

IV2Q06040BD– 650V 40mΩ Gen2 SiC MOSFET Chip

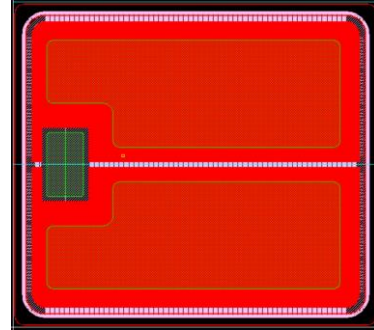
Features

- 2nd Generation SiC MOSFET Technology with +15V~+18V gate drive
- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- 175°C operating junction temperature capability
- Ultra fast and robust intrinsic body diode

Applications

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

Chip Outline:



Part Number	Die Size
IV2Q06040BD	Please contact your sales representative to get the detailed die information

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)	60	A	$V_{GS}=18V, T_c=25^\circ\text{C}$	Fig. 23
		43	A	$V_{GS}=18V, T_c=100^\circ\text{C}$	
I_{DM}	Drain current (pulsed)	150	A	Pulse width limited by SOA and dynamic $R_{\theta(j-c)}$	Fig. 25, 26
I_{SM}	Body diode current (pulsed)	150	A	Pulse width limited by SOA and dynamic $R_{\theta(j-c)}$	Fig. 25, 26
P_{TOT}	Total power dissipation	249	W	$T_c=25^\circ\text{C}$	Fig. 24
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	

Note1: Assumes $R_{\theta(j-c)} < 0.6^\circ\text{C/W}$.

Note2: All the electrical data and curve data please refer to datasheet for packaged device which part number is IV2Q06040T4Z.

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	μA	$V_{DS}=650\text{V}, V_{GS}=0\text{V}$	
I_{GSS}	Gate leakage current			± 100	nA	$V_{DS}=0\text{V}, V_{GS}=-5\sim 20\text{V}$	
V_{TH}	Gate threshold voltage	1.8	2.8	4.5	V	$V_{GS}=V_{DS}, I_D=7.5\text{mA}$	Fig. 8, 9
			2.1			$V_{GS}=V_{DS}, I_D=7.5\text{mA}$ @ $T_J=175^\circ\text{C}$	
R_{ON}	Static drain-source on-resistance		40	53	$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=20\text{A}$ @ $T_J=25^\circ\text{C}$	Fig. 4, 5, 6, 7
			60		$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=20\text{A}$ @ $T_J=175^\circ\text{C}$	
			51		$\text{m}\Omega$	$V_{GS}=15\text{V}, I_D=20\text{A}$ @ $T_J=25^\circ\text{C}$	
			65		$\text{m}\Omega$	$V_{GS}=15\text{V}, I_D=20\text{A}$ @ $T_J=175^\circ\text{C}$	
C_{iss}	Input capacitance		2000		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		158		pF		
C_{rss}	Reverse transfer capacitance		11.4		pF		
E_{oss}	C_{oss} stored energy		31		μJ		Fig. 17
Q_g	Total gate charge		94.7		nC	$V_{DS}=400\text{V}, I_D=20\text{A},$ $V_{GS}=-3\text{ to }18\text{V}$	Fig. 18
Q_{gs}	Gate-source charge		24.5		nC		
Q_{gd}	Gate-drain charge		47.3		nC		
R_g	Gate input resistance		2.9		Ω	$f=1\text{MHz}$	
E_{ON}	Turn-on switching energy		126.2		μJ	$V_{DS}=400\text{V}, I_D=30\text{A},$ $V_{GS}=-3.5\text{ to }18\text{V},$ $R_{G(ext)}=3.3\Omega,$ $L=200\mu\text{H}$ $T_J=25^\circ\text{C}$	Fig. 19, 20
E_{OFF}	Turn-off switching energy		35.7		μJ		
$t_{d(on)}$	Turn-on delay time		7.9		ns		
t_r	Rise time		15.8				
$t_{d(off)}$	Turn-off delay time		17.9				
t_f	Fall time		8.4				
E_{ON}	Turn-on switching energy		156.4			$V_{DS}=400\text{V}, I_D=30\text{A},$ $V_{GS}=-3.5\text{ to }18\text{V},$ $R_{G(ext)}=3.3\Omega, L=200\mu\text{H}$ $T_J=175^\circ\text{C}$	Fig. 22
E_{OFF}	Turn-off switching energy		43.0				

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		4.1		V	$I_{SD}=20\text{A}, V_{GS}=0\text{V}$	Fig. 10, 11, 12
			3.8		V	$I_{SD}=20\text{A}, V_{GS}=0\text{V}, T_J=175^\circ\text{C}$	
I_S	Diode forward current (continuous)			47	A	$V_{GS}=-2\text{V}, T_c=25^\circ\text{C}$	
				27	A	$V_{GS}=-2\text{V}, T_c=100^\circ\text{C}$	
t_{rr}	Reverse recovery time		26.6		ns	$V_{GS}=-3.5\text{V}/+18\text{V}, I_{SD}=30\text{A}, V_R=800\text{V}, R_{G(\text{ext})}=10\Omega, L=200\mu\text{H}, di/dt=3000\text{A}/\mu\text{s}$	
Q_{rr}	Reverse recovery charge		221.0		nC		
I_{RRM}	Peak reverse recovery current		19.3		A		

Typical Performance (curves)

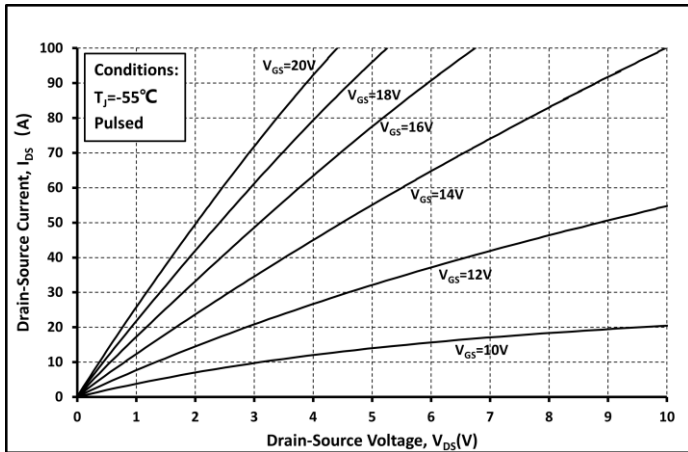


Fig. 1 Output Curve @ $T_J=-55^\circ\text{C}$

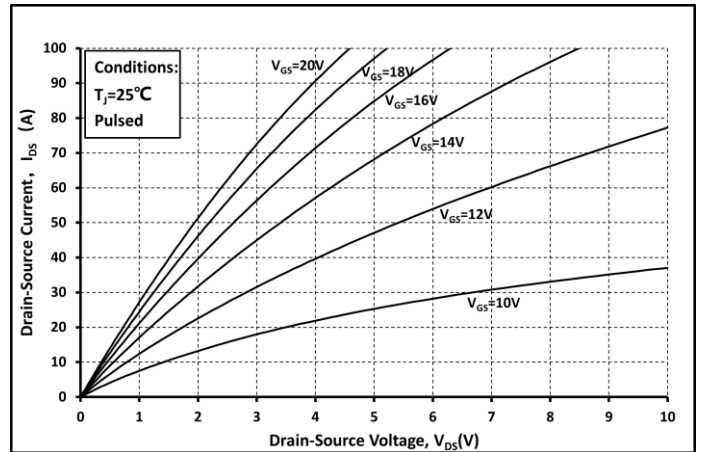


Fig. 2 Output Curve @ $T_J=25^\circ\text{C}$

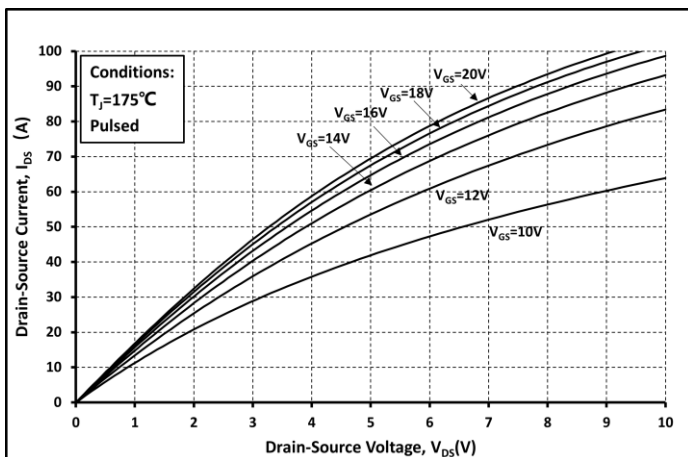


Fig. 3 Output Curve @ $T_J=175^\circ\text{C}$

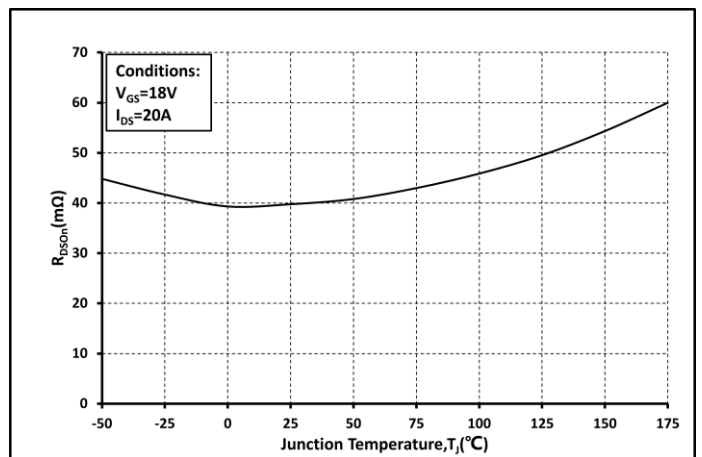


Fig. 4 R_{on} vs. Temperature

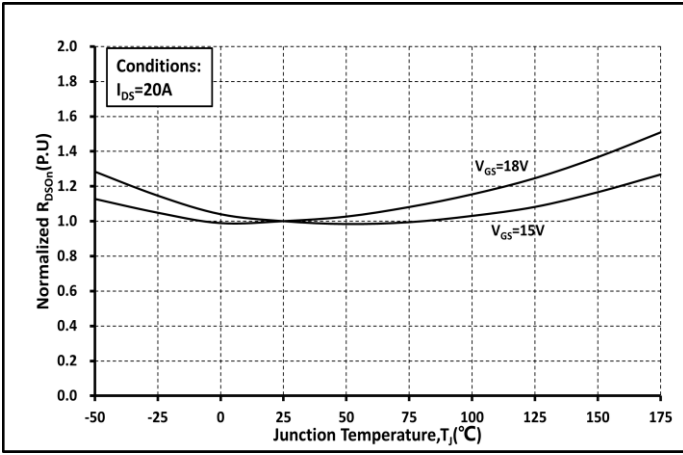


Fig. 5 Normalized Ron vs. Temperature

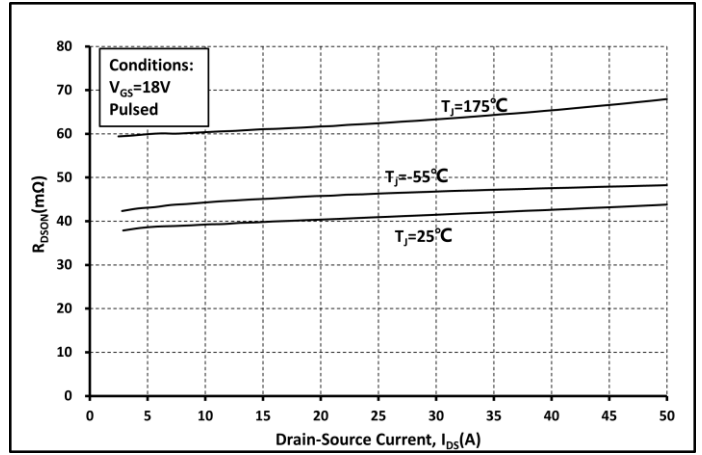


Fig. 6 Ron vs. Ids @ Various Temperature

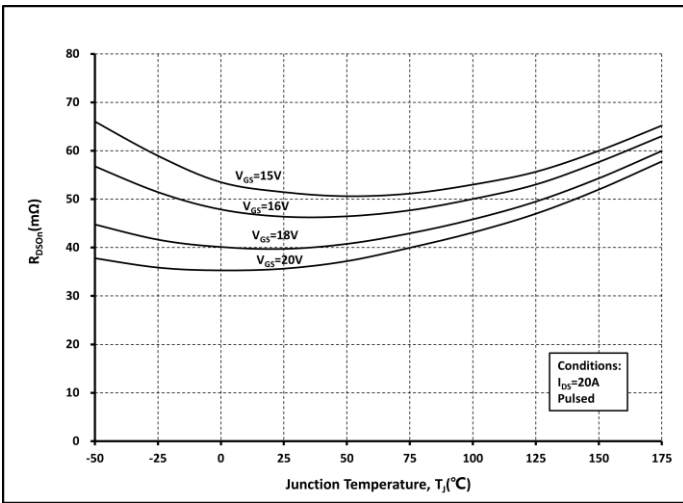


Fig. 7 Ron vs. Temperature @ Various Vgs

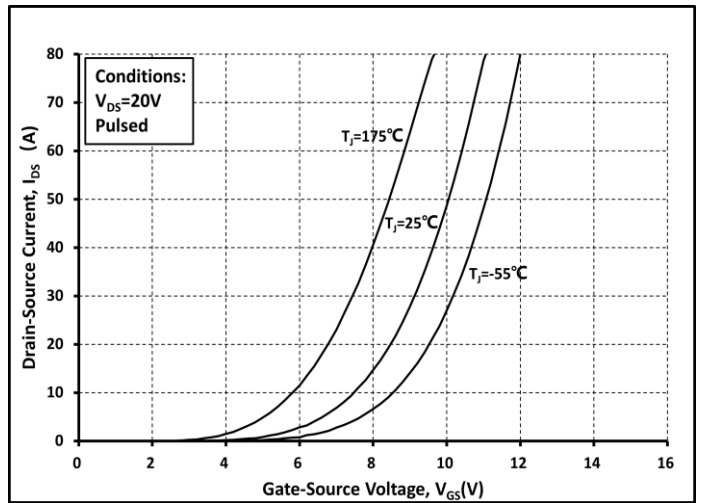


Fig. 8 Transfer Curves @ Various Temperature

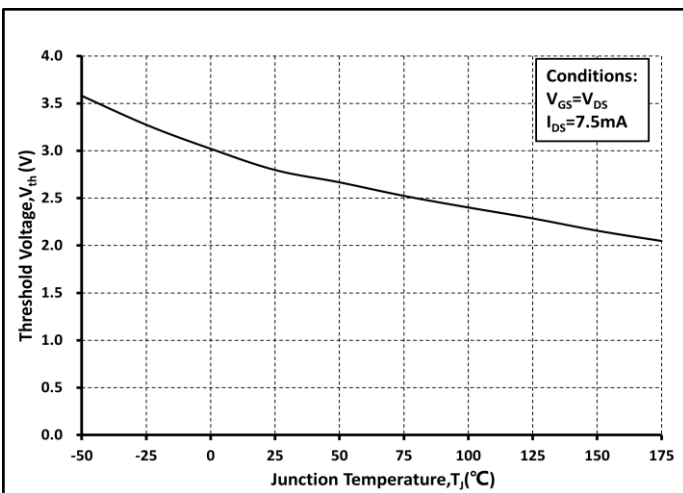


Fig. 9 Threshold Voltage vs. Temperature

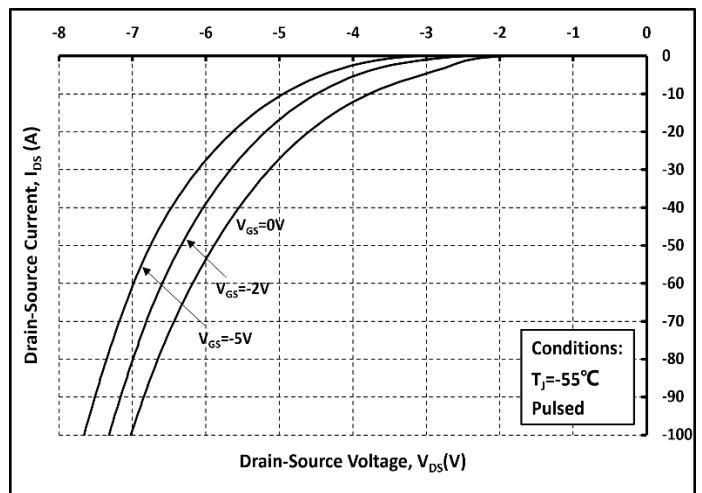


Fig. 10 Body Diode curves @ Tj = -55°C

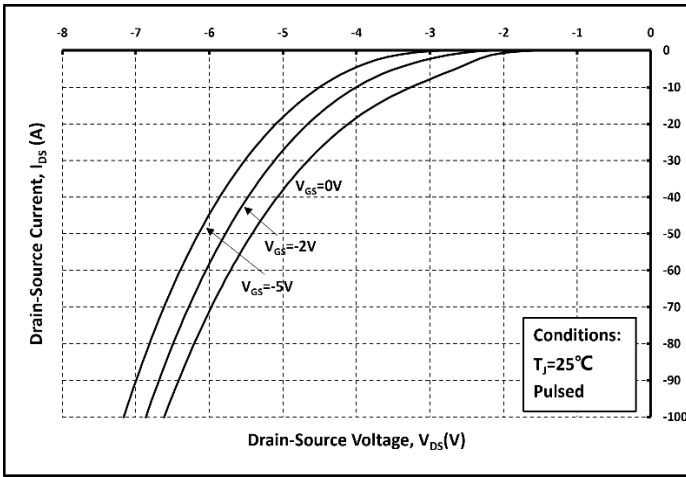


Fig. 11 Body Diode curves @ $T_j=25^\circ\text{C}$

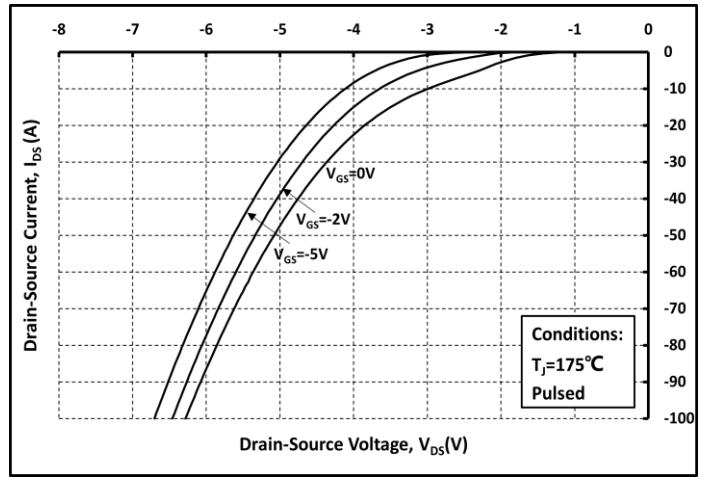


Fig. 12 Body Diode curves @ $T_j=175^\circ\text{C}$

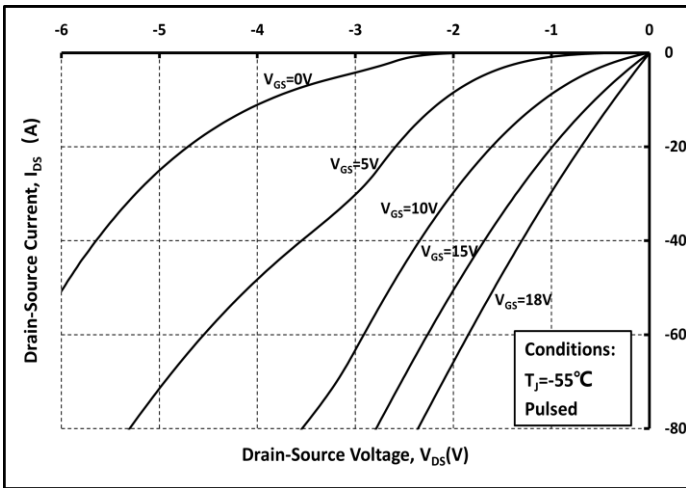


Fig. 13 3rd Quadrant curves @ $T_j=-55^\circ\text{C}$

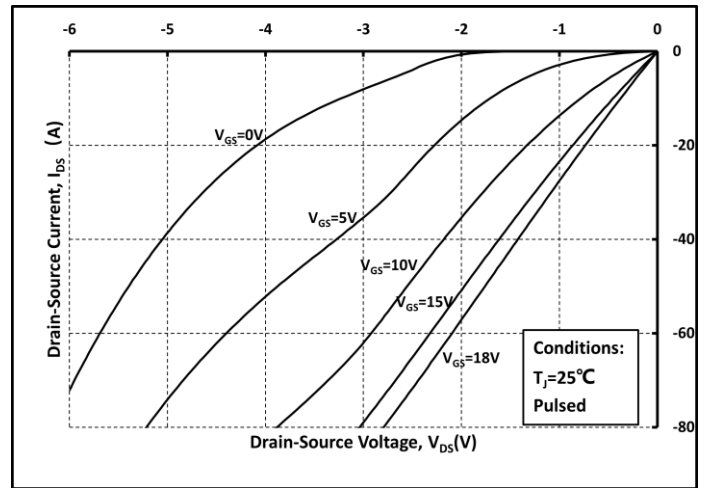


Fig. 14 3rd Quadrant curves @ $T_j=25^\circ\text{C}$

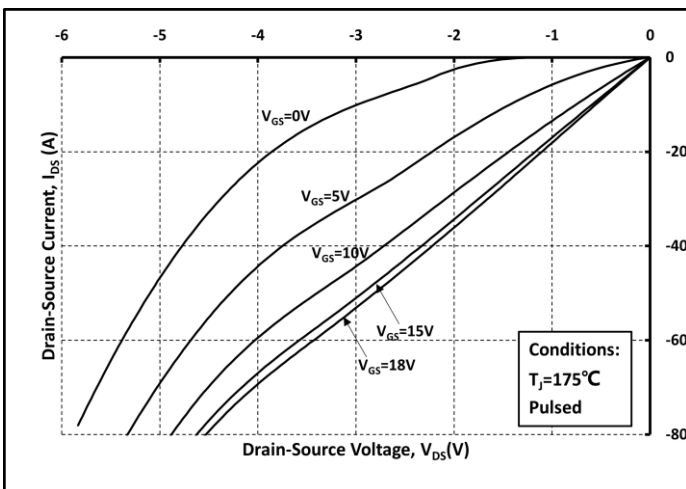


Fig. 15 3rd Quadrant curves @ $T_j=175^\circ\text{C}$

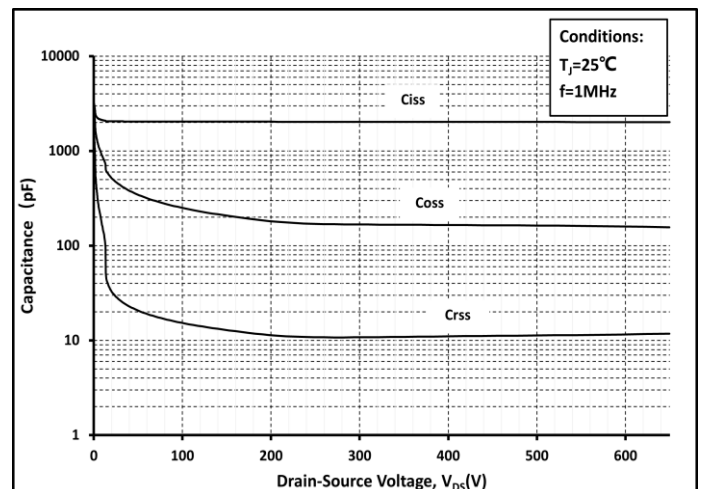


Fig. 16 Capacitance vs. V_{ds}

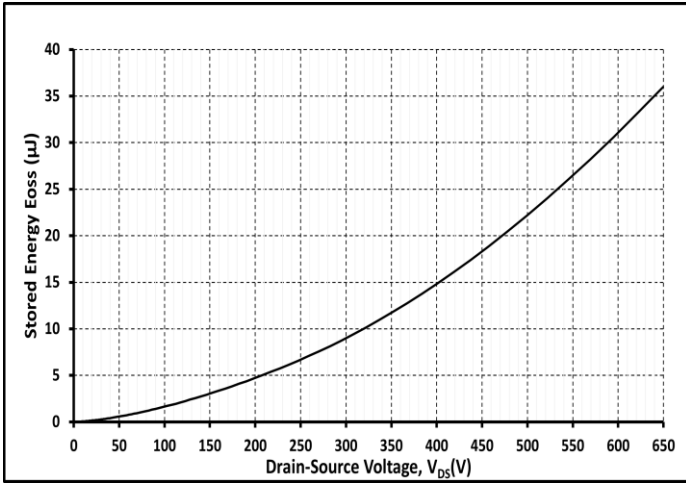


Fig. 17 Output Capacitor Stored Energy

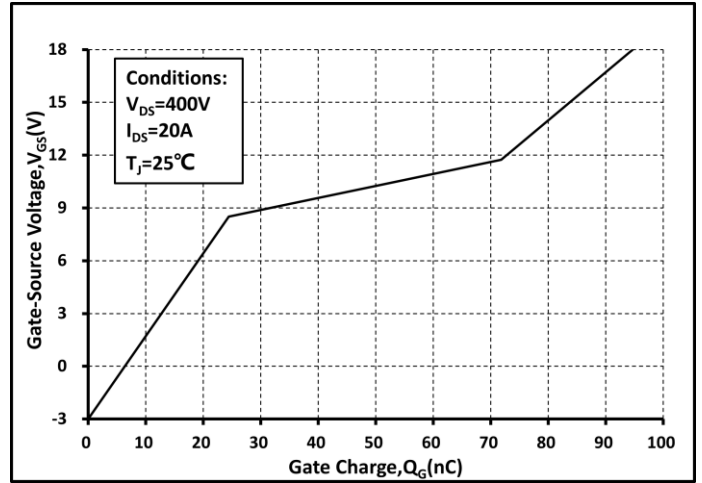


Fig. 18 Gate Charge Characteristics

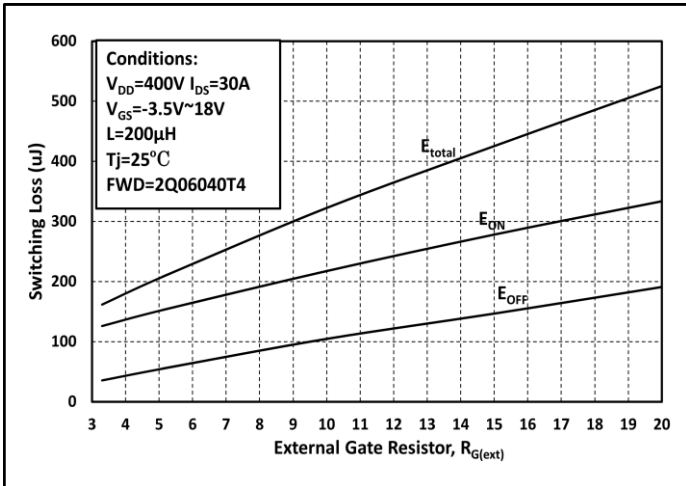


Fig. 19 Switching Energy vs. $R_{G(ext)}$

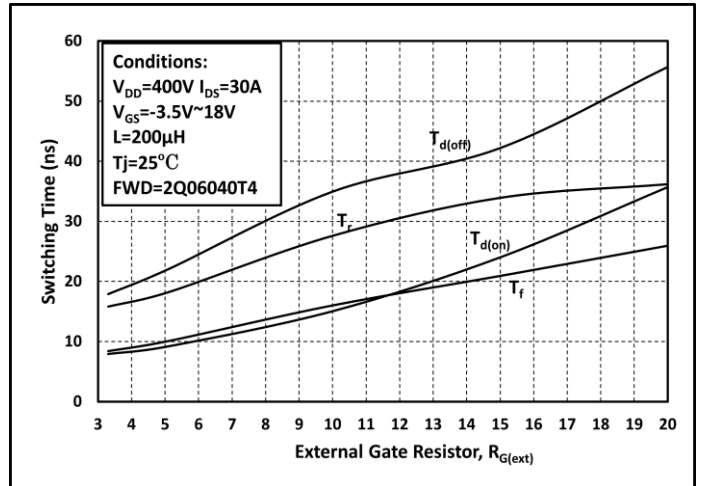


Fig. 20 Switching Times vs. $R_{G(ext)}$

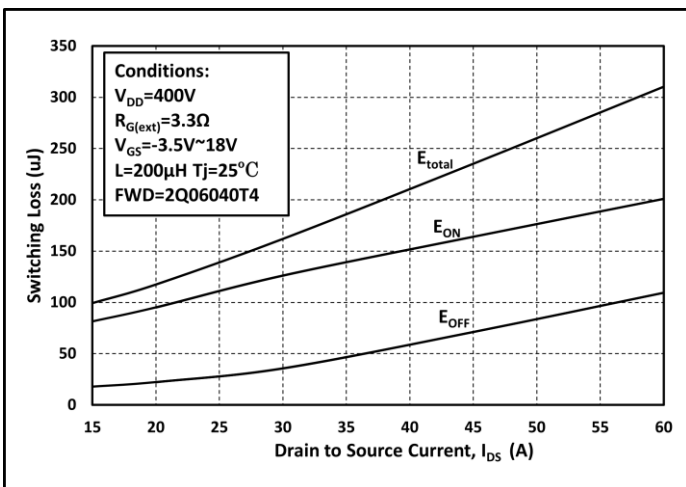


Fig. 21 Switching Energy vs. I_{DS}

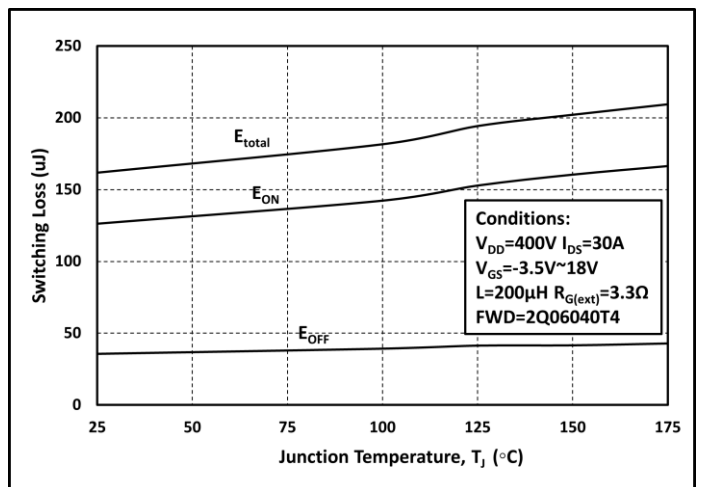


Fig. 22 Switching Energy vs. Temperature

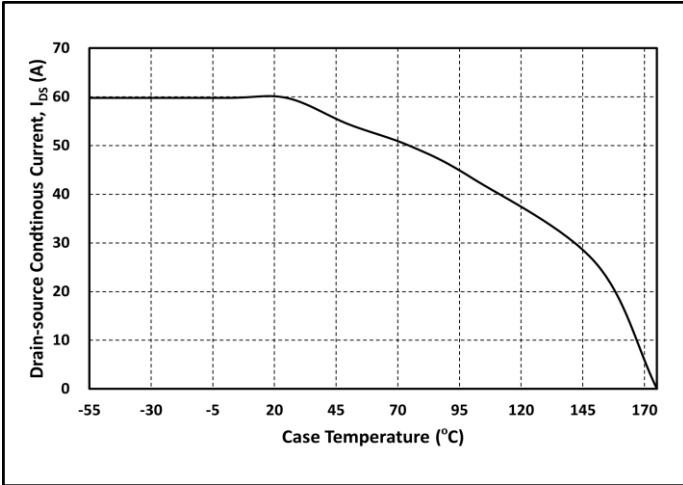


Fig. 23 Continuous Drain Current vs. Case Temperature

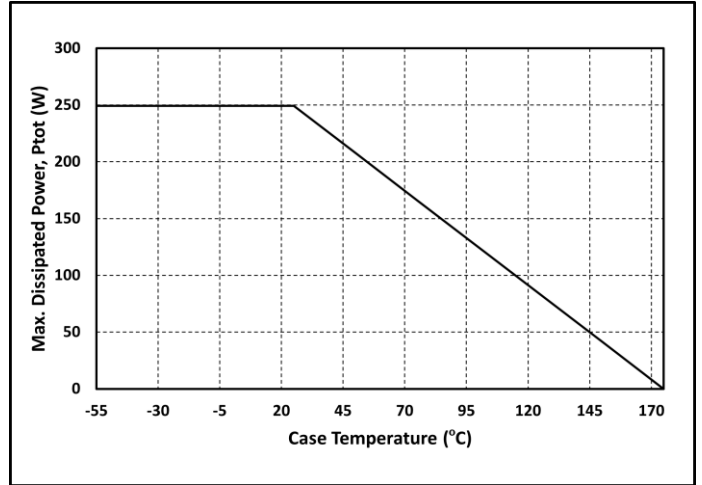


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

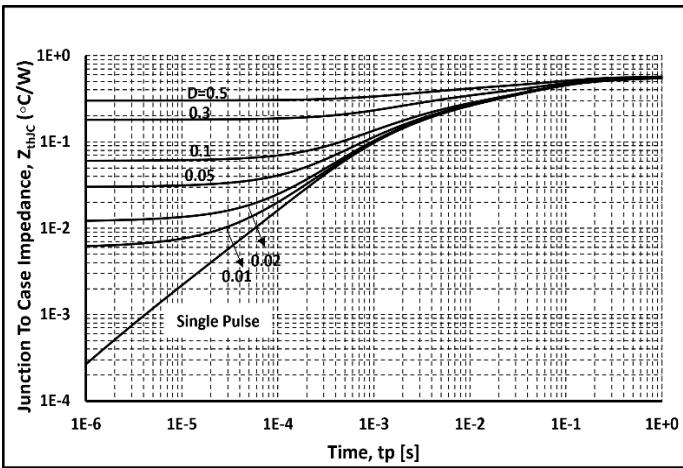


Fig. 25 Thermal impedance

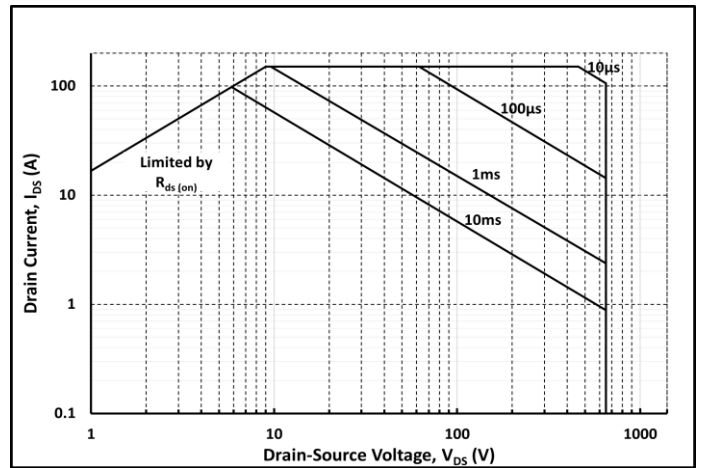


Fig. 26 Safe Operating Area

Notes

For further information please contact IVCT's office.

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