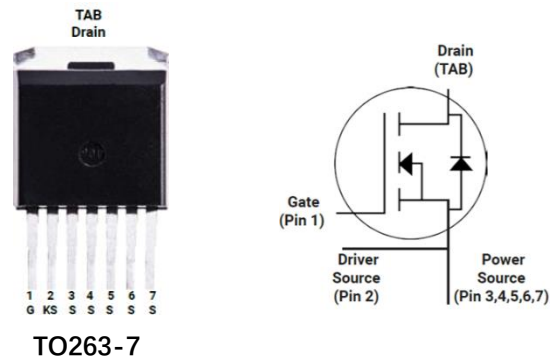


## IV2Q171R0D7Z – 1700V 1000mΩ SiC MOSFET

### Features

- 2<sup>nd</sup> Generation SiC MOSFET Technology with +15~+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
- Kelvin gate input easing driver circuit design
- AEC-Q101 qualified

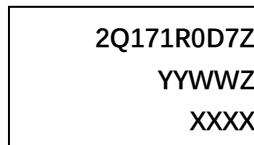
### Outline:



### Applications

- Solar inverters
- Auxiliary power supplies
- Switch mode power supplies
- Smart meters

### Marking Diagram:



2Q171R0D7Z = Specific Device Code  
 YY = Year  
 WW = Work Week  
 Z = Assembly Location  
 XXXX = Lot Traceability

### Absolute Maximum Ratings (T<sub>c</sub>=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V <sub>DS</sub>	Drain-Source voltage	1700	V	V <sub>GS</sub> =0V, I <sub>D</sub> =10μA	
V <sub>GSmax</sub> (Transient)	Maximum spike voltage	-10 to 23	V	Duty cycle <1%, and pulse width<200ns	
V <sub>GSon</sub>	Recommended turn-on voltage	15 to 18	V		
V <sub>GSoff</sub>	Recommended turn-off voltage	-5 to -2	V	Typical value -3.5V	
I <sub>D</sub>	Drain current (continuous)	6.3	A	V <sub>GS</sub> =18V, T <sub>c</sub> =25°C	Fig. 23
		4.8	A	V <sub>GS</sub> =18V, T <sub>c</sub> =100°C	
I <sub>DM</sub>	Drain current (pulsed)	15.7	A	Pulse width limited by SOA and dynamic R <sub>θ(j-c)</sub>	Fig. 25, 26
I <sub>SM</sub>	Body diode current (pulsed)	15.7	A	Pulse width limited by SOA and dynamic R <sub>θ(j-c)</sub>	Fig. 25, 26
P <sub>TOT</sub>	Total power dissipation	73	W	T <sub>c</sub> =25°C	Fig. 24
T <sub>stg</sub>	Storage temperature range	-55 to 175	°C		
T <sub>J</sub>	Operating junction temperature	-55 to 175	°C		

### Thermal Data

Symbol	Parameter	Value	Unit	Note
R <sub>θ(j-c)</sub>	Thermal Resistance from Junction to Case	2.05	°C/W	Fig. 25

**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		1	10	$\mu\text{A}$	$V_{DS}=1700\text{V}, V_{GS}=0\text{V}$	
$I_{GSS}$	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	3.0	4.5	$\text{V}$	$V_{GS}=V_{DS}, I_D=380\mu\text{A}$	Fig. 8, 9
			2.0		$\text{V}$	$V_{GS}=V_{DS}, I_D=380\mu\text{A}$ @ $T_J=175^\circ\text{C}$	
$R_{ON}$	Static drain-source on-resistance		700 1280	910	$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=1\text{A}$ @ $T_J=25^\circ\text{C}$ @ $T_J=175^\circ\text{C}$	Fig. 4, 5, 6, 7
			950 1450	1250	$\text{m}\Omega$	$V_{GS}=15\text{V}, I_D=1\text{A}$ @ $T_J=25^\circ\text{C}$ @ $T_J=175^\circ\text{C}$	
$C_{iss}$	Input capacitance		285		$\text{pF}$	$V_{DS}=1000\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}, V_{AC}=25\text{mV}$	Fig. 16
$C_{oss}$	Output capacitance		15.3		$\text{pF}$		
$C_{rss}$	Reverse transfer capacitance		2.2		$\text{pF}$		
$E_{oss}$	$C_{oss}$ stored energy		11		$\mu\text{J}$		Fig. 17
$Q_g$	Total gate charge		16.5		$\text{nC}$	$V_{DS}=1000\text{V}, I_D=1\text{A},$ $V_{GS}=-5$ to $18\text{V}$	Fig. 18
$Q_{gs}$	Gate-source charge		2.7		$\text{nC}$		
$Q_{gd}$	Gate-drain charge		12.5		$\text{nC}$		
$R_g$	Gate input resistance		13		$\Omega$	$f=1\text{MHz}$	
$E_{ON}$	Turn-on switching energy		51.0		$\mu\text{J}$	$V_{DS}=1000\text{V}, I_D=2\text{A},$ $V_{GS}=-3.5\text{V}$ to $18\text{V},$ $R_{G(ext)}=10\Omega, L=2330\mu\text{H}$ $T_J=25^\circ\text{C}$	Fig. 19, 20
$E_{OFF}$	Turn-off switching energy		17.0		$\mu\text{J}$		
$t_{d(on)}$	Turn-on delay time		4.8		ns		
$t_r$	Rise time		13.2				
$t_{d(off)}$	Turn-off delay time		12.0				
$t_f$	Fall time		66.8				
$E_{ON}$	Turn-on switching energy		90.3		$\mu\text{J}$	$V_{DS}=1000\text{V}, I_D=2\text{A},$ $V_{GS}=-3.5\text{V}$ to $18\text{V},$ $R_{G(ext)}=10\Omega, L=2330\mu\text{H}$ $T_J=175^\circ\text{C}$	Fig. 22
$E_{OFF}$	Turn-off switching energy		22.0		$\mu\text{J}$		

**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		4.0		V	$I_{SD}=1\text{A}, V_{GS}=0\text{V}$	Fig. 10, 11, 12
			3.8		V	$I_{SD}=1\text{A}, V_{GS}=0\text{V}, T_J=175^\circ\text{C}$	
$I_S$	Diode forward current (continuous)			11.8	A	$V_{GS}=-2\text{V}, T_c=25^\circ\text{C}$	
				6.8	A	$V_{GS}=-2\text{V}, T_c=100^\circ\text{C}$	
$t_{rr}$	Reverse recovery time		20.6		ns	$V_{GS}=-3.5\text{V}/+18\text{V}, I_{SD}=2\text{A}, V_R=1000\text{V}, R_{G(\text{ext})}=10\ \Omega, L=2330\ \mu\text{H}, di/dt=5000\text{A}/\mu\text{s}$	
$Q_{rr}$	Reverse recovery charge		54.2		nC		
$I_{RRM}$	Peak reverse recovery current		8.2		A		

**Typical Performance (curves)**

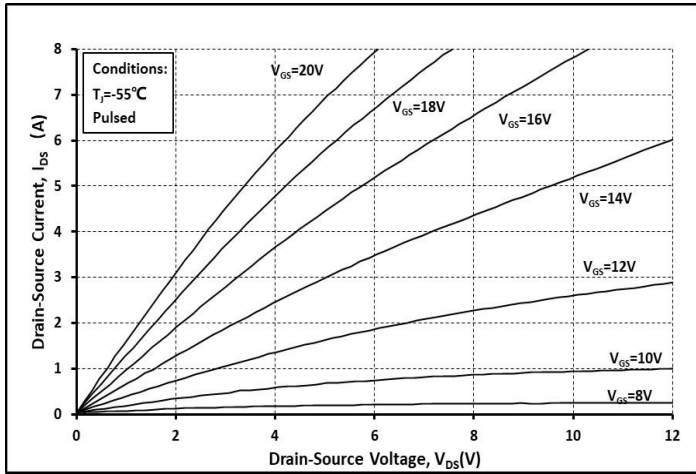


Fig. 1 Output Curve @  $T_J = -55^\circ\text{C}$

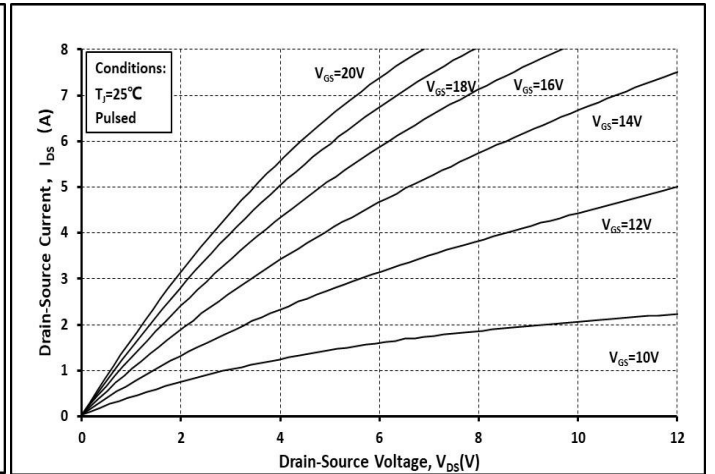


Fig. 2 Output Curve @  $T_J = 25^\circ\text{C}$

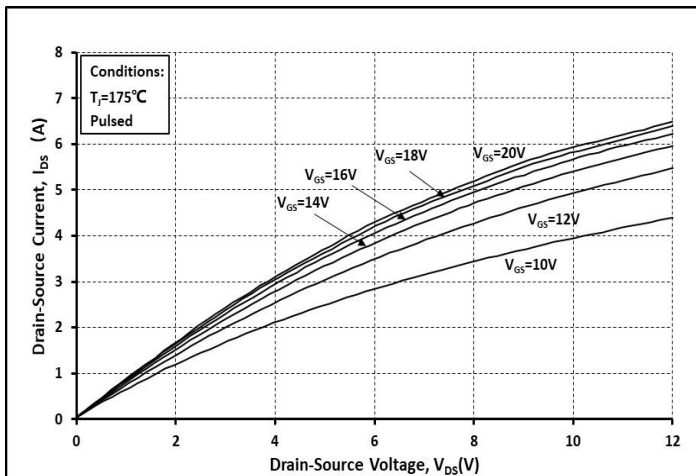


Fig. 3 Output Curve @  $T_J = 175^\circ\text{C}$

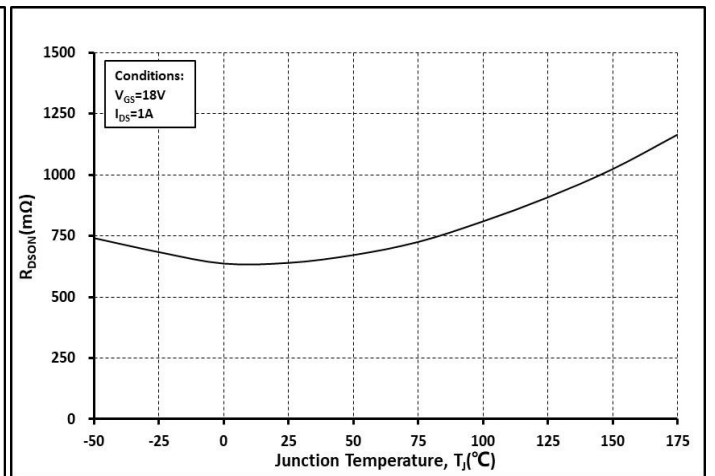


Fig. 4  $R_{DS(\text{on})}$  vs. Temperature

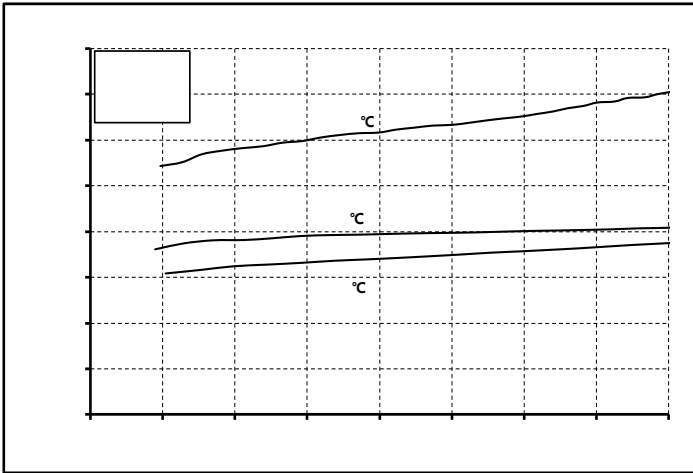


Fig. 5  $R_{on}$  vs.  $I_{DS}$  @ Various Temperature

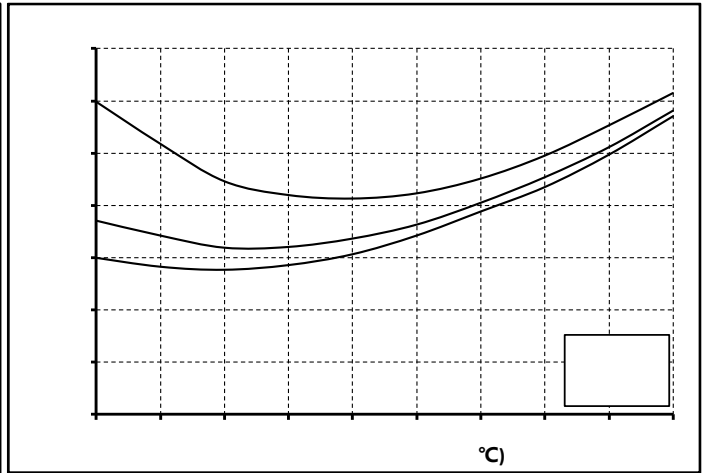


Fig. 6  $R_{on}$  vs. Temperature @ Various  $V_{GS}$

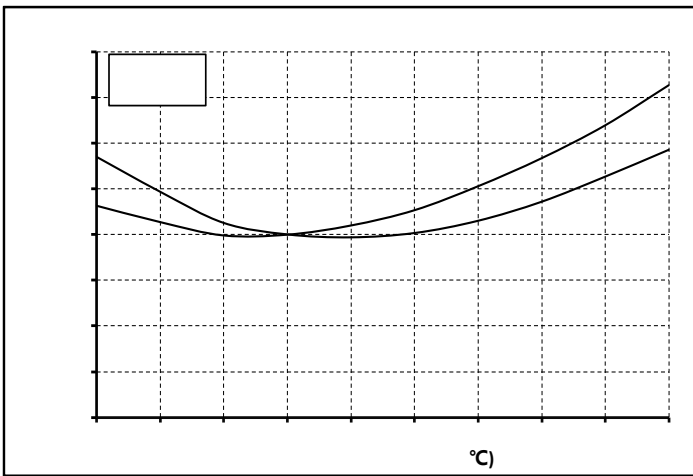


Fig. 7 Normalized  $R_{on}$  vs. Temperature

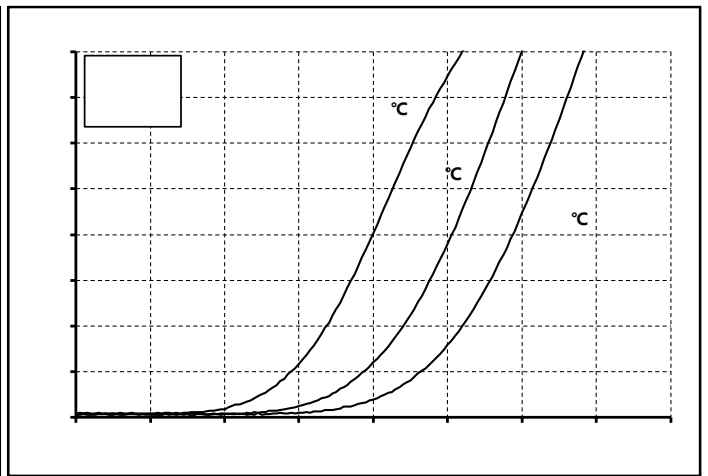


Fig. 8 Transfer Curves @ Various Temperature

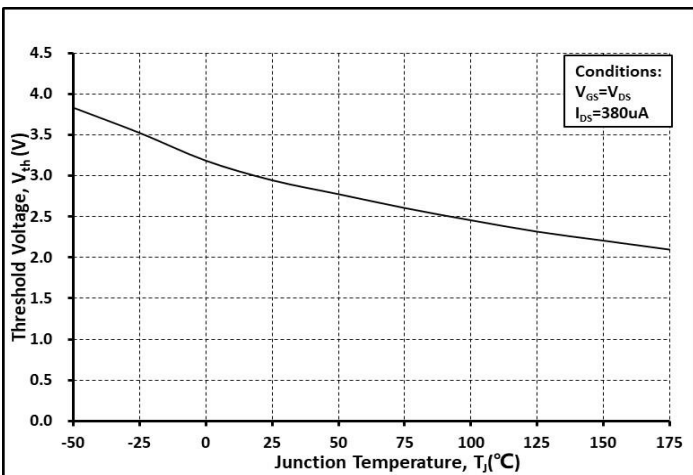


Fig. 9 Threshold Voltage vs. Temperature

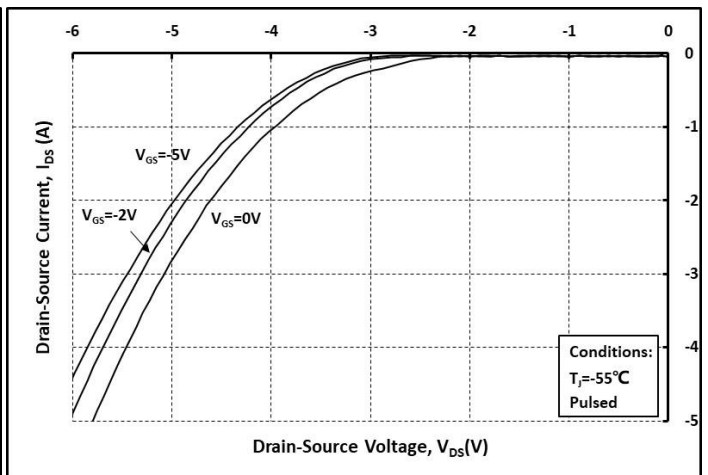


Fig. 10 Body Diode Curves @  $T_J = -55^{\circ}C$

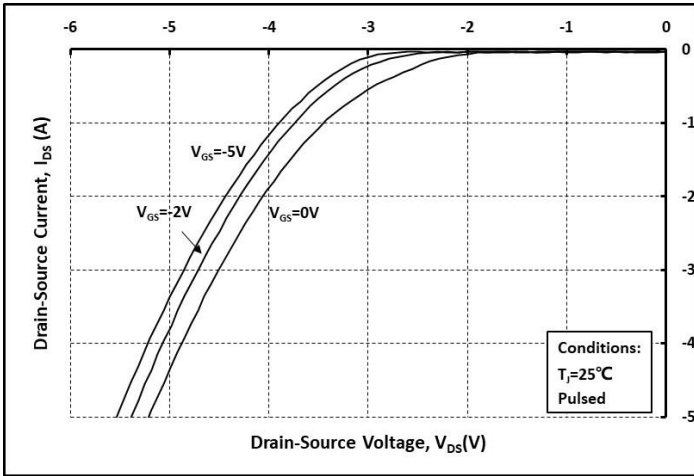


Fig. 11 Body Diode Curves @  $T_j = 25^\circ C$

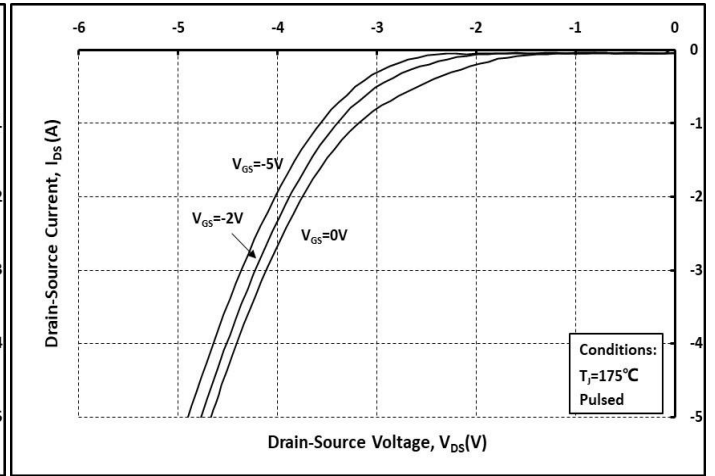


Fig. 12 Body Diode Curves @  $T_j = 175^\circ C$

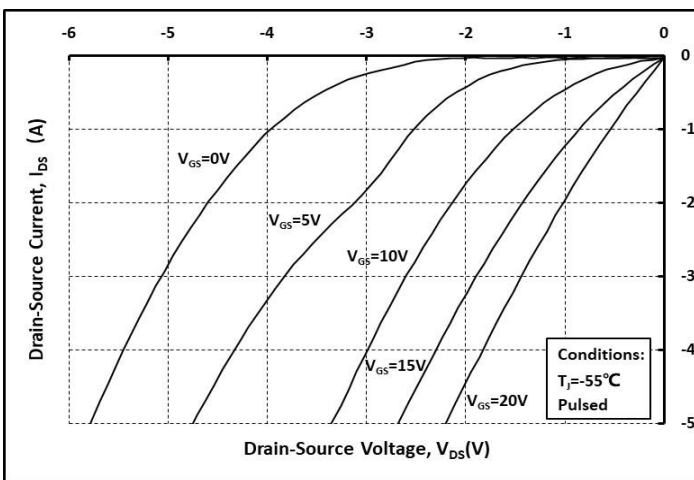


Fig. 13 3<sup>rd</sup> Quadrant Curves @  $T_j = -55^\circ C$

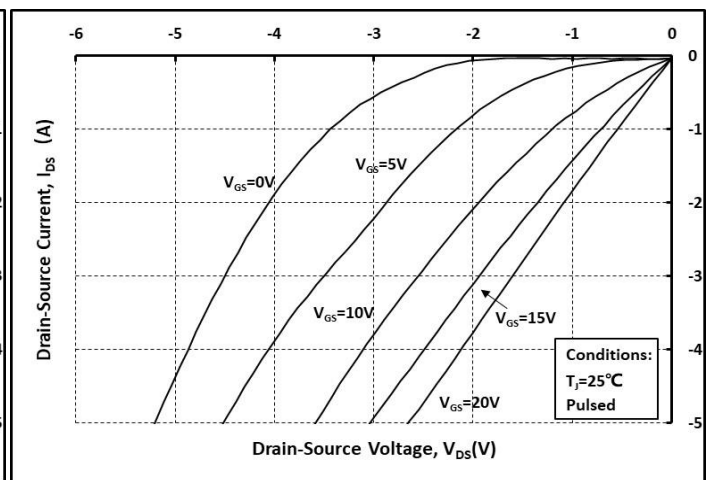


Fig. 14 3<sup>rd</sup> Quadrant Curves @  $T_j = 25^\circ C$

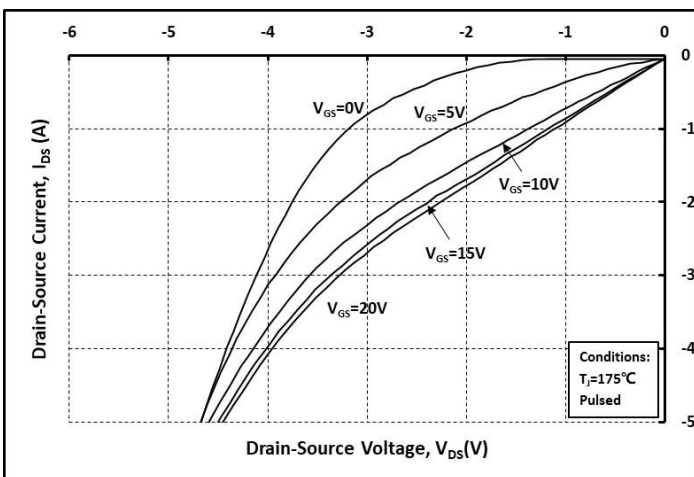


Fig. 15 3<sup>rd</sup> Quadrant Curves @  $T_j = 175^\circ C$

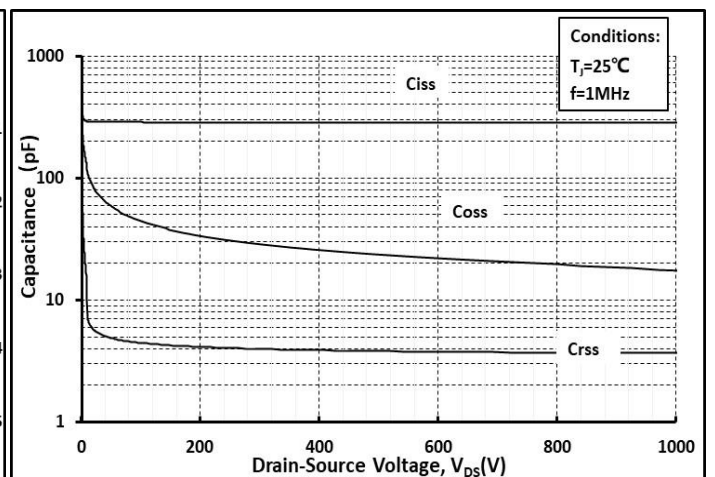


Fig. 16 Capacitance vs.  $V_{DS}$

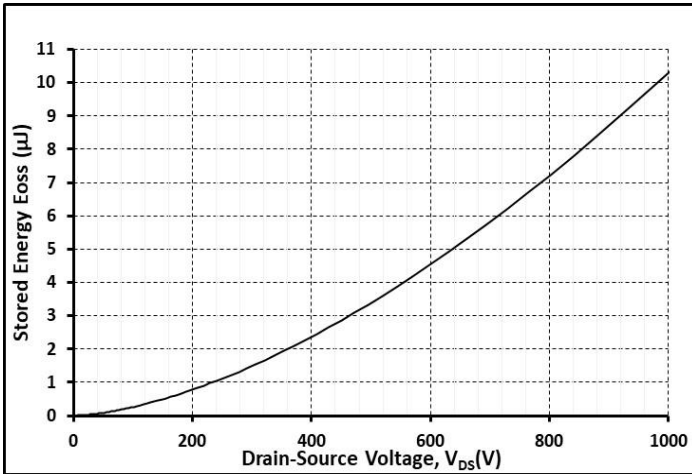


Fig. 17 Output Capacitor Stored Energy

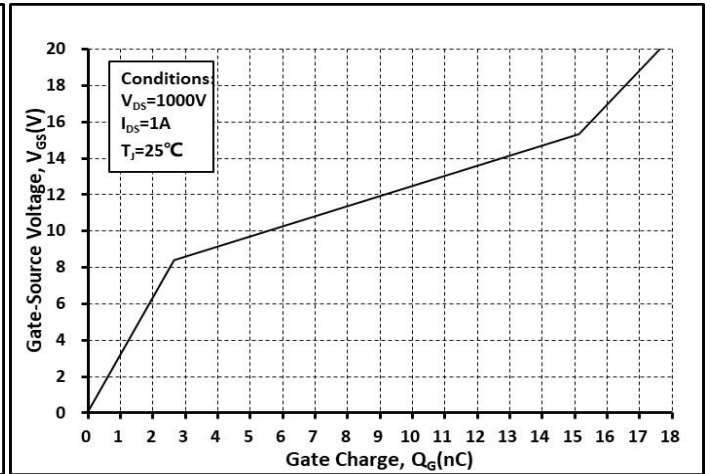


Fig. 18 Gate Charge Characteristics

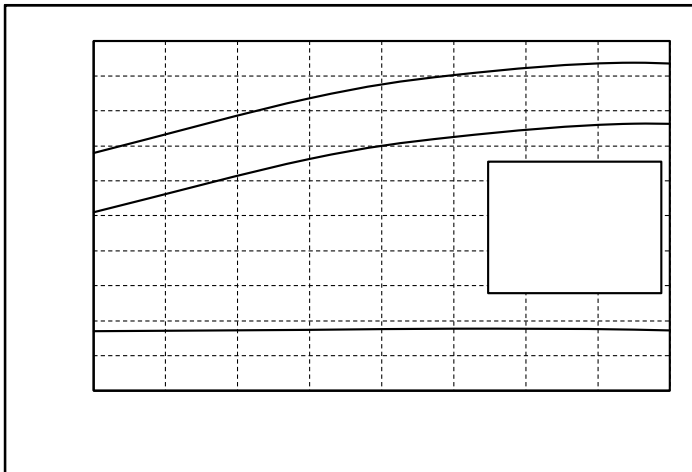


Fig. 19 Switching Energy vs.  $R_{G(ext)}$

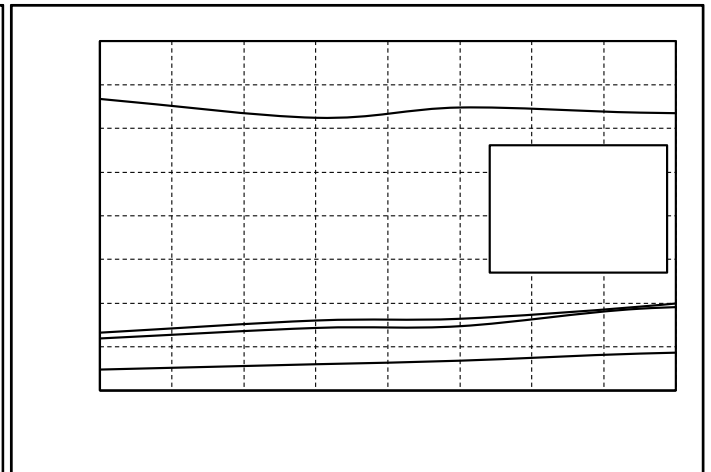


Fig. 20 Switching Times vs.  $R_{G(ext)}$

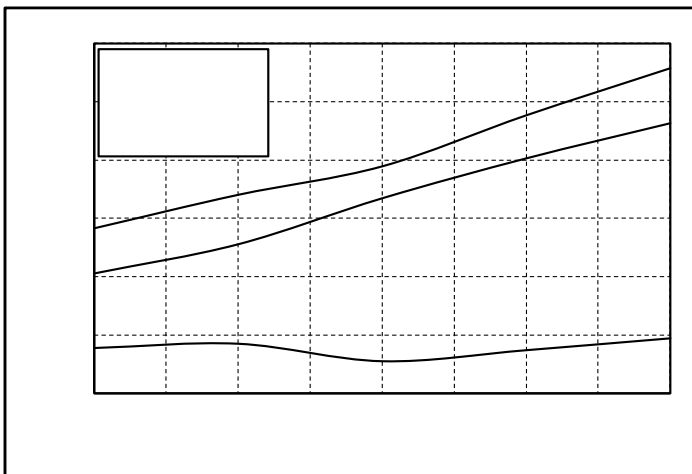


Fig. 21 Switching Energy vs.  $I_{DS}$

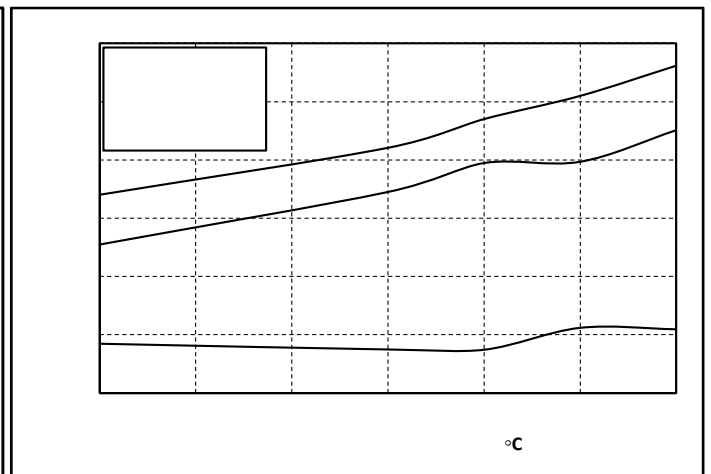


Fig. 22 Switching Energy vs. Temperature

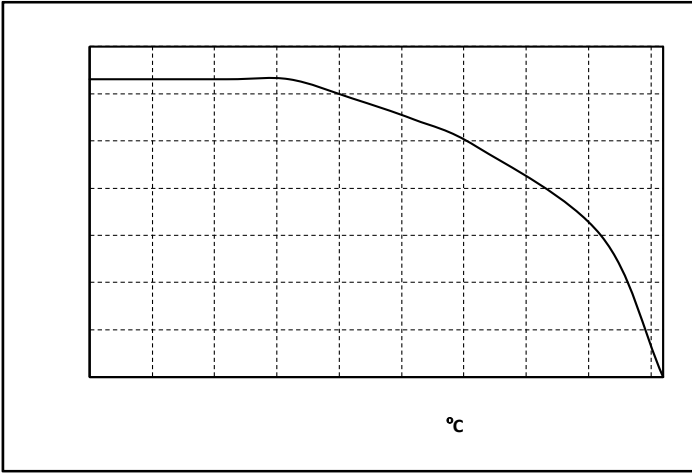


Fig. 21 Continuous Drain Current vs. Case Temperature

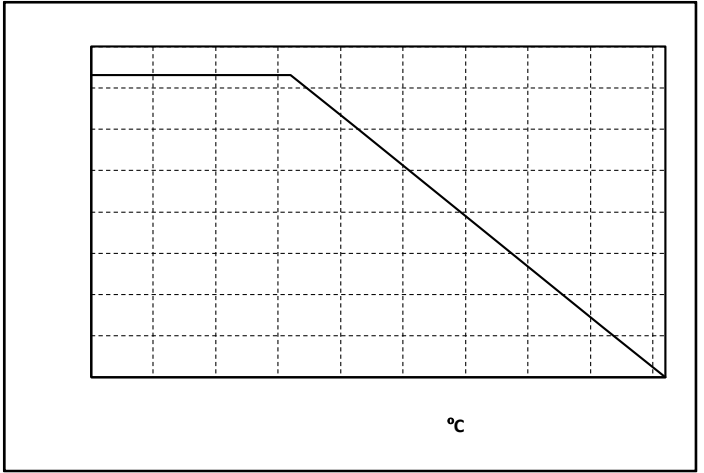


Fig. 22 Max. Power Dissipation Derating vs. Case Temperature

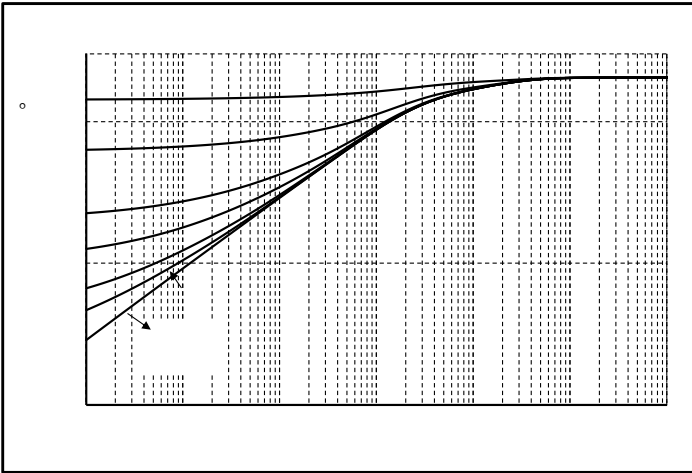


Fig. 23 Thermal Impedance

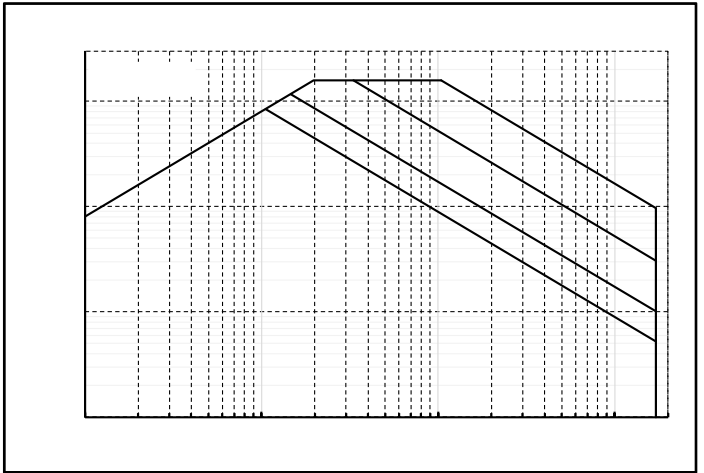
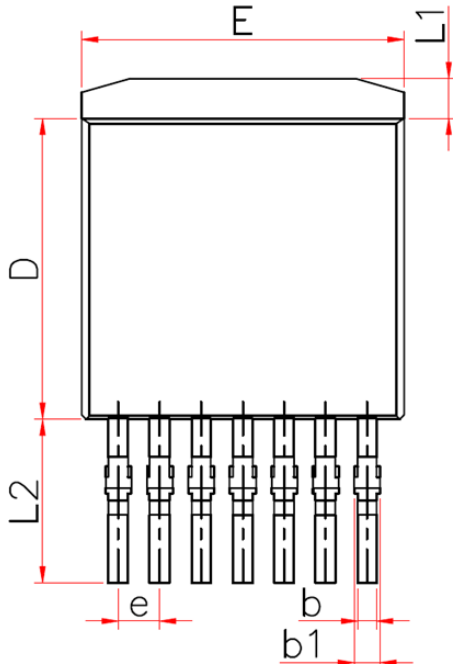
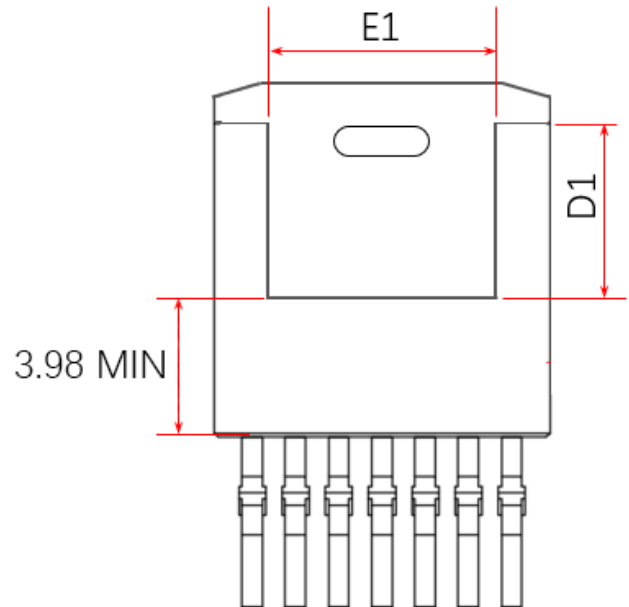
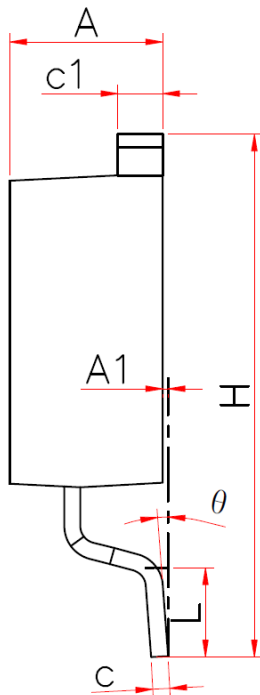


Fig. 24 Safe Operating Area

## Package Dimensions



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.300	4.560
A1	—	0.250
b	0.500	0.700
b1	0.600	0.900
c	0.450	0.600
c1	1.200	1.400
D	8.930	9.230
D1	4.650	4.950
E	10.08 0	10.28 0
E1	6.820	7.620
e	1.27 REF.	
H	15.00 0	16.00 0
L	1.900	2.500
L1	0.980	1.420
L2	4.350	5.890
θ	0°	7°



### Note:

1. Package Reference: JEDEC TO263, Variation AD
2. All Dimensions are in mm
3. Subject to Change Without Notice