IV2Q06025L1 – 650V 25mΩ Gen2 SiC MOSFET

Features

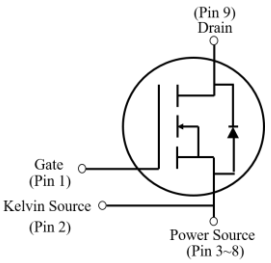
- 2nd Generation SiC MOSFET Technology with +15~+18V gate drive
- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Very fast and robust intrinsic body diode
- Kelvin gate input easing driver circuit design

Applications

- Motor drivers
- Solar inverters
- Automotive DC/DC converters
- Automotive compressor inverters
- Switch mode power supplies

Outline:

TOLL



Marking Diagram:

2Q06025L1	= Specific Device Code
YY	= Year
WW	= Work Week
Z	= Assembly Location
XXXX	= Lot Traceability

2Q06025L1
YYWWZ
XXXX

Absolute Maximum Ratings (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source voltage	650	V	V_{GS}=0V, I_D=100μA	
V_{GSmax} (Transient)	Maximum transient voltage	-10 to 23	V	Duty cycle<1%, and pulse width<200ns	
V_{GSon}	Recommended turn-on voltage	15 to 18	V		
V_{GSoff}	Recommended turn-off voltage	-5 to -2	V	Typical -3.5V	
I_D	Drain current (continuous)	111	A	V_{GS}=18V, T_C=25°C	Fig. 23
		83	A	V_{GS}=18V, T_C=100°C	
I_{DM}	Drain current (pulsed)	277	A	Pulse width limited by SOA	Fig. 26
P_{TOT}	Total power dissipation	600	W	T_C=25°C	Fig. 24
T_{stg}	Storage temperature range	-55 to 175	°C		
T_J	Operating junction temperature	-55 to 175	°C		
T_L	Solder Temperature	260	°C	wave soldering only allowed at leads, 1.6mm from case for 10 s	

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	0.25	°C/W	Fig. 25

Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
I_{DSS}	Zero gate voltage drain current		3	100	μA	V_{DS}=650V, V_{GS}=0V	
I_{GSS}	Gate leakage current			±100	nA	V_{DS}=0V, V_{GS}=-5~20V	
V_{TH}	Gate threshold voltage	1.8	2.8	4.5	V	V_{GS}=V_{DS}, I_D=12mA	Fig. 8, 9
			2.0			V_{GS}=V_{DS}, I_D=12mA @ T_J=175°C	
R_{ON}	Static drain-source on-resistance		25	33	mΩ	V_{GS}=18V, I_D=40A @T_J=25°C	Fig. 4, 5, 6, 7
			38		mΩ	V_{GS}=18V, I_D=40A @T_J=175°C	
C_{iss}	Input capacitance		3090		pF	V_{DS}=600V, V_{GS}=0V, f=1MHz, V_{AC}=25mV	Fig. 16
C_{oss}	Output capacitance		251		pF		
C_{rss}	Reverse transfer capacitance		19		pF		
E_{oss}	C_{oss} stored energy		52		μJ		Fig. 17
Q_g	Total gate charge		125		nC	V_{DS}=400V, I_D=40A, V_{GS}=-3 to 18V	Fig. 18
Q_{gs}	Gate-source charge		35.7		nC		
Q_{gd}	Gate-drain charge		38.5		nC		
R_g	Gate input resistance		1.5		Ω	f=1MHz	
E_{ON}	Turn-on switching energy		271		μJ	V_{DS}=400V, I_D=40A, V_{GS}=-3.5 to 18V, $R_{G(ext)}$=3.3Ω, L=200μH T_J=25°C	Fig. 19, 20
E_{OFF}	Turn-off switching energy		75		μJ		
$t_{d(on)}$	Turn-on delay time		13.0		ns		
t_r	Rise time		23.4				
$t_{d(off)}$	Turn-off delay time		35.1				
t_f	Fall time		11.5				
E_{ON}	Turn-on switching energy		319		μJ	V_{DS}=400V, I_D=40A, V_{GS}=-3.5 to 18V, $R_{G(ext)}$=3.3Ω,L=200μH T_J=175°C	Fig. 22
E_{OFF}	Turn-off switching energy		86		μJ		

Reverse Diode Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
V_{SD}	Diode forward voltage		3.7		V	I_{SD}=20A, V_{GS}=0V	Fig. 10, 11, 12
			3.5		V	I_{SD}=20A, V_{GS}=0V, T_J=175°C	
t_{rr}	Reverse recovery time		44		ns	V_{GS}=-3.5V/+18V, I_{SD}=40A, V_R=400V, $R_{G(ext)}$=10Ω L=200μH di/dt=3000A/μs	
Q_{rr}	Reverse recovery charge		187		nC		
I_{RRM}	Peak reverse recovery current		19.2		A		

Typical Performance (curves)

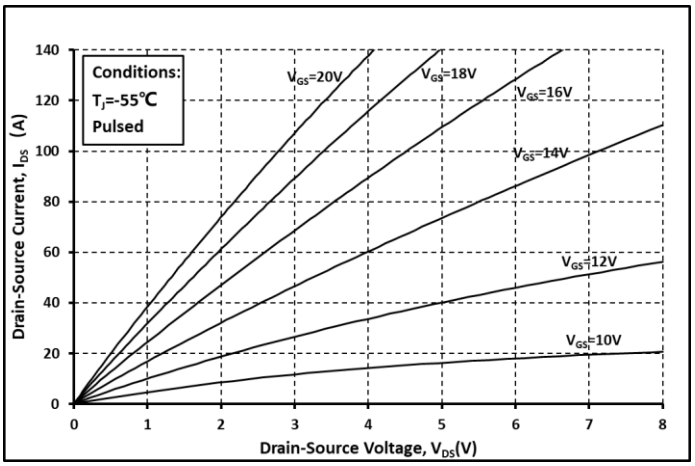


Fig. 1 Output Curve @ T_J=-55℃

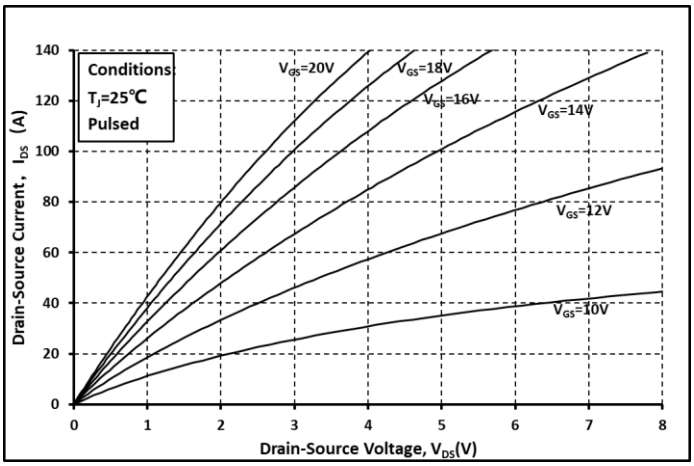


Fig. 2 Output Curve @ T_J=25℃

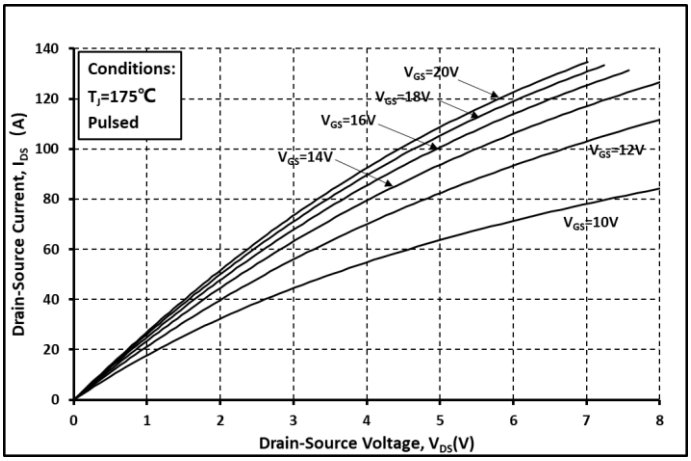


Fig. 3 Output Curve @ T_J=175℃

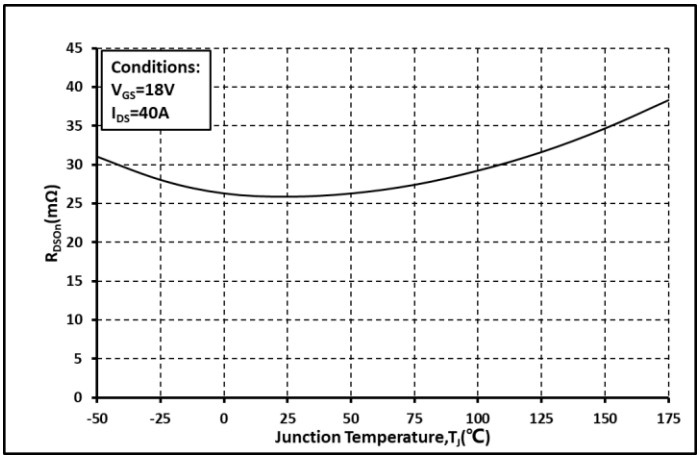


Fig. 4 Ron vs. Temperature

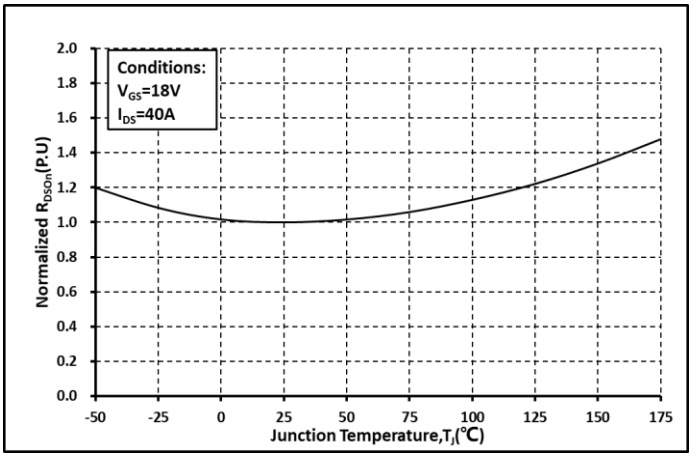


Fig. 5 Normalized Ron vs. Temperature

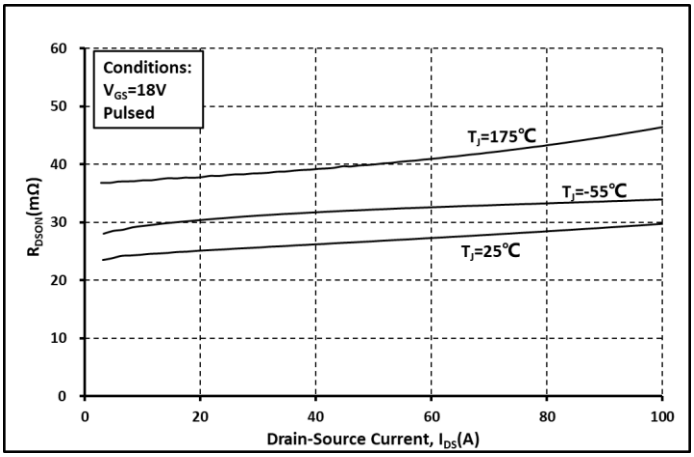


Fig. 6 Ron vs. I_{DS} @ Various Temperature

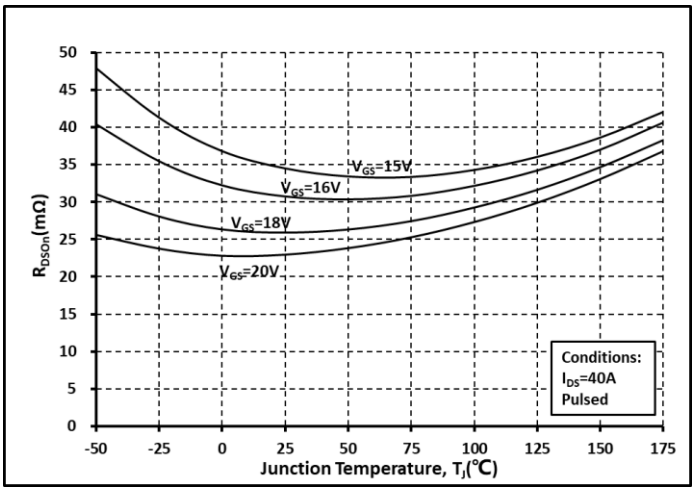


Fig. 7 Ron vs. Temperature @ Various V_{GS}

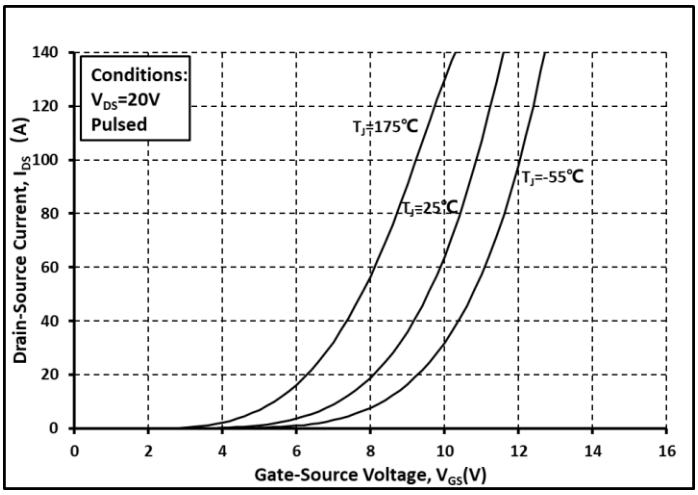


Fig. 8 Transfer Curves @ Various Temperature

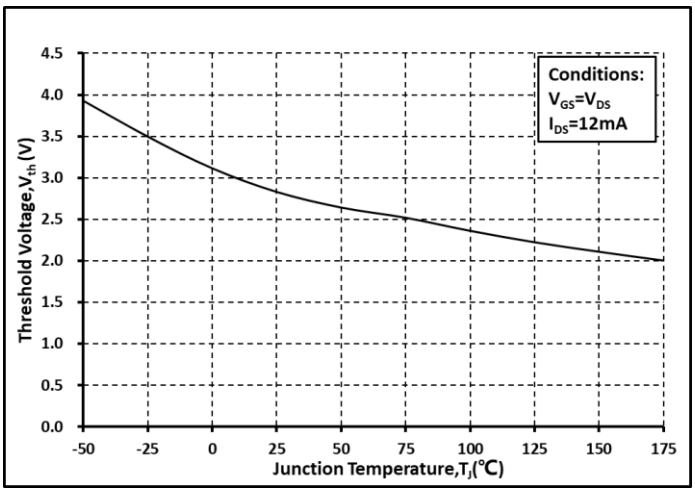


Fig. 9 Threshold Voltage vs. Temperature

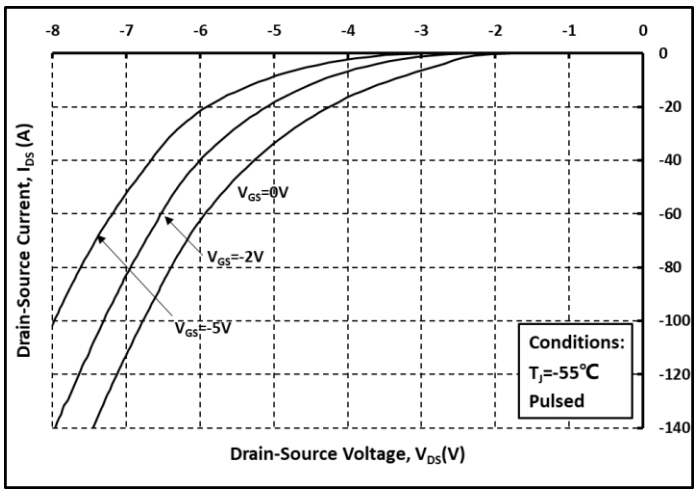


Fig. 10 Body Diode curves @ T_J=-55℃

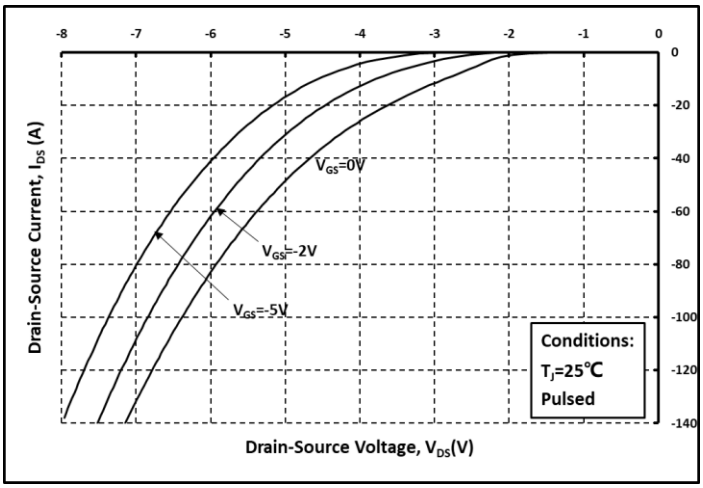


Fig. 11 Body Diode curves @ T_J=25℃

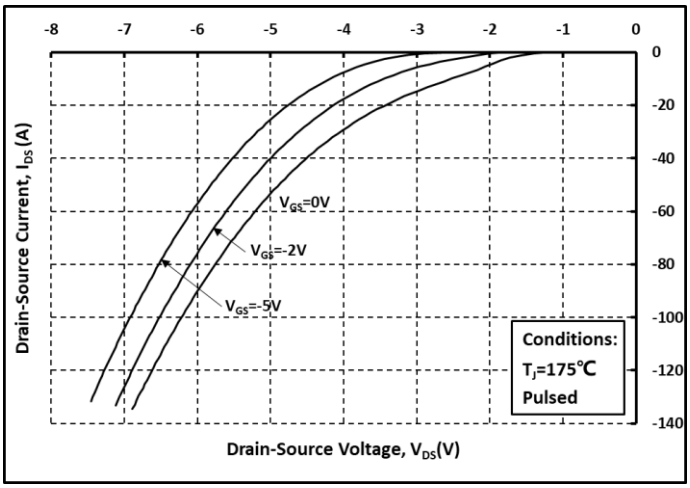


Fig. 12 Body Diode curves @ T_J=175℃

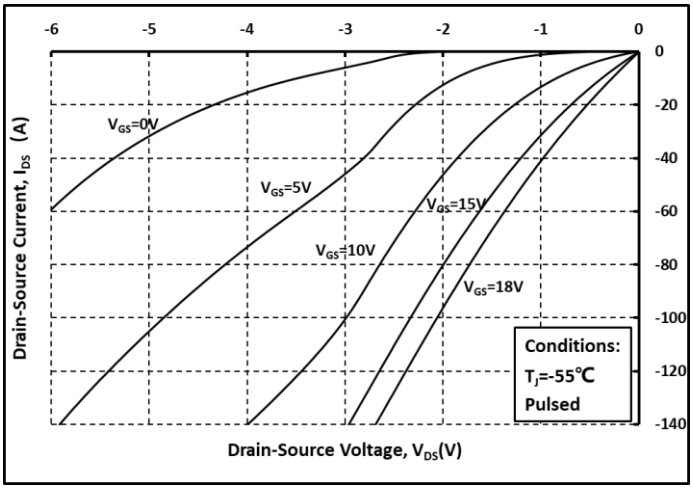


Fig. 13 3rd Quadrant curves @ T_J=-55°C

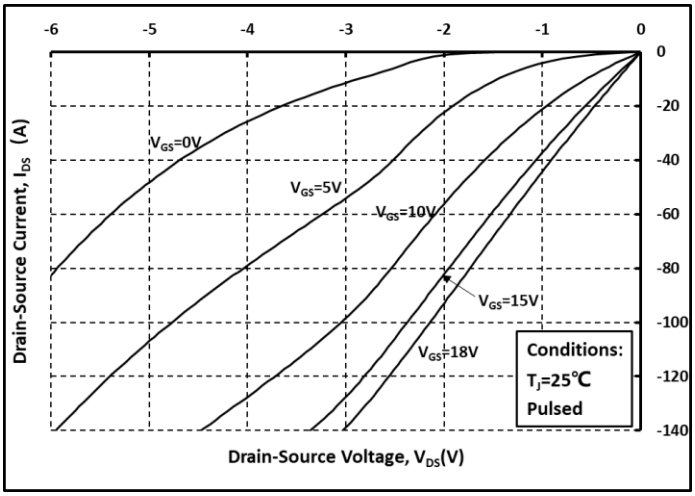


Fig. 14 3rd Quadrant curves @ T_J=25°C

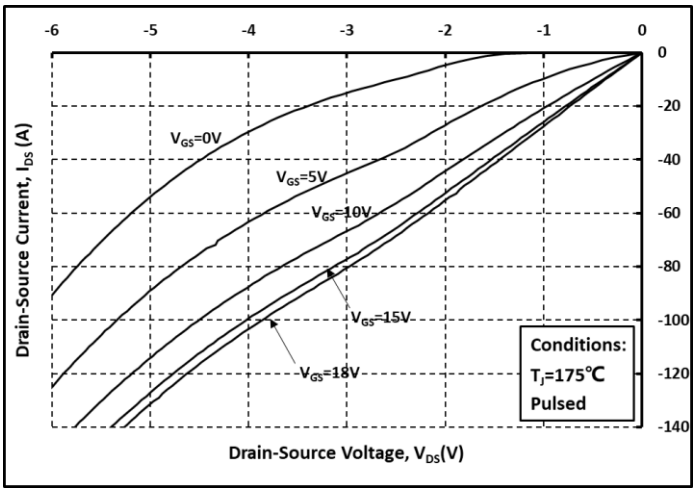


Fig. 15 3rd Quadrant curves @ T_J=175°C

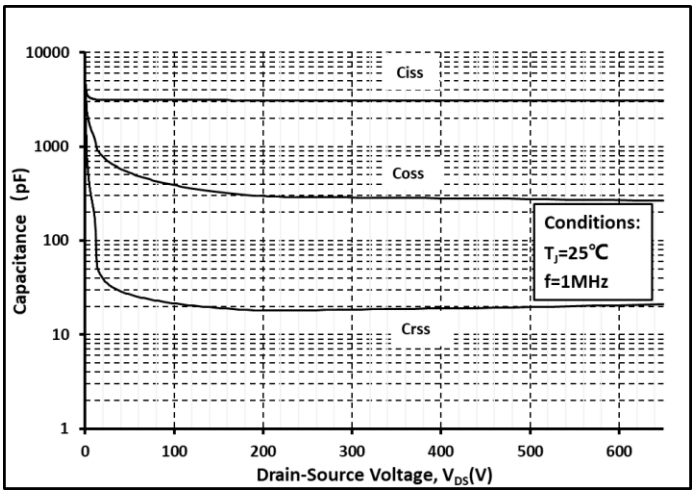


Fig. 16 Capacitance vs. V_{DS}

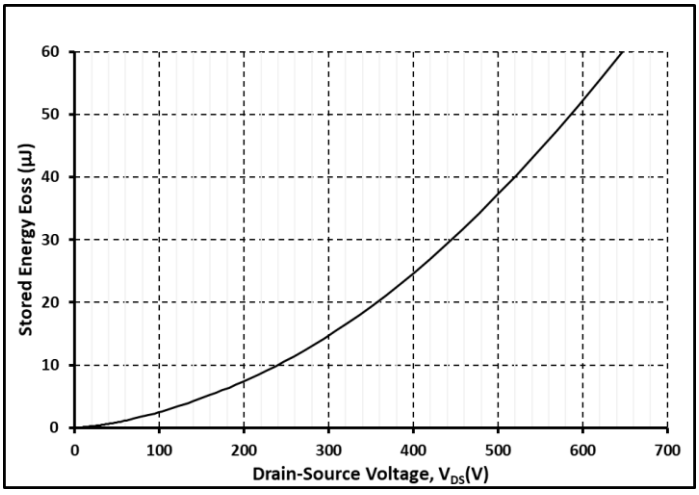


Fig. 17 Output Capacitor Stored Energy

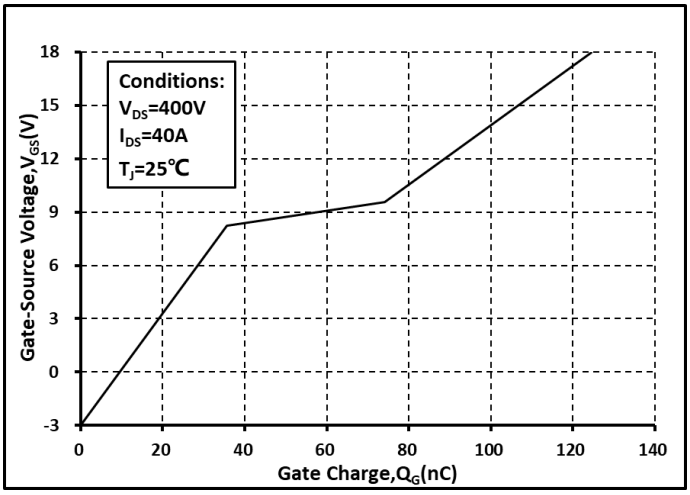


Fig. 18 Gate Charge Characteristics

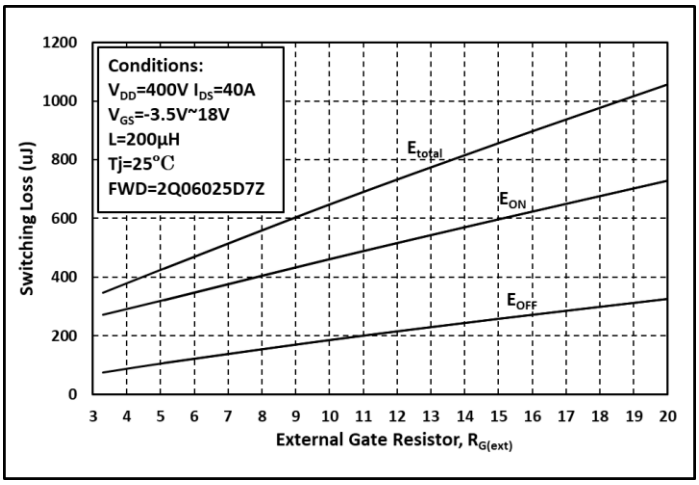


Fig. 19 Switching Energy vs. $R_{G(ext)}$

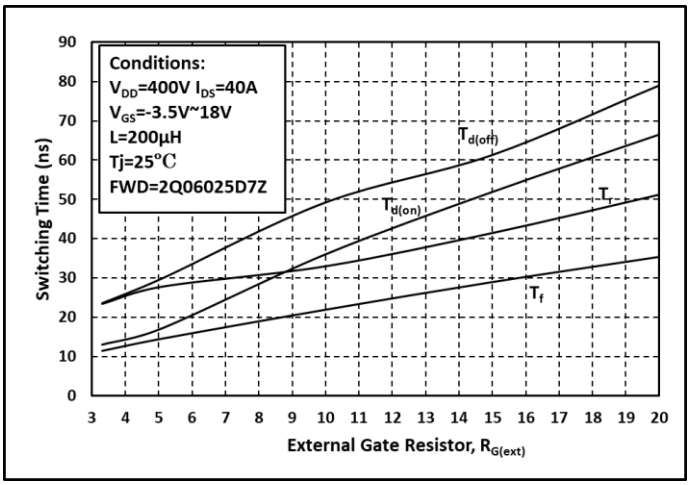


Fig. 20 Switching Times vs. $R_{G(ext)}$

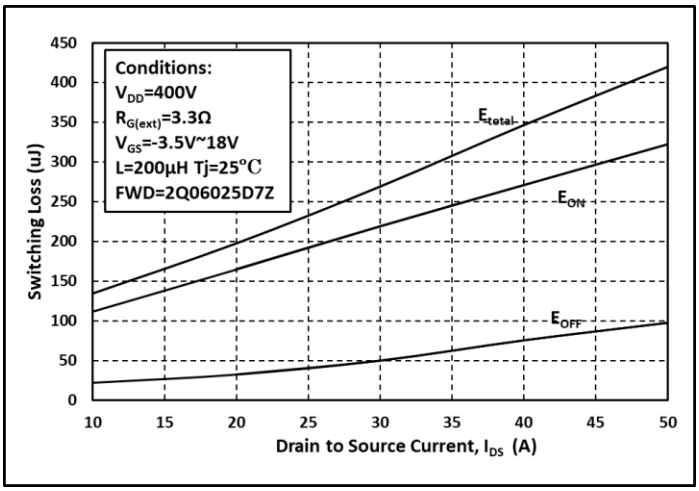


Fig. 21 Switching Energy vs. I_{DS}

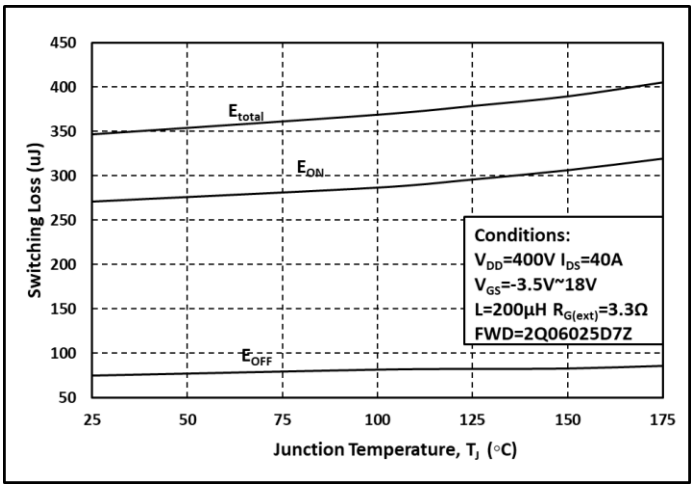


Fig. 22 Switching Energy vs. Temperature

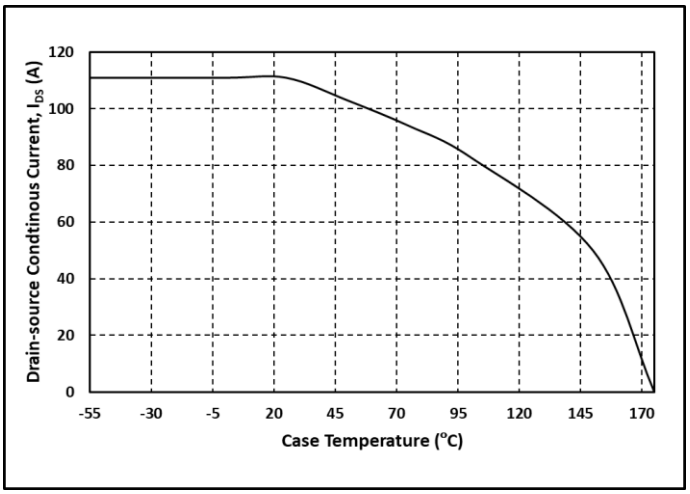


Fig. 23 Continuous Drain Current vs. Case Temperature

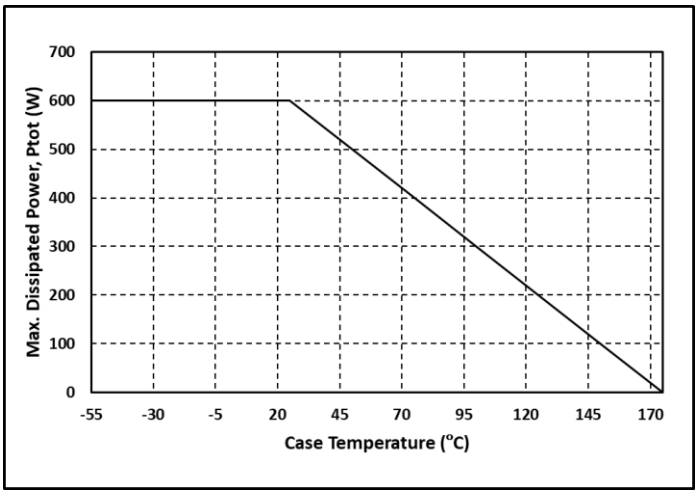


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

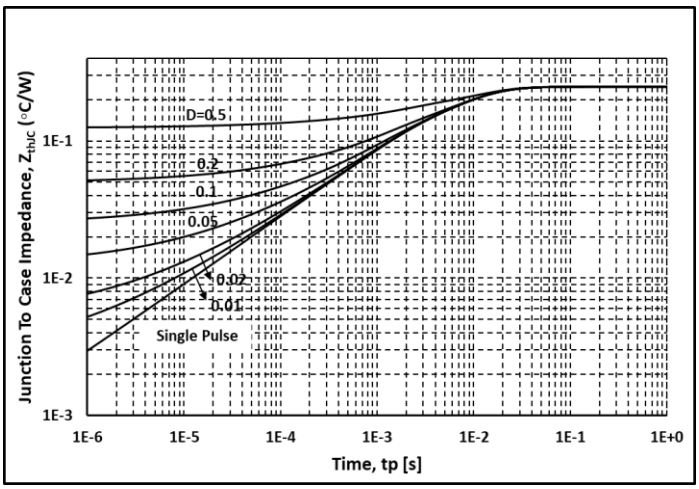


Fig. 25 Thermal impedance

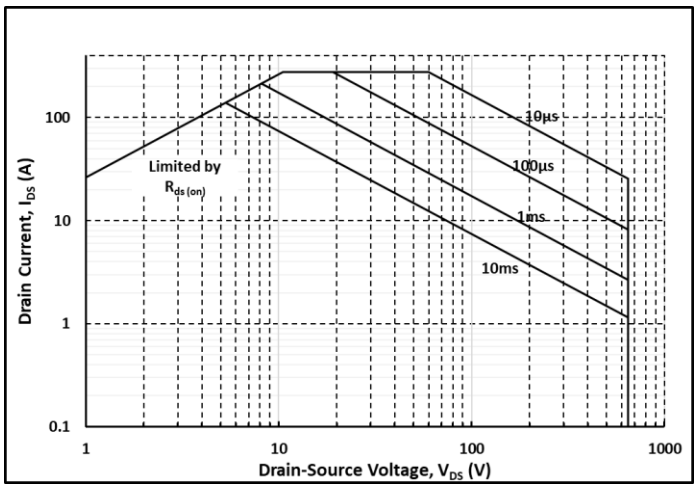
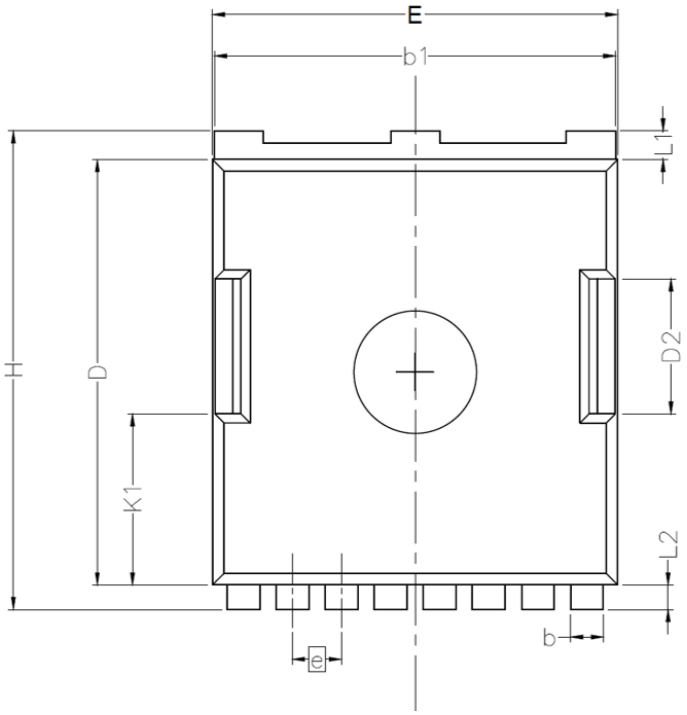
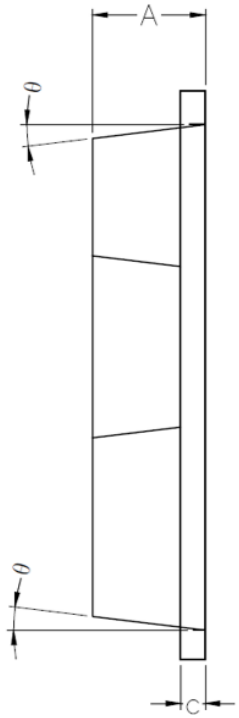


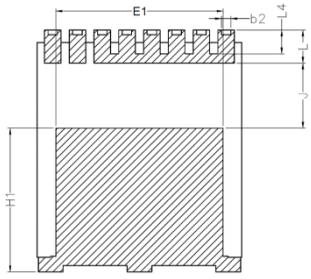
Fig. 26 Safe Operating Area

Package Dimensions



Dimensions In Millimeters		
SYMBOL	MIN.	MAX.
A	2.20	2.40
b	0.70	0.90
b1	9.70	9.90
b2	0.42	0.50
c	0.40	0.60
D	10.28	10.58
D2	3.10	3.50
E	9.7	10.10
E1	7.90	8.30
e	1.20 BSC	
H	11.48	11.88
H1	6.75	7.15
N	8	
J	3.00	3.30
K1	3.98	4.38
L	1.40	1.80
L1	0.60	0.80
L2	0.50	0.70
L4	1.00	1.30
θ	4°	10°





Note:

1. Package Reference: JEDEC TOLL, Variation AD
2. All Dimensions are in mm
3. Slot Required, Notch May Be Rounded
4. Dimension D&E Do Not Include Mold Flash
5. Subject to Change Without Notice

Notes

For further information please contact IVCT's office.

The Information in this document is subject to change without notice.

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