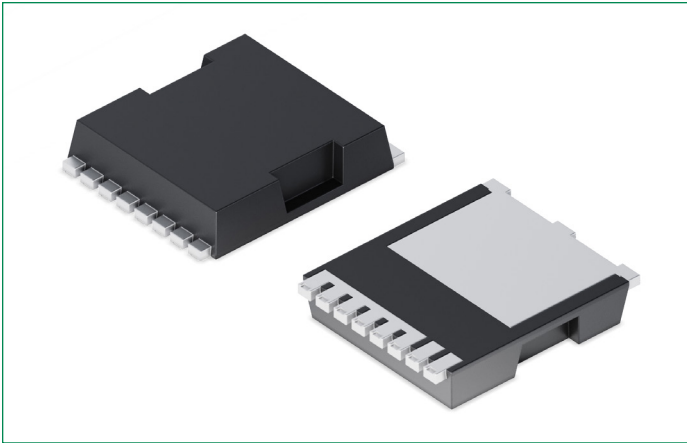
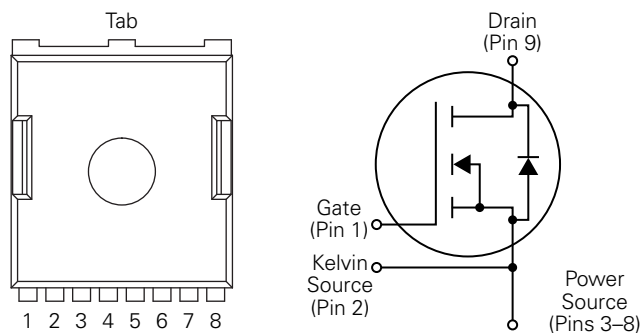


IXSG60N65L2K

650 V, 40 mΩ, 60 A SiC MOSFET

RoHS

HF

**Pinout Diagram (TOLL)****G:** Gate; **KS:** Kelvin Source; **S:** Power Source; **Tab:** Drain**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

Product Summary

Characteristic	Value	Unit
V_{DSS}	650	V
$R_{DS(on)}$	40	mΩ
$I_D @ 25\text{ °C}$	60	A

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

Symbol	Characteristic	Conditions	Value	Unit
V_{DSS}	Drain-source voltage	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	650	V
V_{GSM}	Maximum gate-source voltage	Static (DC)	-5 to +20	V
	Transient gate-source voltage	Duty cycle < 1%, and pluse width < 200 ns	-10 to +23	V
I_D	Drain current (continuous) Fig. 21	$V_{GS} = 18\text{ V}, T_c = 25\text{ }^\circ\text{C}$	60	A
		$V_{GS} = 18\text{ V}, T_c = 100\text{ }^\circ\text{C}$	43	A
I_{DM}	Peak drain current Fig. 24	Pulse width limited by SOA and thermal impedance Z_{th}	150	A
P_{tot}	Total power dissipation Fig. 22	$T_c = 25\text{ }^\circ\text{C}$	249	W
T_{vj}	Virtual junction temperature range	-	-55 to +175	$^\circ\text{C}$
T_{stg}	Storage temperature range	-	-55 to +175	$^\circ\text{C}$
T_{sold}	Soldering temperature	-	260	$^\circ\text{C}$

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	-	0.6	-	K/W

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

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
I_{DSS}	Drain-source leakage current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	3	100	μA
I_{GSS}	Gate leakage current	$V_{DS} = 0\text{ V}, V_{GS} = -5 \sim 20\text{ V}$	-	-	± 100	nA
$V_{GS(th)}$	Gate threshold voltage Fig. 8, 9	$V_{GS} = V_{DS}, I_D = 7.5\text{ mA}$	1.8	2.8	4.5	V
		$V_{GS} = V_{DS}, I_D = 7.5\text{ mA}, T_{vj} = 175\text{ }^\circ\text{C}$	-	2.1	-	
$R_{DS(on)}$	Drain-source on-state resistance Fig. 4, 5, 6, 7	$V_{GS} = 18\text{ V}, I_D = 20\text{ A} @ T_{vj} = 25\text{ }^\circ\text{C}$	-	40	53	m Ω
		$V_{GS} = 18\text{ V}, I_D = 20\text{ A} @ T_{vj} = 175\text{ }^\circ\text{C}$	-	60	-	

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

Symbol	Characteristic	Conditions	Value			Unit	
			Min.	Typ.	Max.		
C_{iss}	Input capacitance Fig. 16	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	–	2000	–	pF	
C_{oss}	Output capacitance Fig. 16		–	158	–		
C_{rss}	Reverse transfer capacitance Fig. 16		–	11.4	–		
E_{oss}	C_{oss} stored energy Fig. 17		–	31	–		μJ
Q_G	Total gate charge Fig. 18	$V_{DS} = 400\text{ V}, I_D = 20\text{ A},$ $V_{GS} = -3\text{ to }+18\text{ V}$	–	94.7	–	nC	
Q_{GS}	Gate-source charge Fig. 18		–	24.5	–		
Q_{GD}	Gate-drain charge Fig. 18		–	47.3	–		
$R_{g(int)}$	Gate input resistance	$f = 1\text{ MHz}$	–	2.9	–	Ω	
E_{on}	Turn-on switching energy Fig. 19, 20	$V_{DS} = 400\text{ V}, I_D = 30\text{ A},$ $V_{GS} = -3.5\text{ to }+18\text{ V},$ $R_{G(ext)} = 3.3\text{ }\Omega, L = 200\text{ }\mu\text{H}$	$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	133.4	–	μJ
E_{off}	Turn-off switching energy Fig. 19, 20		$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	37.6	–	
$t_{d(on)}$	Turn-on delay time Fig. 19, 20		$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	7	–	ns
t_r	Rise time Fig. 19, 20		$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	14.1	–	
$t_{d(off)}$	Turn-off delay time Fig. 19, 20		$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	17	–	
t_f	Fall time Fig. 19, 20		$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	8	–	

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

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode forward voltage Fig. 10, 11, 12	$I_{SD} = 20\text{ A}, V_{GS} = 0\text{ V}$	–	4.1	–	V
		$I_{SD} = 20\text{ A}, V_{GS} = 0\text{ V}, T_{vj} = 175\text{ }^{\circ}\text{C}$	–	3.8	–	V
t_{rr}	Reverse recovery time	$V_{GS} = -3.5\text{ V}/+18\text{ V}, I_{SD} = 30\text{ A}, V_R = 400\text{ V},$ $R_{G(ext)} = 15\text{ }\Omega, L = 200\text{ }\mu\text{H}, di/dt = 3000\text{ A}/\mu\text{s}$	–	33.3	–	ns
Q_{rr}	Reverse recovery charge		–	192.1	–	nC
I_{rrm}	Peak reverse recovery current		–	17.5	–	A

Characteristic Curves

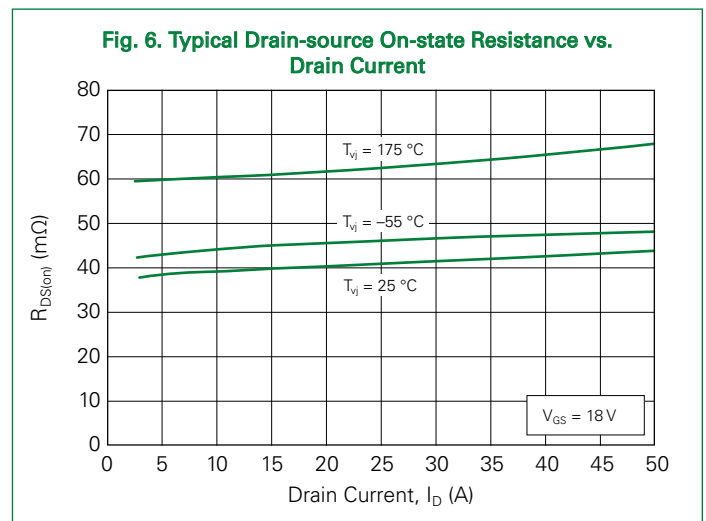
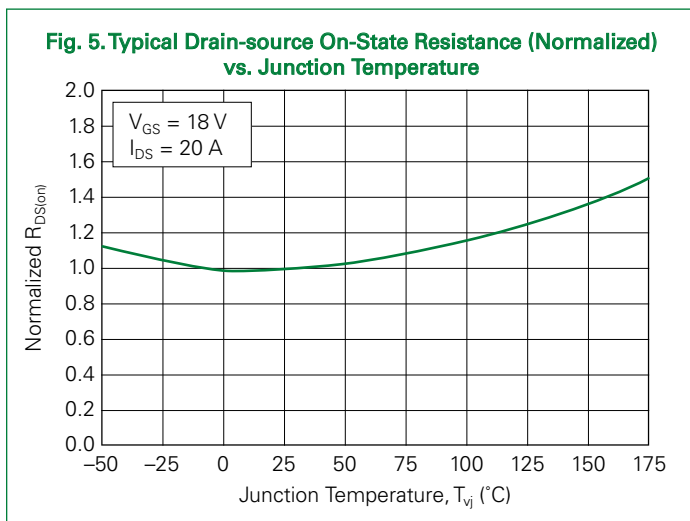
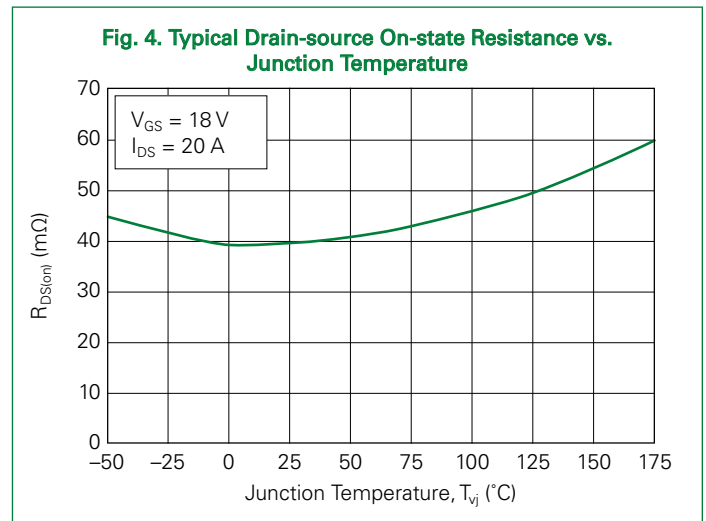
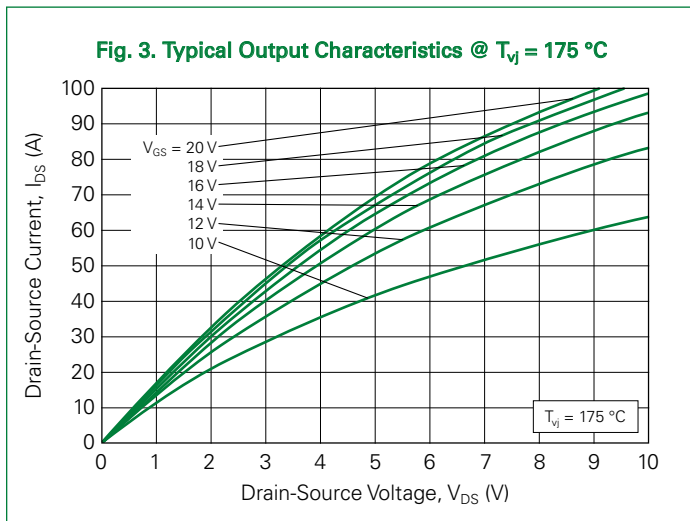
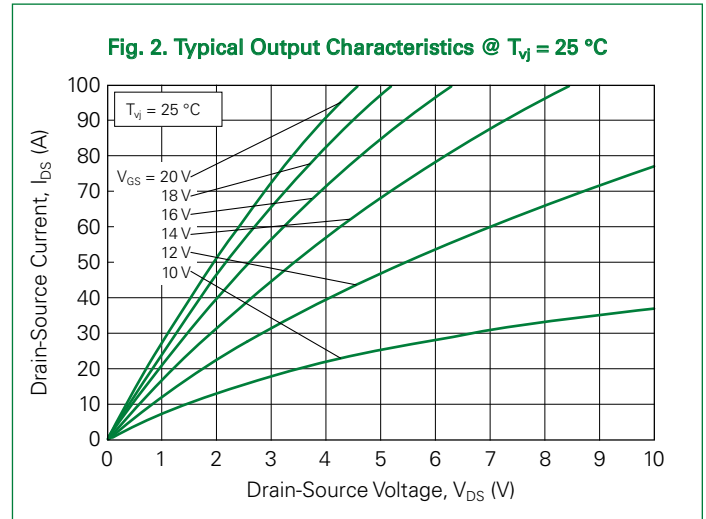
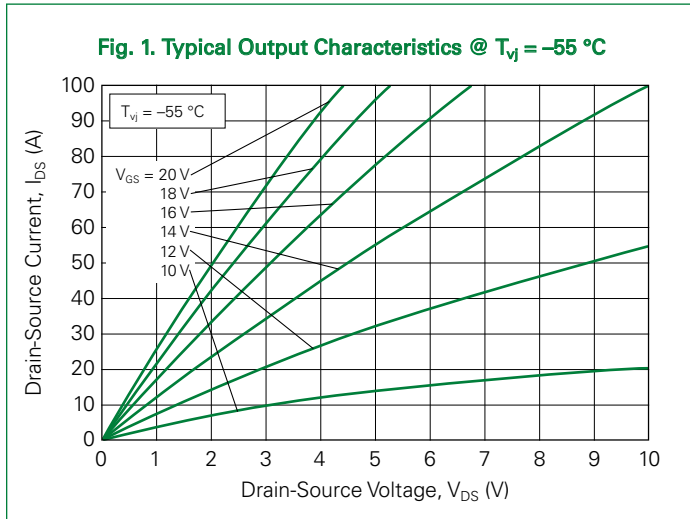


Fig. 7. $R_{DS(on)}$ vs. Temperature

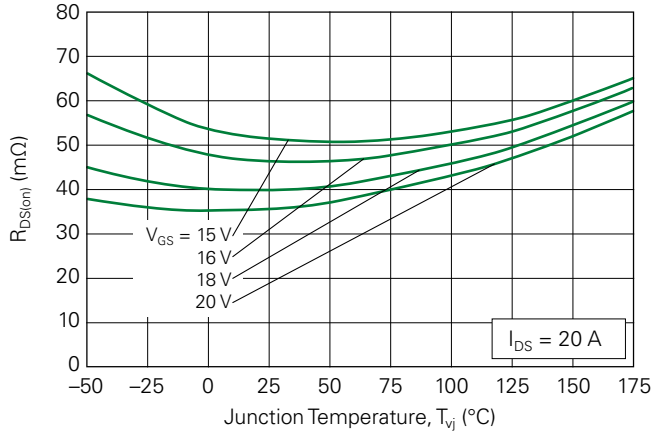


Fig. 8. Transfer Curves

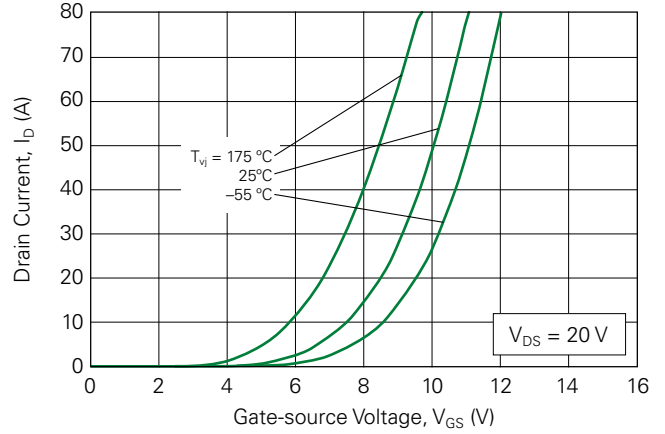


Fig. 9. Threshold Voltage vs. Temperature

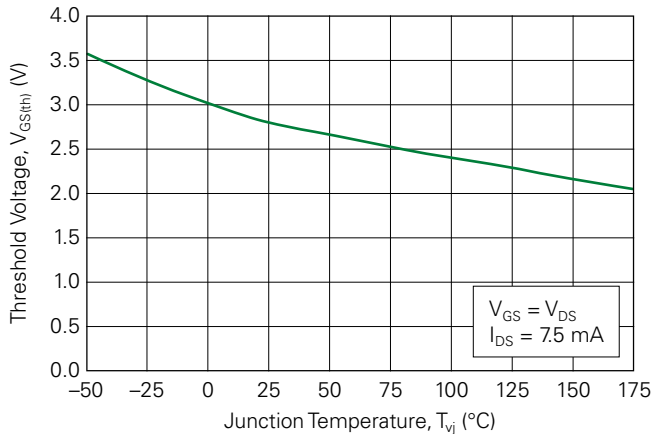


Fig. 10. Body Diode Curves @ $T_{vj} = -55$ °C

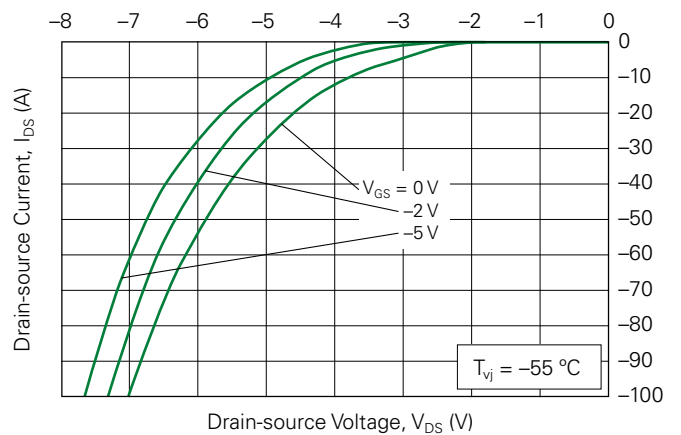


Fig. 11. Body Diode Curves @ $T_{vj} = 25$ °C

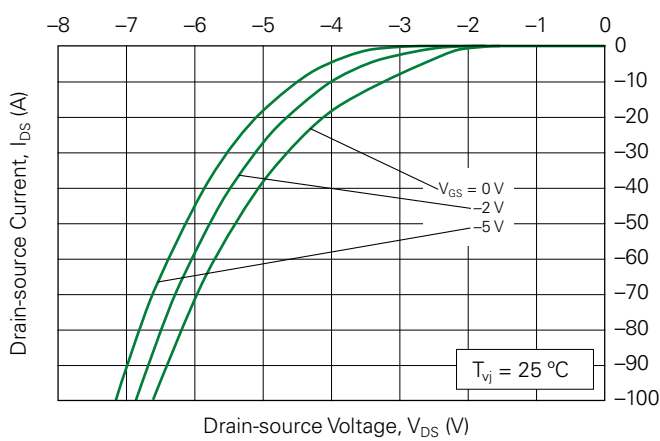


Fig. 12. Body Diode Curves @ $T_{vj} = 175$ °C

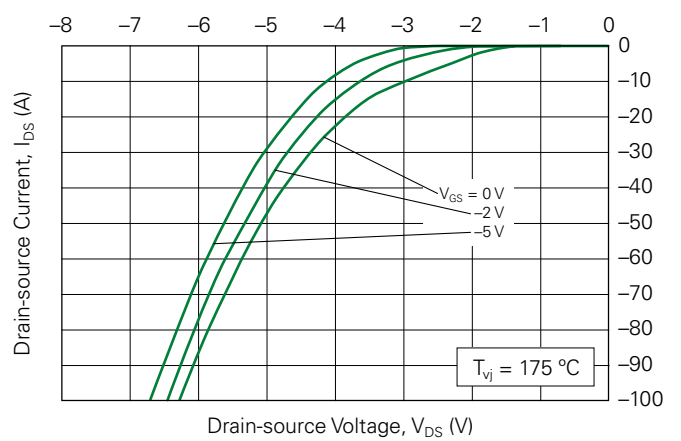


Fig. 13. Typical Reverse Conduction Characteristics @ $T_{vj} = -55\text{ }^\circ\text{C}$

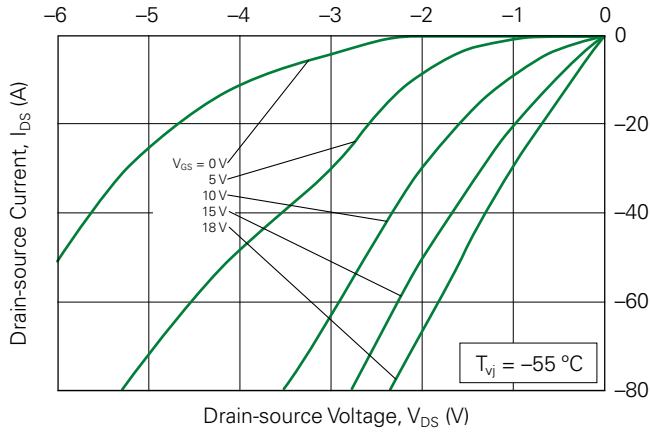


Fig. 14. Typical Reverse Conduction Characteristics @ $T_{vj} = 25\text{ }^\circ\text{C}$

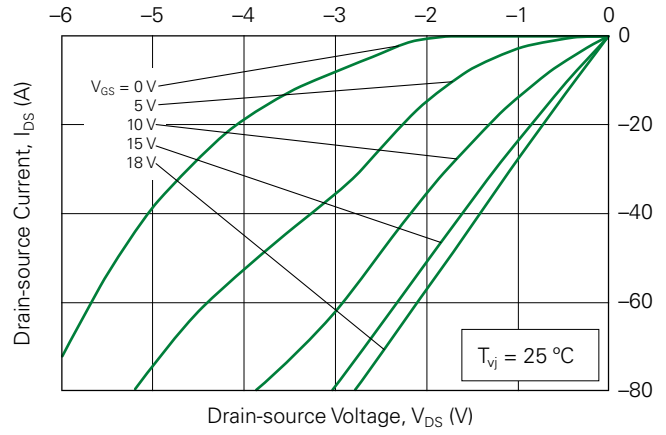


Fig. 15. Typical Reverse Conduction Characteristics @ $T_{vj} = 175\text{ }^\circ\text{C}$

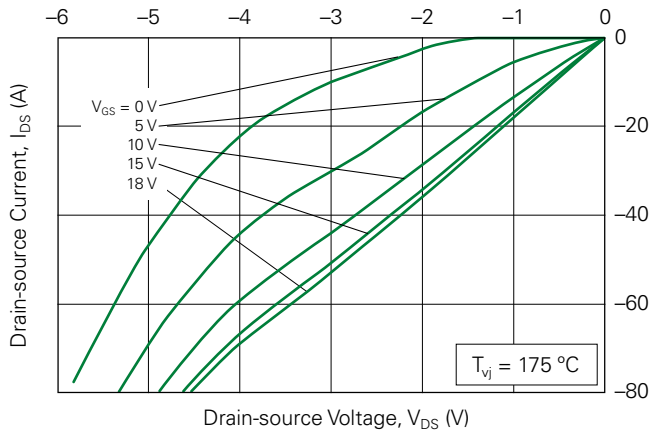


Fig. 16. Capacitance vs. V_{DS}

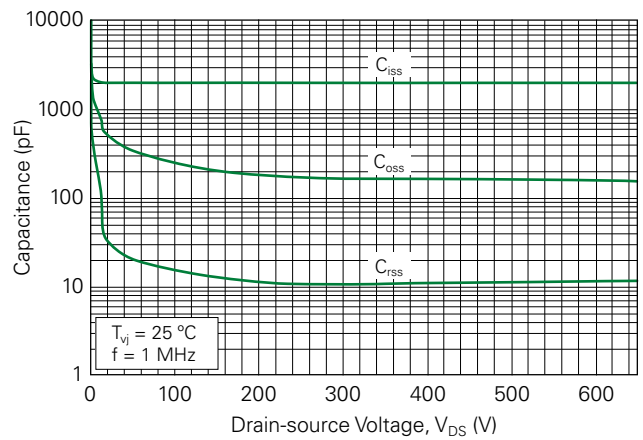


Fig. 17. Output Capacitor Stored Energy

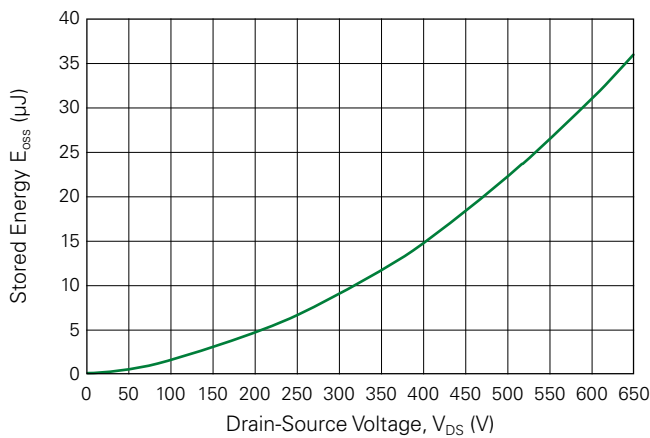


Fig. 18. Gate Charge Characteristics

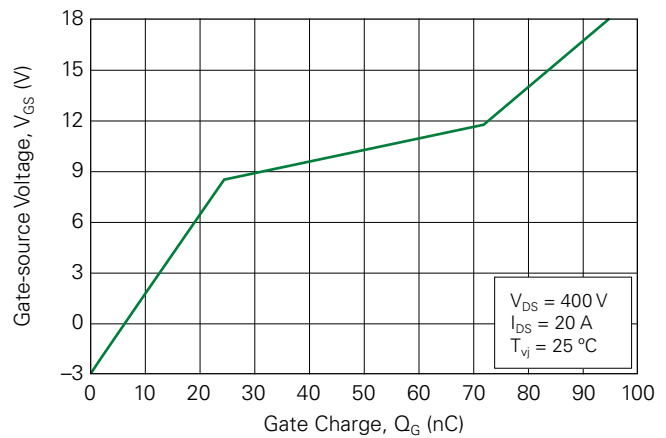


Fig. 19. Switching Energy vs. $R_{G(ext)}$

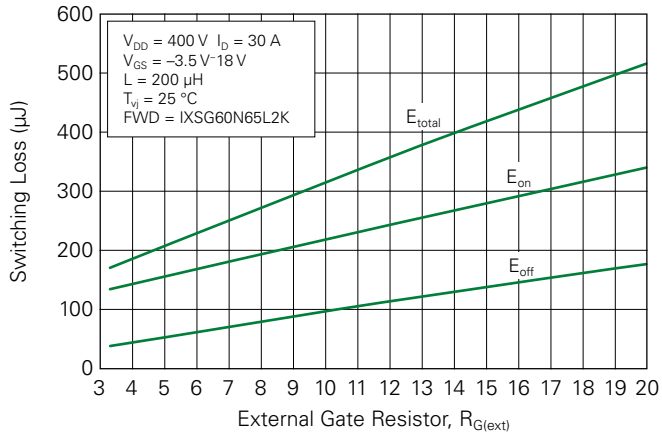


Fig. 20. Switching Times vs. $R_{G(ext)}$

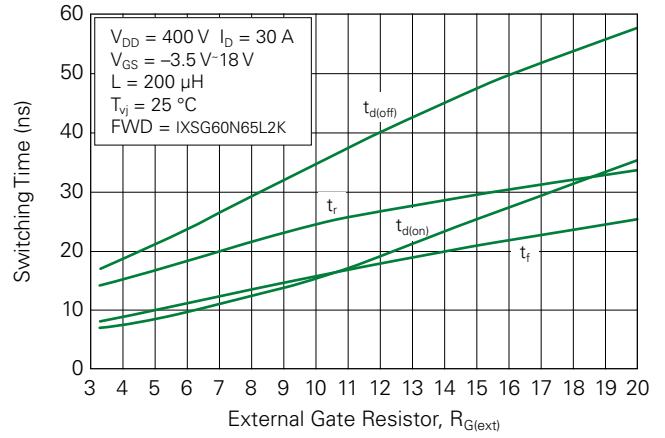


Fig. 21. Continuous Drain Current vs. Case Temperature

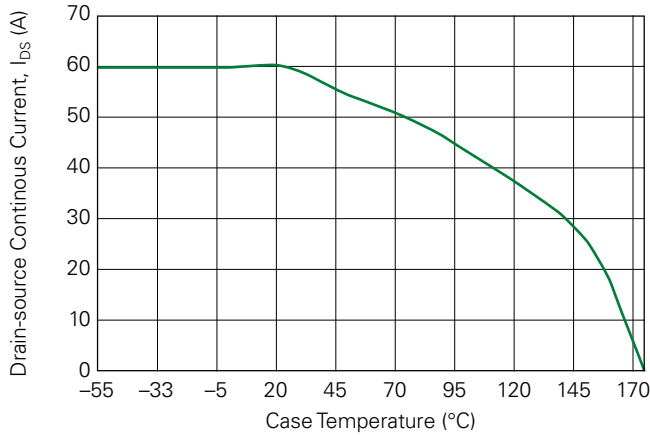


Fig. 22. Max. Power Dissipation Derating vs. Case Temperature

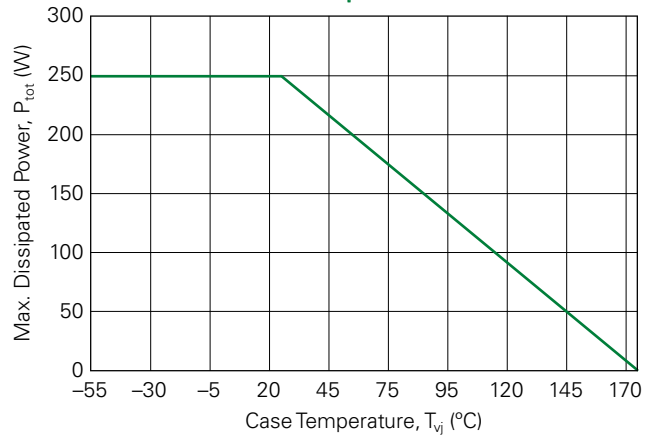


Fig. 23. Thermal Impedance

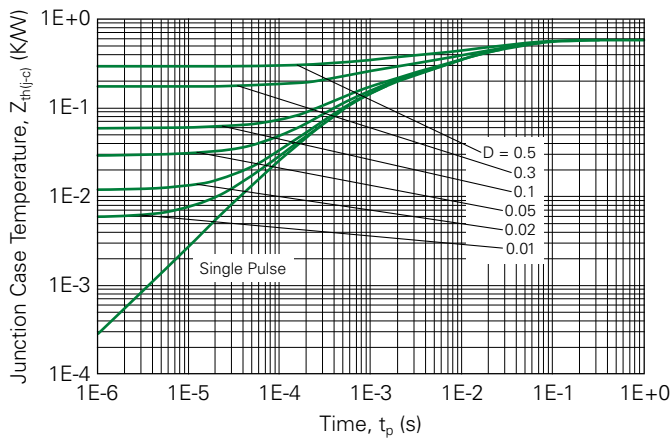
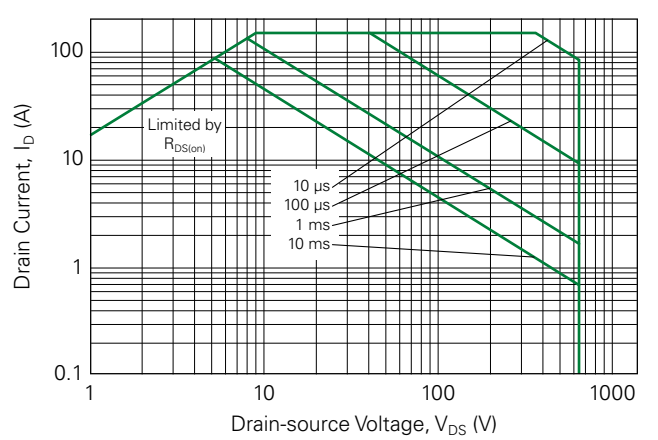
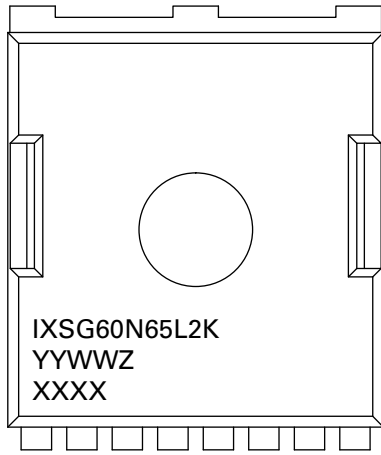


Fig. 24. Safe Operating Area

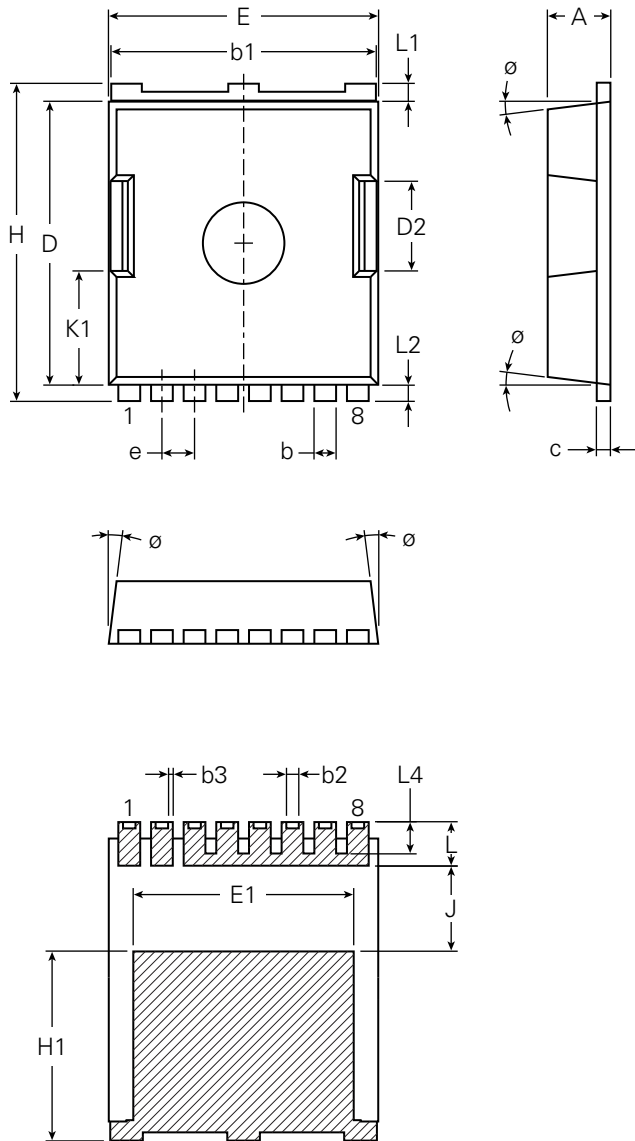


Part Number and Marking



IXSG60N65L2K = 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
∅	4°	7°	10°	4°	7°	10°

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Part of:

