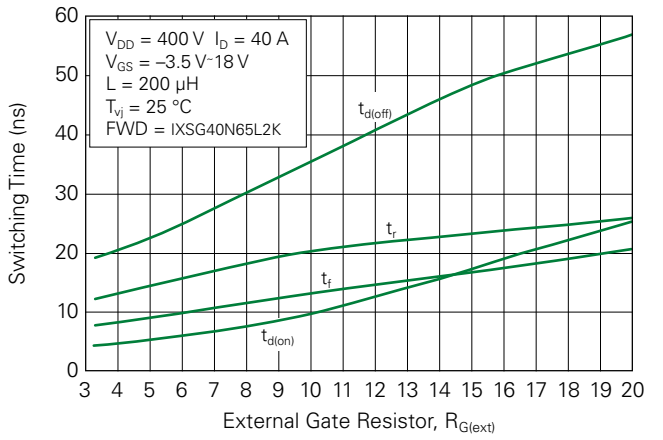


Fig. 21. Continuous Drain Current vs. Case Temperature

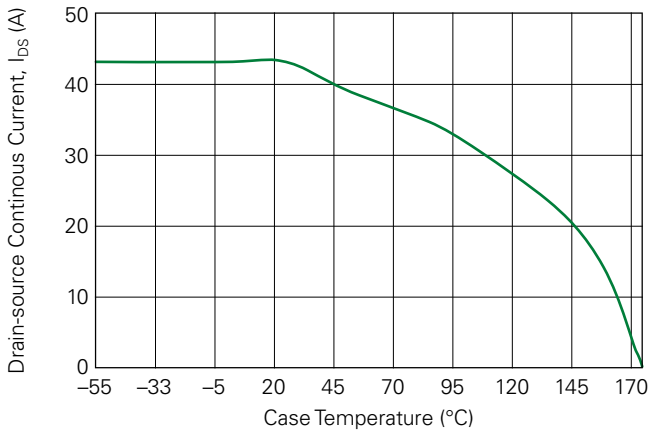


Fig. 22. Max. Power Dissipation Derating vs. Case Temperature

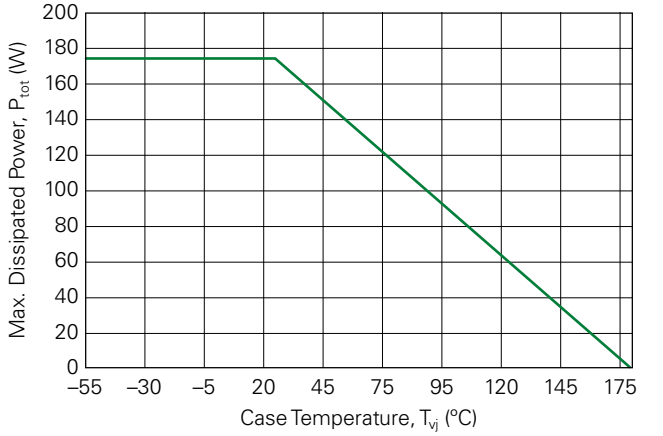


Fig. 23. Thermal Impedance

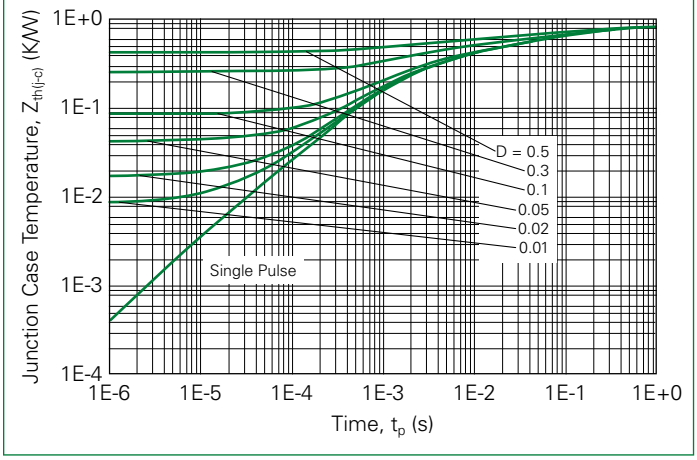
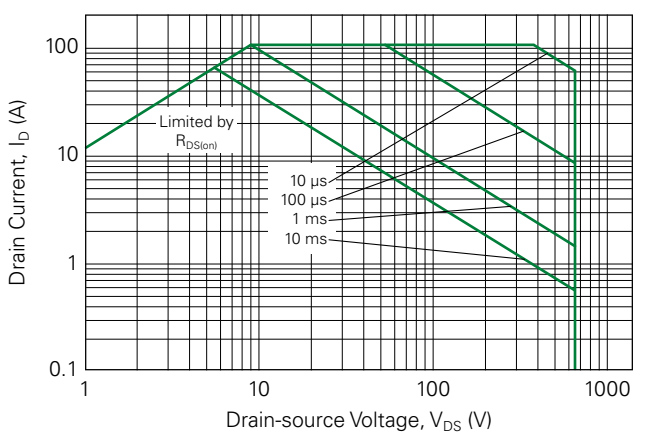
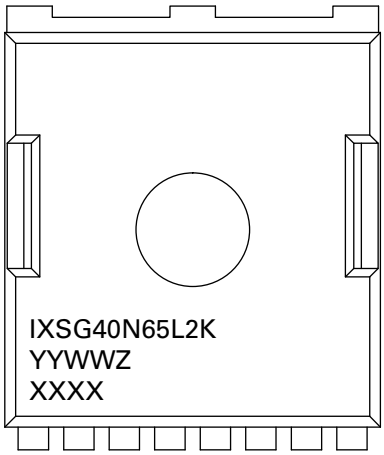


Fig. 24. Safe Operating Area

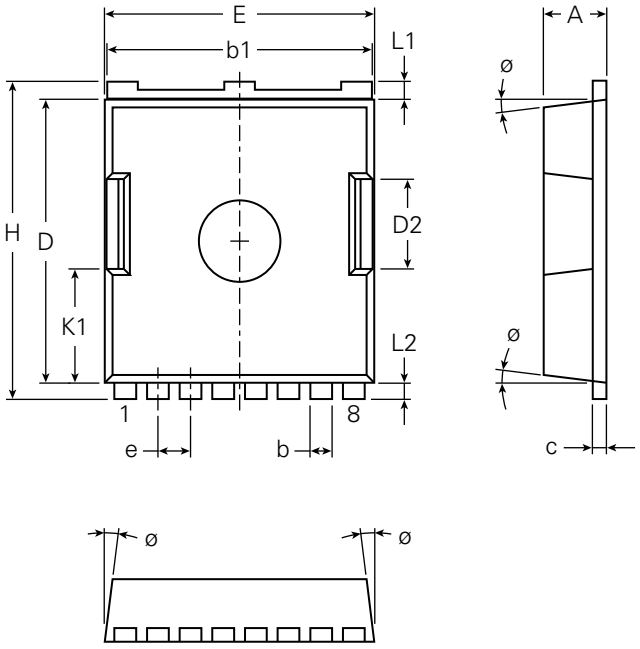


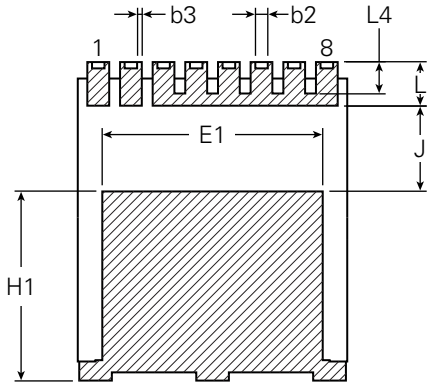
Part Number and Marking



IXSG40N65L2K = Specific Device Code
YY = Year
WW = Work Week
Z = Assembly Location
XXXX = Lot Traceability

Part Outline Drawing (TOLL)





Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max
A	0.087	–	0.094	2.20	–	2.40
b	0.028	–	0.035	0.70	–	0.90
b1	0.382	–	0.390	9.70	–	9.90
b2	0.017	–	0.020	0.42	–	0.50
b3	0.003	0.007	0.011	0.07	0.17	0.27
c	0.016	–	0.024	0.40	–	0.60
D	0.405	–	0.417	10.28	–	10.58
D2	0.122	0.130	0.138	3.10	3.30	3.50
E	0.382	0.390	0.398	9.70	9.90	10.10
E1	0.311	0.319	0.327	7.90	8.10	8.30
e	0.047 BSC			1.20 BSC		
H	0.452	0.460	0.468	11.48	11.68	11.88
H1	0.266	0.274	0.281	6.75	6.95	7.15
J	0.118	0.124	0.130	3.00	3.15	3.30
K1	0.157	0.165	0.172	3.98	4.18	4.38
L	0.055	0.063	0.071	1.40	1.60	1.80
L1	0.024	0.028	0.031	0.60	0.70	0.80
L2	0.020	0.024	0.028	0.50	0.60	0.70
L4	0.039	0.045	0.051	1.00	1.15	1.30
ø	4°	7°	10°	4°	7°	10°