

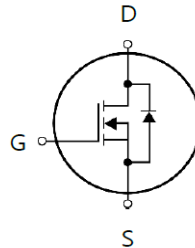
## Silicon Carbide Enhancement Mode MOSFET

### Features

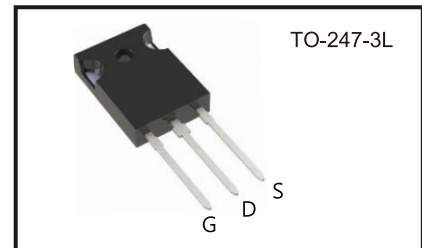
- Low Capacitance With High Speed Switching Speed
- Low Reverse Recovery (Qrr)
- Reduction of Heat Sink Requirements
- Halogen Free, and RoHS Compliant

### Benefits

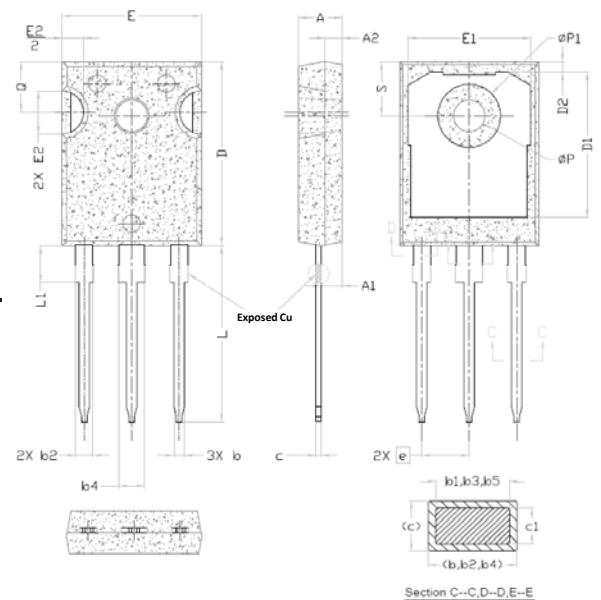
- Increase Parallel Device Convenience
- Higher System Efficiency
- Allow High Frequency Operation
- Realize Compact and Lightweight Systems



$V_{DSS}$	650V
$I_D(@25^{\circ}\text{C})$	70A
$R_{DS(ON) \text{ typ.}}$	35.5m $\Omega$



Package Dimensions



Section C--C,D--D,E--E

### Absolute Maximum Ratings

(T<sub>c</sub> = 25°C unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage $V_{GS}=0V$ $I_D=100\mu A$	$V_{DS}$	650	V
Gate-Source Voltage	$V_{GS}$	-10/+25	V
Recommended Operation Value	$V_{GS(op)}$	-4/+18	V
Drain Current-Continuous @ T <sub>c</sub> =25°C @ T <sub>c</sub> =100°C	$I_D$	70 50	A
Pulse Drain Current Pulse width t <sub>p</sub> limited by T <sub>jmax</sub>	$I_{DM}$	120	A
Power Dissipation	$P_D$	217	W
Storage Temperature Range	T <sub>STG</sub>	-55 to +175	°C
Operating Junction Temperature Range	T <sub>J</sub>	-55 to +175	°C
Soldering Temperature	T <sub>L</sub>	260	°C

Symbol	Min	Max
A	4.83	5.21
A1	2.29	2.55
A2	1.50	2.49
b	1.12	1.33
b1	1.12	1.28
b2	1.91	2.39
b3	1.91	2.34
b4	2.87	3.22
b5	2.87	3.18
c	0.55	0.69
c1	0.55	0.65
D	20.80	21.10
D1	16.25	17.65
D2	0.51	1.35
E	15.75	16.13
E1	13.46	14.16
E2	4.32	5.49
e	5.44 BSC	
L	19.81	20.32
L1	4.10	4.40
ΦP	3.56	3.65
ΦP1	7.19 REF	
Q	5.39	6.20
S	6.04	6.30

**Electrical Characteristics @ T<sub>c</sub> =25°C (unless otherwise specified)**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OFF Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V , I <sub>D</sub> =100μA	650	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> =0V , V <sub>DS</sub> =650V	-	1	50	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =18V , V <sub>DS</sub> =0V	-	-	250	nA
ON Characteristics						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =10mA	-	2.8	-	V
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =18V , I <sub>D</sub> =20A	-	35.5	53	mΩ
		V <sub>GS</sub> =18V , I <sub>D</sub> =20A , T <sub>J</sub> =175°C	-	46	-	
Internal Gate Resistance	R <sub>G(int.)</sub>	f = 1MHz , V <sub>AC</sub> =25mV	-	1.4	-	Ω
Dynamic Characteristics						
Input Capacitance	C <sub>iSS</sub>	V <sub>DS</sub> =600V V <sub>GS</sub> =0V f =1MHz V <sub>AC</sub> =25mV	-	1600	-	pF
Output Capacitance	C <sub>oSS</sub>		-	15	-	
Reverse Transfer Capacitance	C <sub>rSS</sub>		-	10	-	
Turn-On Switching Energy	E <sub>on</sub>	V <sub>DS</sub> =400V , V <sub>GS</sub> =-4/+18V I <sub>D</sub> =40A , R <sub>G(ext)</sub> =5Ω L=200uH	-	110	-	μJ
Turn-Off Switching Energy	E <sub>off</sub>		-	25	-	
Total Switching Energy	E <sub>tot</sub>		-	135	-	
Switching Characteristics						
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DS</sub> =400V V <sub>GS</sub> =-4/+18V I <sub>D</sub> =40A R <sub>G(ext)</sub> =5Ω L=200uH	-	4	-	ns
Rise Time	t <sub>r</sub>		-	21	-	
Turn-Off Delay Time	t <sub>d(off)</sub>		-	20	-	
Fall Time	t <sub>f</sub>		-	6	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =400V V <sub>GS</sub> =-4/+18V I <sub>D</sub> =20A	-	81	-	nC
Gate to Source Charge	Q <sub>gs</sub>		-	20	-	
Gate to Drain Charge	Q <sub>gd</sub>		-	22	-	
Body Diode Characteristics						
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =-4V , I <sub>SD</sub> =10A	-	4.3	-	V
Continuous Diode Forward Current	I <sub>S</sub>	V <sub>GS</sub> =-4V , T <sub>C</sub> =25°C	-	43	-	A
Reverse Recovery Time	T <sub>rr</sub>	V <sub>GS</sub> =-4V I <sub>S</sub> =20A , V <sub>R</sub> =400V diir/dt=2400A/μs	-	20	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>		-	100	-	nC
Reverse Recovery Charge	I <sub>rrm</sub>		-	11	-	A
Thermal Resistance						
Thermal Resistance, Junction-to-Case	Rθ <sub>JC</sub>		-	0.69	-	°C/W
Thermal Resistance, Junction-to-Ambient	Rθ <sub>JA</sub>		-	40	-	

## Typical Performance

Fig 1. Output Characteristics,  $T_J = 25^\circ\text{C}$

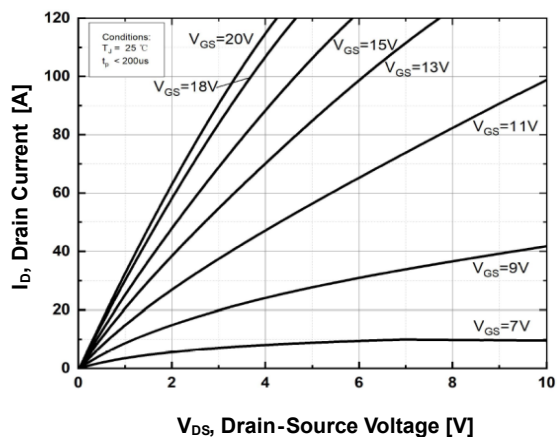


Fig 2. Output Characteristics,  $T_J = 175^\circ\text{C}$

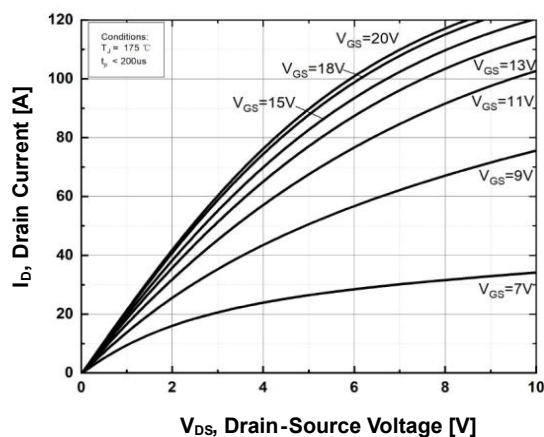


Fig 3. On-Resistance Variation vs. Temperature

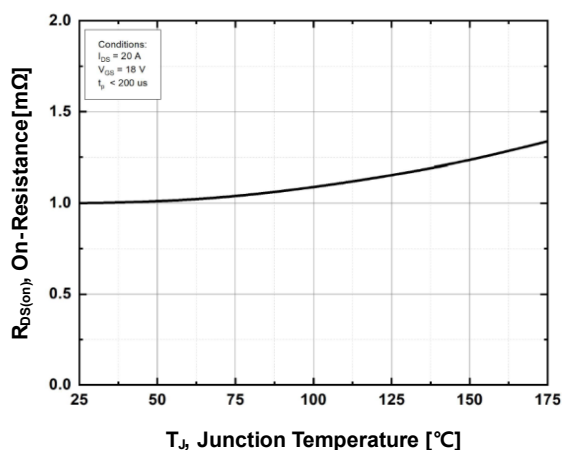


Fig 4. Transfer Characteristics

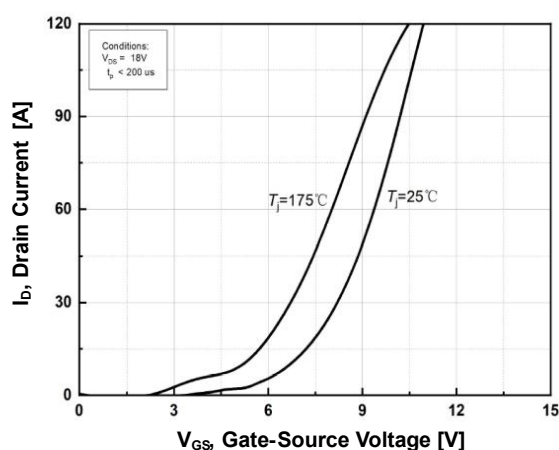


Fig 5.  $V_{SD}$ - $I_{DS}$  Characteristics,  $T_J = 25^\circ\text{C}$

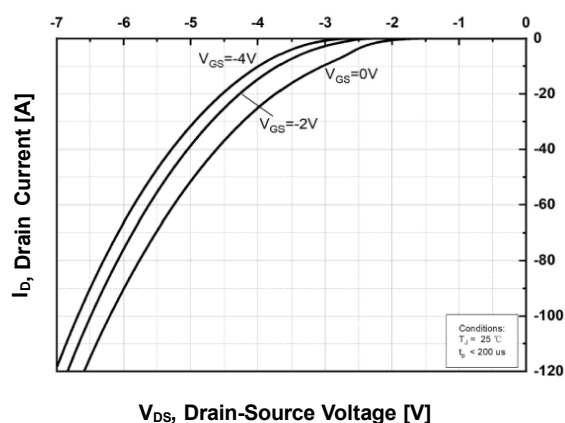
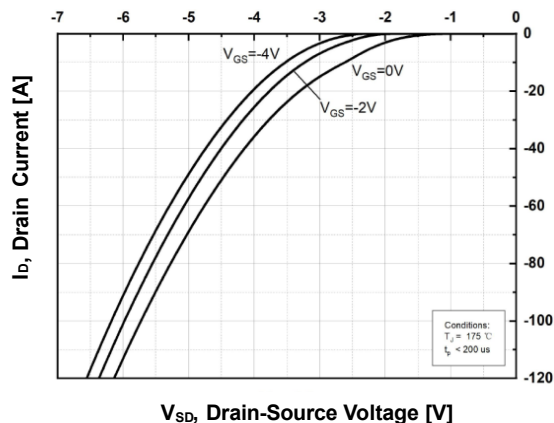


Fig 6.  $V_{SD}$ - $I_{DS}$  Characteristics,  $T_J = 175^\circ\text{C}$



## Typical Performance

Fig 7. Threshold Voltage vs. Temperature

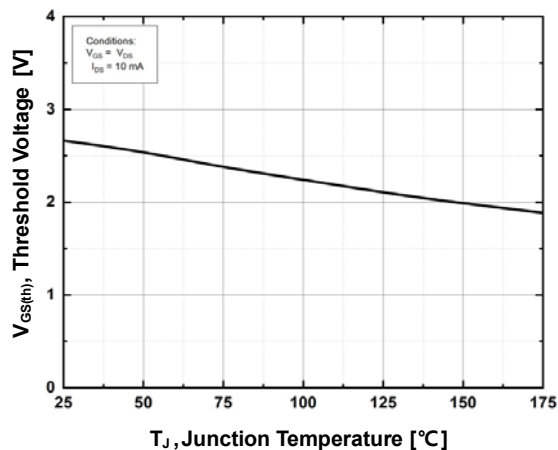


Fig 8. Gate Charge Characteristics

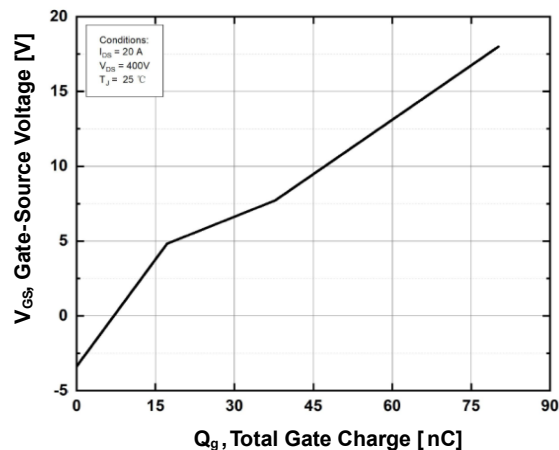


Fig 9. Stored Energy in Output Capacitance

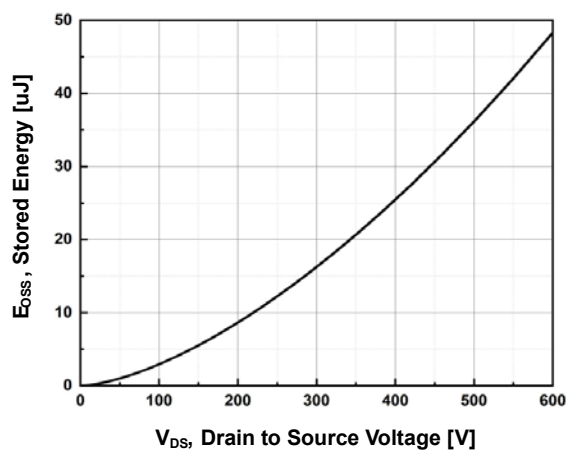


Fig 10. Capacitance Characteristics

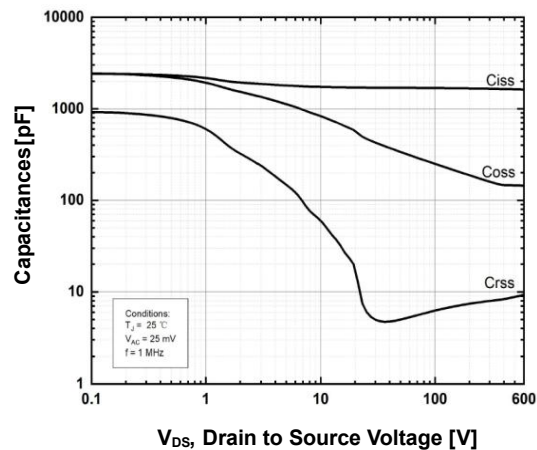


Fig 11. Max.  $P_D$  Derating vs. Case Temperature

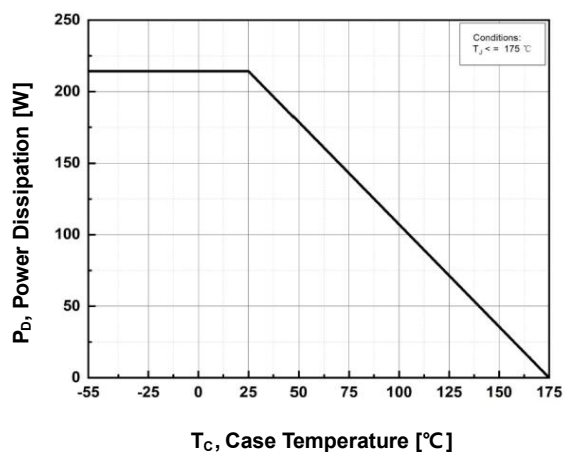
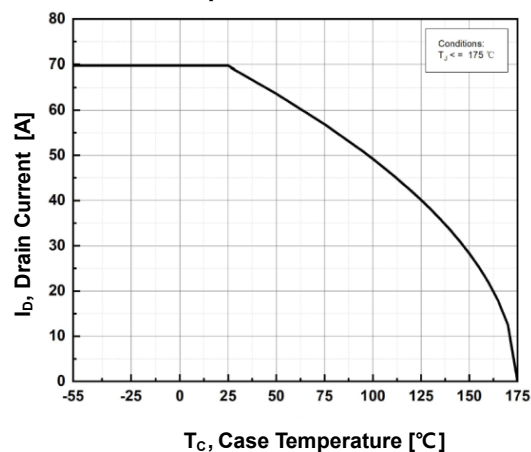


Fig 12. Continuous  $I_D$  Derating vs. Case Temperature



## Typical Performance

Fig 13. Transient Thermal impedance

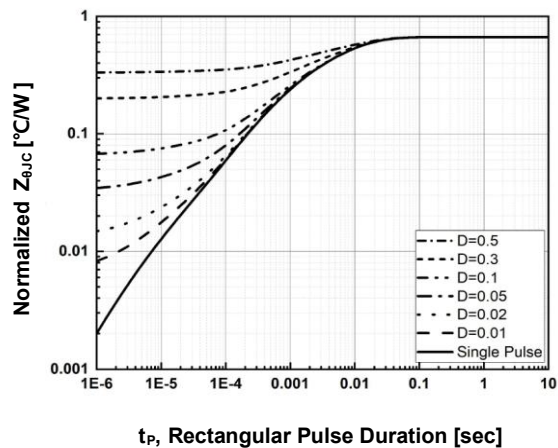


Fig 14. Safe Operating Area

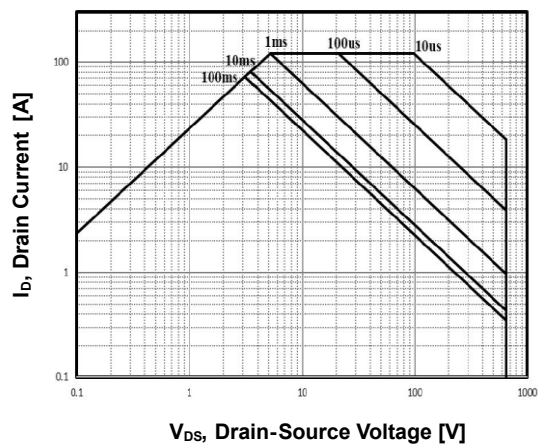


Fig 15. CIS Energy vs. Drain Current

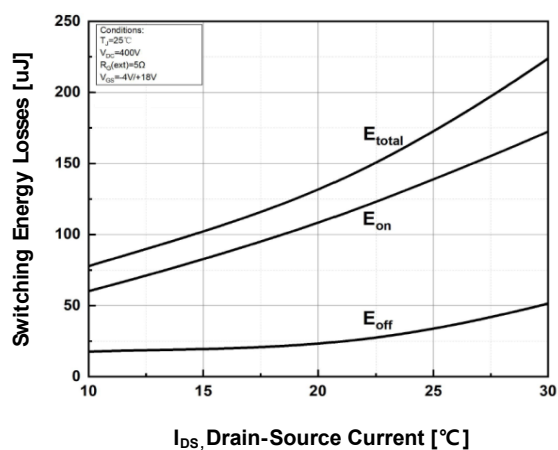


Fig 16. CIS Energy vs.  $R_{g(ext)}$

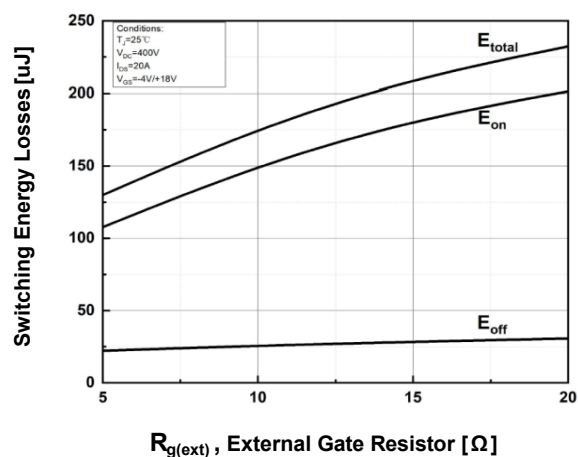
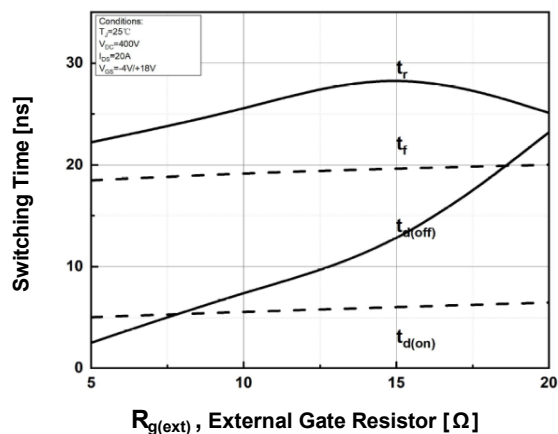


Fig 17. Switching Times vs.  $R_{g(ext)}$



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