

## IV2Q06060L1 – 650V 60mΩ Gen2 SiC MOSFET

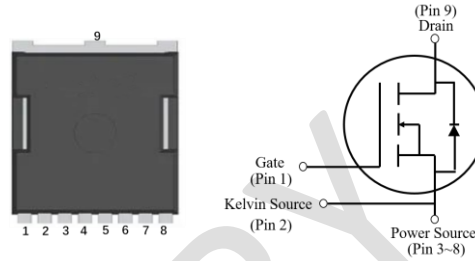
### Features

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

### Applications

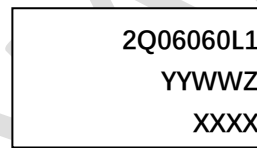
- EV chargers and OBCs
- Solar boosters
- Automotive compressor inverters
- AC/DC power supplies

### Outline:



TOLL

### Marking Diagram:



2Q06060L1 = Specific Device Code  
YY = Year  
WW = Work Week  
Z = Assembly Location  
XXXX = Lot Traceability

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{DS}$	Drain-Source voltage	650	V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GSmax}$ (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)	43	A	$V_{GS}=18V, T_c=25^\circ\text{C}$	Fig. 21
		32	A	$V_{GS}=18V, T_c=100^\circ\text{C}$	
$I_{DM}$	Drain current (pulsed)	108	A	Pulse width limited by SOA and dynamic $R_{\theta(j-c)}$	Fig. 25,26
$I_{SM}$	Body diode current (pulsed)	108	A	Pulse width limited by SOA and dynamic $R_{\theta(j-c)}$	Fig. 25,26
$P_{TOT}$	Total power dissipation	174	W	$T_c=25^\circ\text{C}$	Fig. 22
$T_{stg}$	Storage temperature range	-55 to 175	$^\circ\text{C}$		
$T_J$	Operating junction temperature	-55 to 175	$^\circ\text{C}$		
$T_L$	Solder Temperature	260	$^\circ\text{C}$	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	0.86	$^\circ\text{C}/\text{W}$	Fig. 23

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

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
$I_{DSS}$	Zero gate voltage drain current		3	100	$\mu\text{A}$	$V_{DS}=650\text{V}, V_{GS}=0\text{V}$	
$I_{GSS}$	Gate leakage current			$\pm 100$	$\text{nA}$	$V_{DS}=0\text{V}, V_{GS}=-5\sim 20\text{V}$	
$V_{TH}$	Gate threshold voltage	1.8	2.8	4.5	$\text{V}$	$V_{GS}=V_{DS}, I_D=5\text{mA}$	Fig. 8, 9
			2.0			$V_{GS}=V_{DS}, I_D=5\text{mA}$ @ $T_J=175^\circ\text{C}$	
$R_{ON}$	Static drain-source on-resistance		60	78	$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=15\text{A}$ @ $T_J=25^\circ\text{C}$	Fig. 4, 5, 6, 7
			84		$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=15\text{A}$ @ $T_J=175^\circ\text{C}$	
			79		$\text{m}\Omega$	$V_{GS}=15\text{V}, I_D=15\text{A}$ @ $T_J=25^\circ\text{C}$	
			92		$\text{m}\Omega$	$V_{GS}=15\text{V}, I_D=15\text{A}$ @ $T_J=175^\circ\text{C}$	
$C_{iss}$	Input capacitance		1218		$\text{pF}$	$V_{DS}=600\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}, V_{AC}=25\text{mV}$	Fig. 16
$C_{oss}$	Output capacitance		118		$\text{pF}$		
$C_{rss}$	Reverse transfer capacitance		7.6		$\text{pF}$		
$E_{oss}$	$C_{oss}$ stored energy		24.6		$\mu\text{J}$		
$Q_g$	Total gate charge		64		$\text{nC}$	$V_{DS}=400\text{V}, I_D=15\text{A},$ $V_{GS}=-3\text{ to }18\text{V}$	Fig. 18
$Q_{gs}$	Gate-source charge		14		$\text{nC}$		
$Q_{gd}$	Gate-drain charge		33		$\text{nC}$		
$R_g$	Gate input resistance		4.7		$\Omega$	$f=1\text{MHz}$	
$E_{ON}$	Turn-on switching energy		76.2		$\mu\text{J}$	$V_{DS}=400\text{V}, I_D=15\text{A},$ $V_{GS}=-3.5\text{ to }18\text{V},$ $R_{G(\text{ext})}=3.3\Omega,$ $L=200\mu\text{H}$ $T_J=25^\circ\text{C}$	Fig. 19, 20
$E_{OFF}$	Turn-off switching energy		12.9		$\mu\text{J}$		
$t_{d(\text{on})}$	Turn-on delay time		4.3		ns		
$t_r$	Rise time		12.2				
$t_{d(\text{off})}$	Turn-off delay time		11.4				
$t_f$	Fall time		7.8				

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

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
$V_{SD}$	Diode forward voltage		4.2		V	$I_{SD}=15\text{A}, V_{GS}=0\text{V}$	Fig. 10, 11, 12
			3.9		V	$I_{SD}=15\text{A}, V_{GS}=0\text{V}, T_J=175^\circ\text{C}$	
$I_S$	Diode forward current (continuous)			33		$V_{GS}=-2\text{V}, T_c=25^\circ\text{C}$	
				19		$V_{GS}=-2\text{V}, T_c=100^\circ\text{C}$	
$t_{rr}$	Reverse recovery time		26.4		ns	$V_{GS}=-3.5\text{V}/+18\text{V}, I_{SD}=15\text{A}, V_R=400\text{V}, R_{G(\text{ext})}=13\Omega, L=200\mu\text{H}, di/dt=3000\text{A}/\mu\text{s}$	
$Q_{rr}$	Reverse recovery charge		138.5		nC		
$I_{RRM}$	Peak reverse recovery current		14.9		A		

**Typical Performance (curves)**

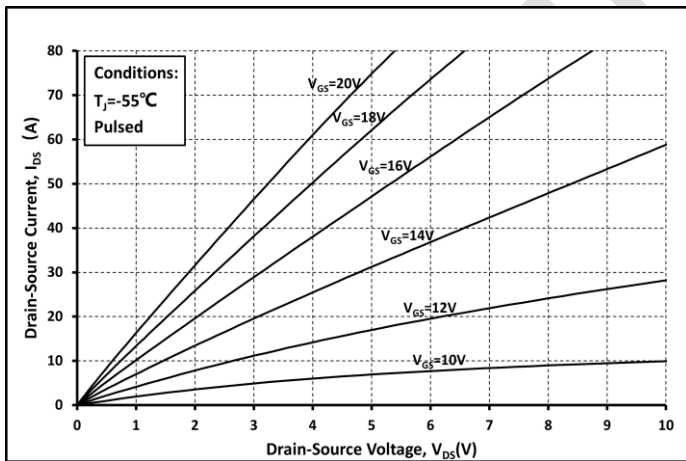


Fig. 1 Output Curve @  $T_J=-55^\circ\text{C}$

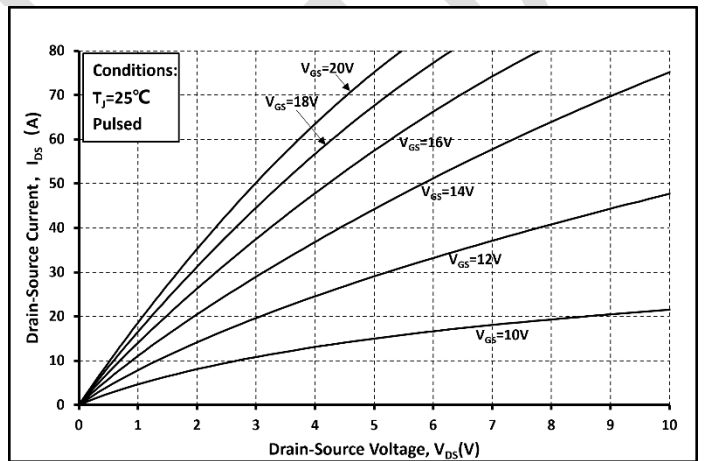


Fig. 2 Output Curve @  $T_J=25^\circ\text{C}$

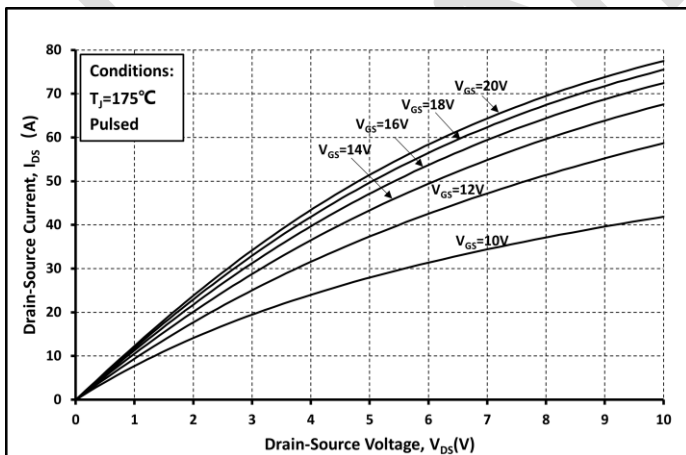


Fig. 3 Output Curve @  $T_J=175^\circ\text{C}$

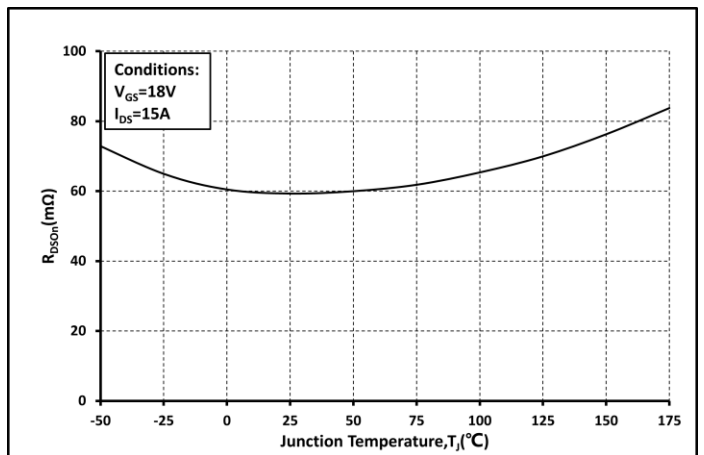


Fig. 4  $R_{on}$  vs. Temperature

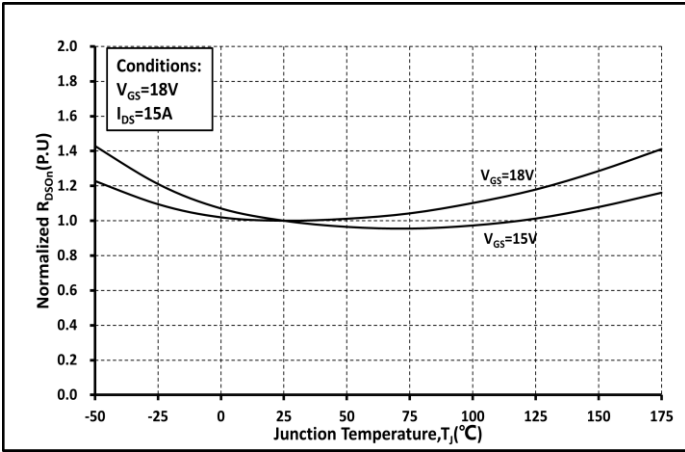


Fig. 5 Normalized Ron vs. Temperature

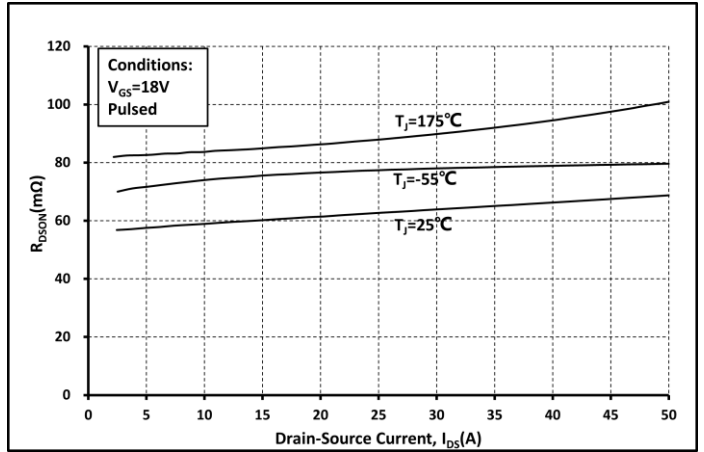


Fig. 6 Ron vs. Ids @ Various Temperature

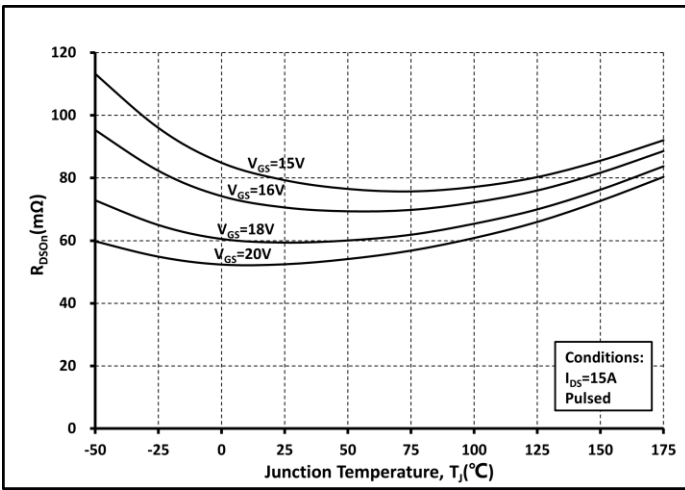


Fig. 7 Ron vs. Temperature @ Various Vgs

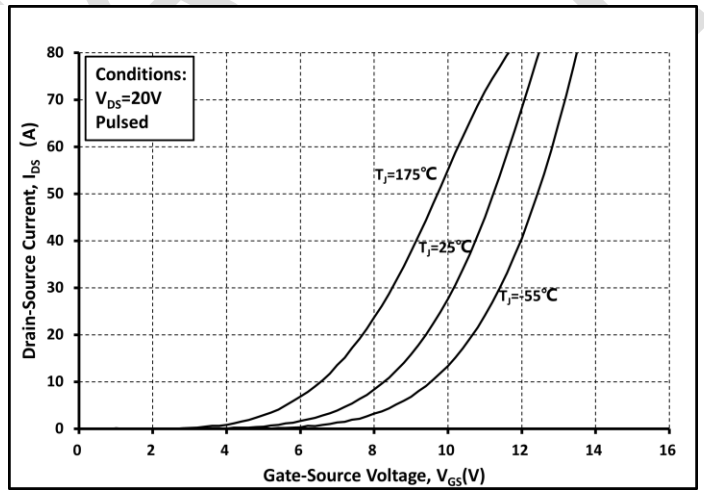


Fig. 8 Transfer Curves @ Various Temperature

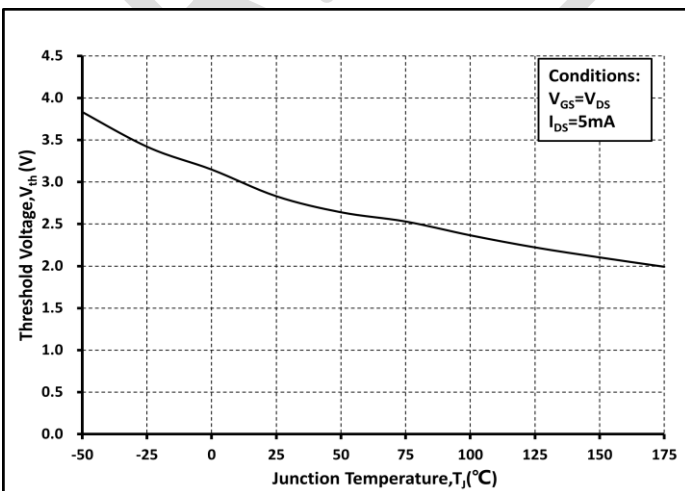


Fig. 9 Threshold Voltage vs. Temperature

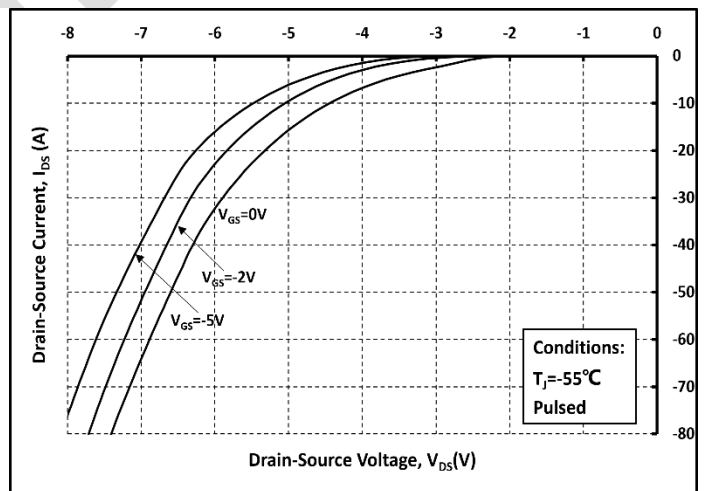


Fig. 10 Body Diode curves @ Tj=-55°C

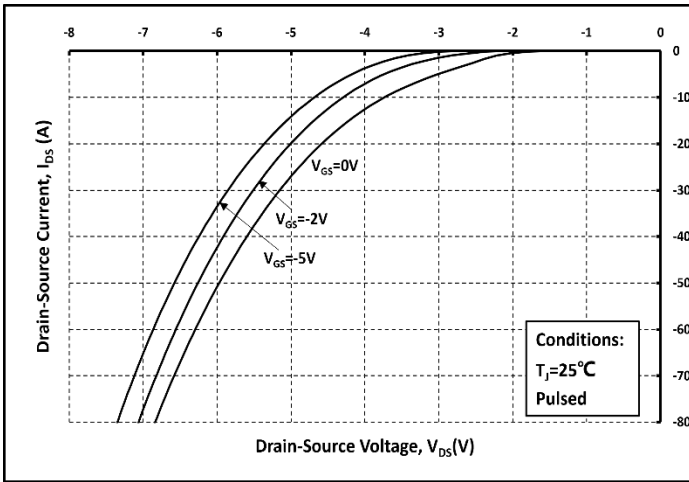


Fig. 11 Body Diode curves @  $T_j=25^\circ\text{C}$

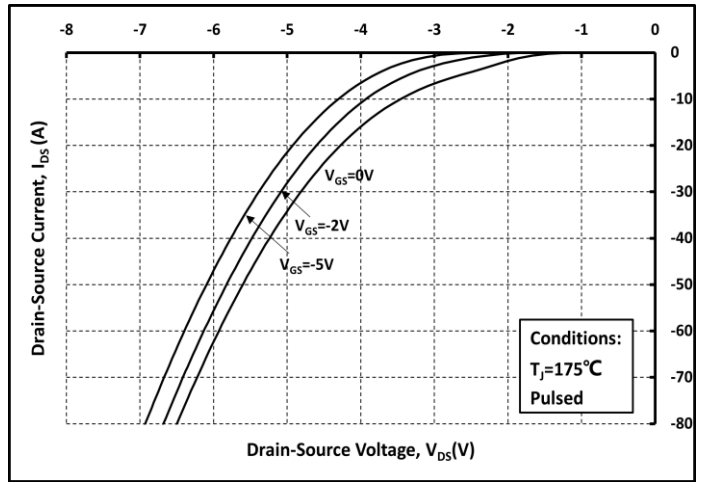


Fig. 12 Body Diode curves @  $T_j=175^\circ\text{C}$

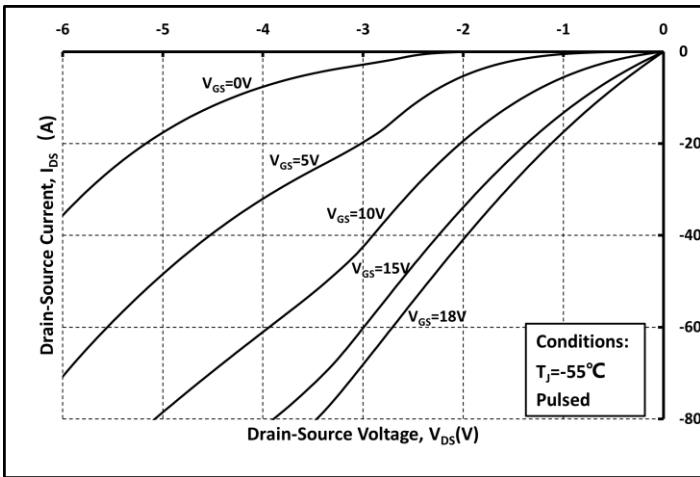


Fig. 13 3<sup>rd</sup> Quadrant curves @  $T_j=-55^\circ\text{C}$

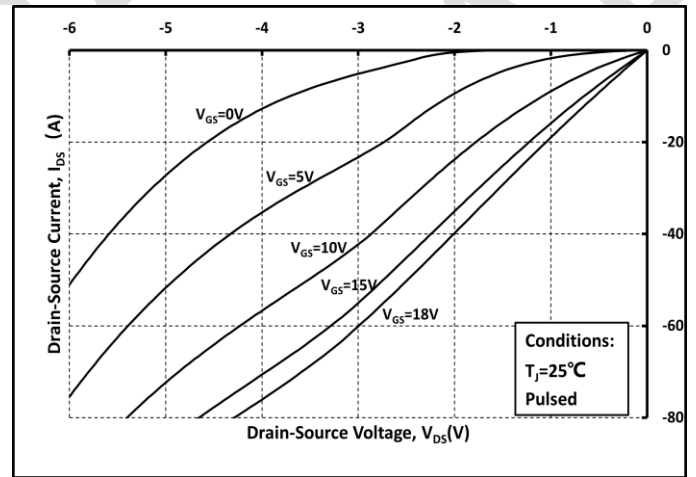


Fig. 14 3<sup>rd</sup> Quadrant curves @  $T_j=25^\circ\text{C}$

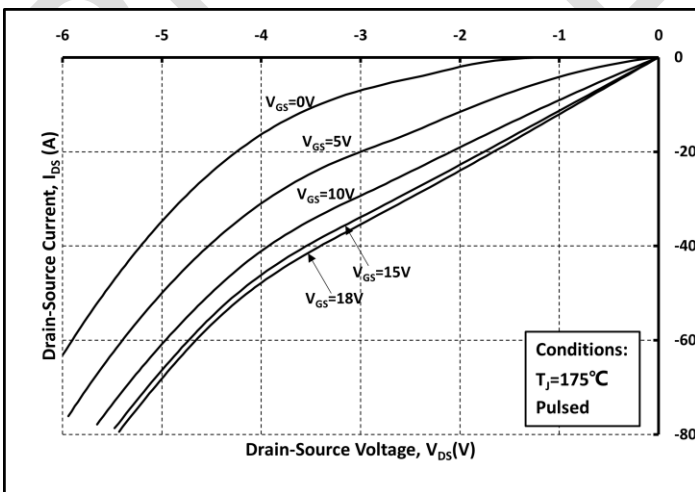


Fig. 15 3<sup>rd</sup> Quadrant curves @  $T_j=175^\circ\text{C}$

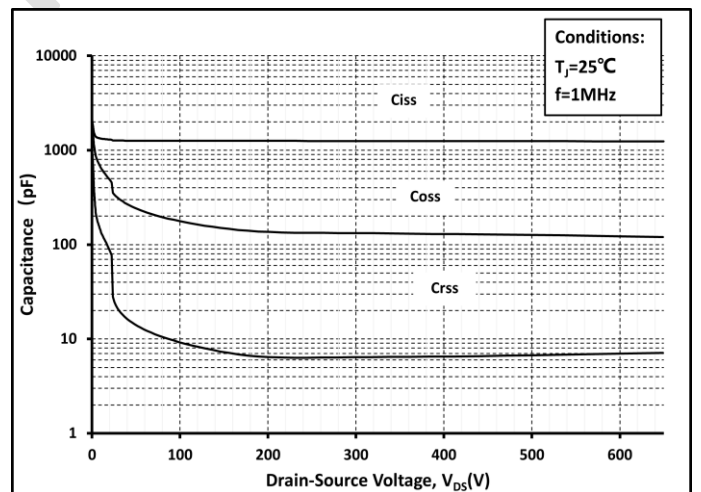


Fig. 16 Capacitance vs.  $V_{DS}$

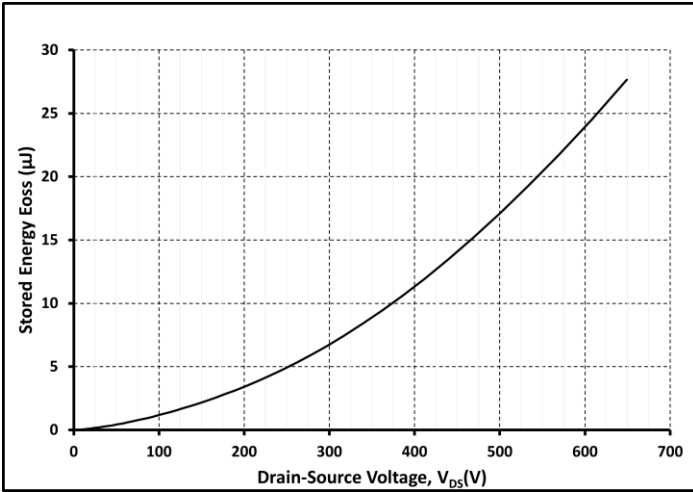


Fig. 17 Output Capacitor Stored Energy

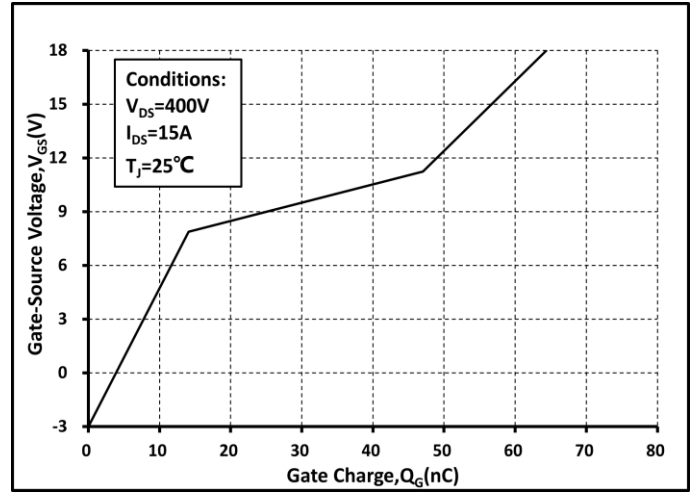


Fig. 18 Gate Charge Characteristics

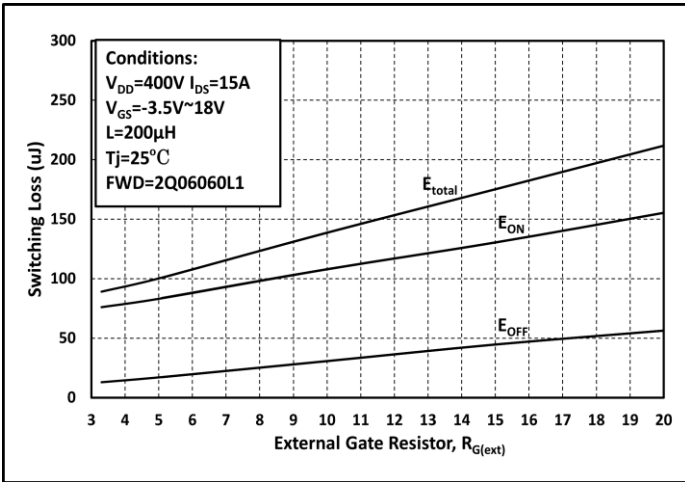


Fig. 19 Switching Energy vs.  $R_{G(ext)}$

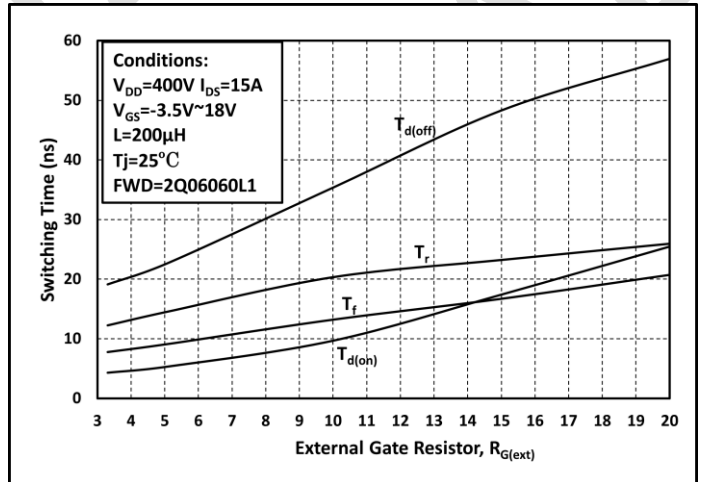


Fig. 20 Switching Times vs.  $R_{G(ext)}$

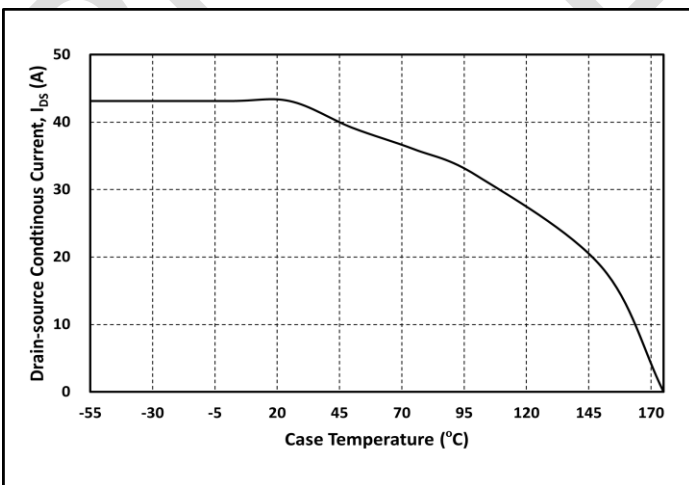


Fig. 21 Continuous Drain Current vs. Case Temperature

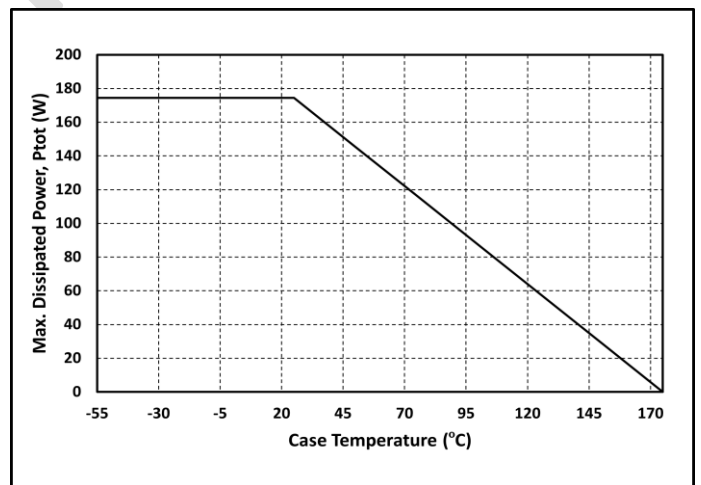


Fig. 22 Max. Power Dissipation Derating vs. Case Temperature



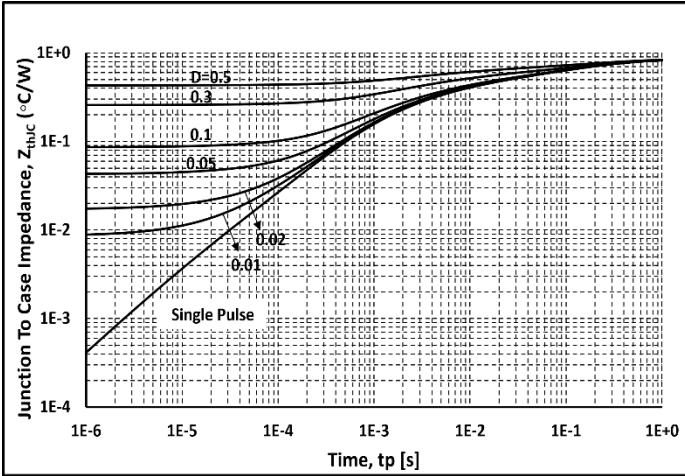


Fig. 23 Thermal impedance

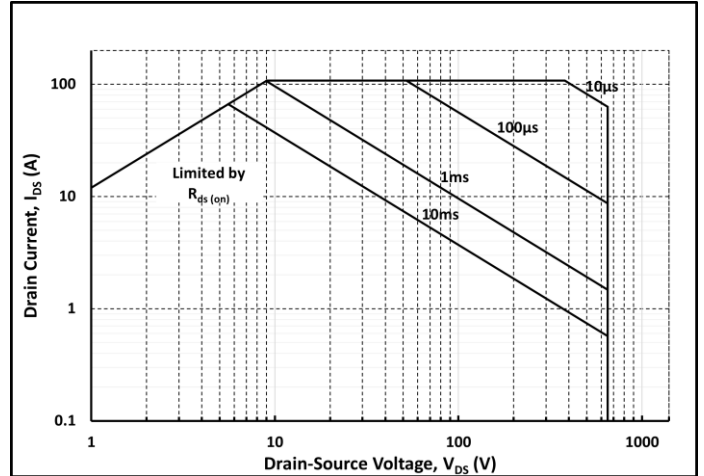
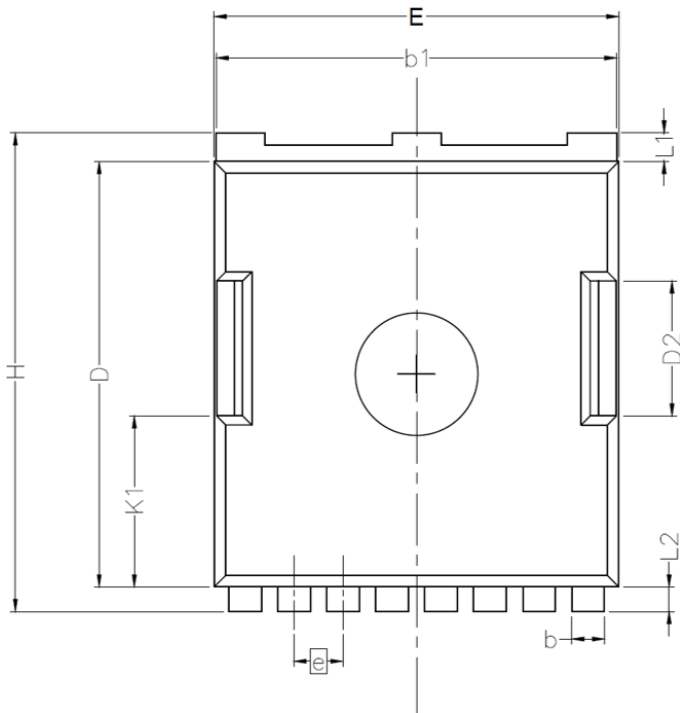


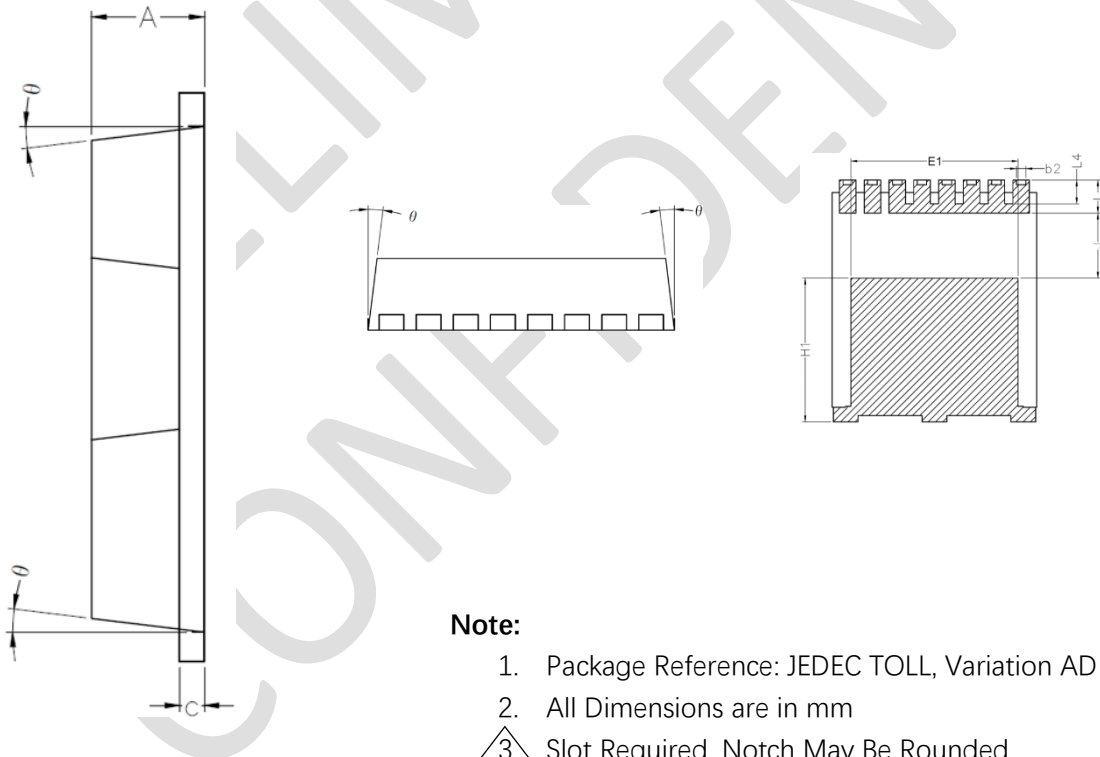
Fig. 24 Safe Operating Area

PRELIMINARY  
CONFIDENTIAL

## Package Dimensions



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



**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.

Copyright©2024 InventChip Technology Co., Ltd. All rights reserved.

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

## Related Links

<http://www.inventchip.com.cn>



PRELIMINARY  
CONFIDENTIAL

单击下面可查看定价，库存，交付和生命周期等信息

[>>Inventchip\(瞻芯电子\)](#)