

## Silicon Carbide Enhancement Mode MOSFET

### Features

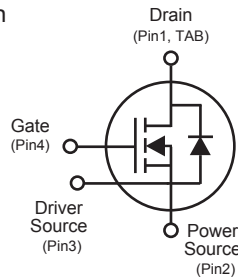
- Low On-Resistance and High Current Capability
- Low Capacitance for High Speed Switching Operation
- Positive Temperature Coefficient Device
- Low Impedance Kelvin Source Pin-Out
- RoHS Compliant and Halogen Free

### Benefits

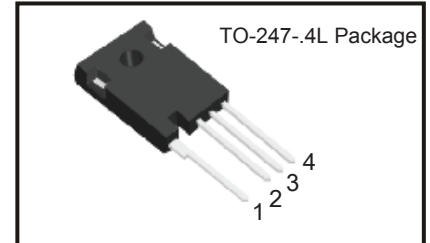
- Higher System Efficiency
- Ease of Paralleling
- Capable of 175°C High T<sub>J</sub> Application
- Capable of High Switching Frequency Operating
- Miniaturize and Light Weight System

### Applications

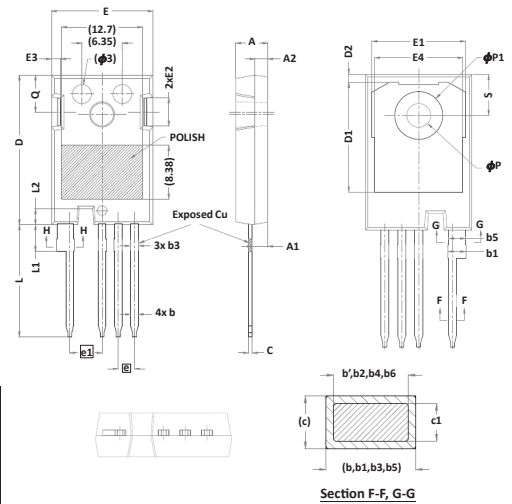
- Switching Mode Power Supply
- DC/DC Converters, UPS, and PFC
- EV Charging Station
- Motor Drives
- Power Inverters
- Solar/Wind Renewable Energy



$V_{DSS}$	1200V
$I_D(@25^{\circ}C)$	78A
$R_{DS(ON)}$	30m $\Omega$



Package Dimensions



### Absolute Maximum Ratings

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

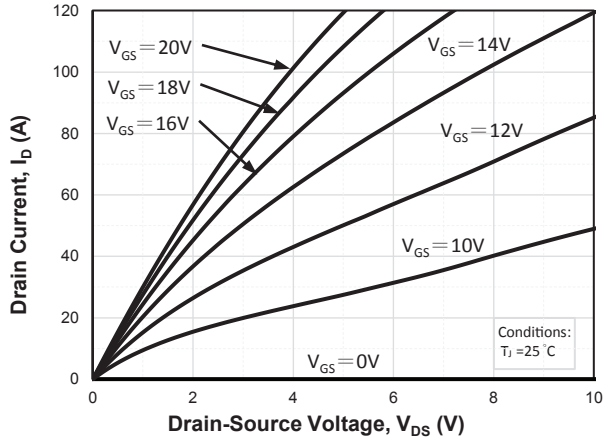
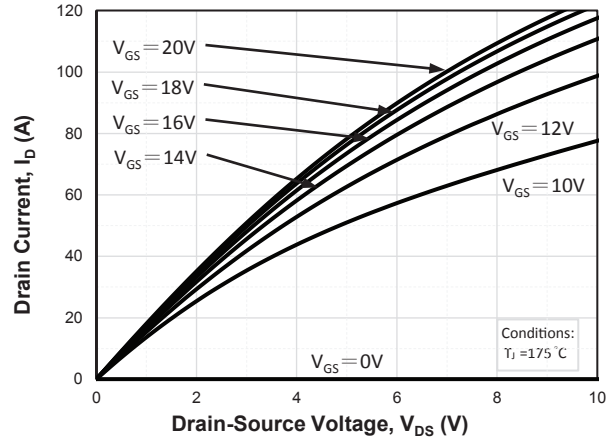
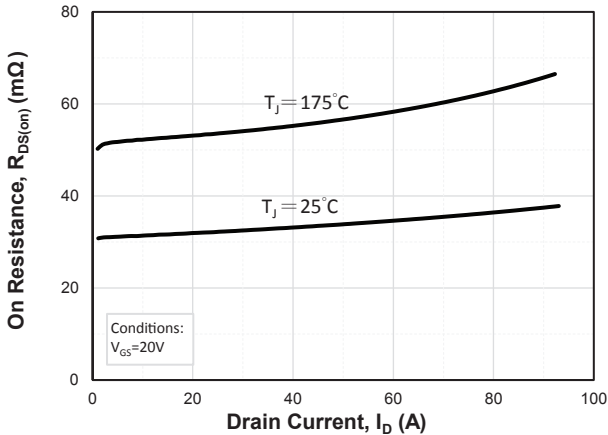
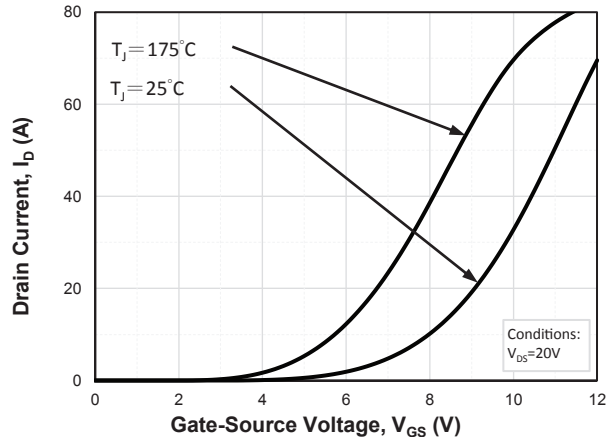
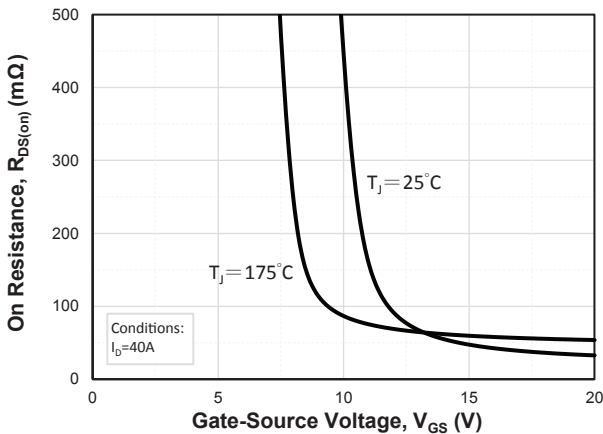
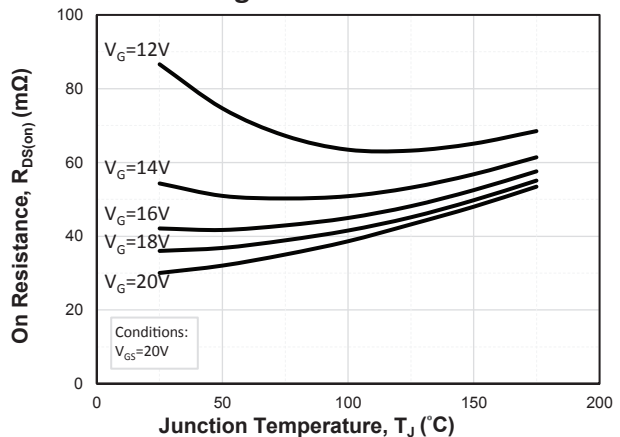
Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	$V_{DS}$	1200	V
Gate-Source Voltage	$V_{GS}$	-5/+20	V
Drain Current-Continuous	$I_D$	78 53	A
		@ T <sub>c</sub> = 25°C @ T <sub>c</sub> = 110°C	
Pulse Drain Current	$I_{D,pulse}$	349	A
Power Dissipation	$P_D$	375	W
Avalanche Energy, Single Pulse	$E_{AS}$	2500	mJ
		$V_{DD}=100V$ $I_D=14A$	
Storage Temperature Range	T <sub>STG</sub>	-55 to +175	°C
Operating Junction Temperature Range	T <sub>J</sub>	-55 to +175	°C
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.4	°C/W
Mounting Torque (M3 or 6-32 screw)	$M_d$	1.0	N <sub>m</sub>

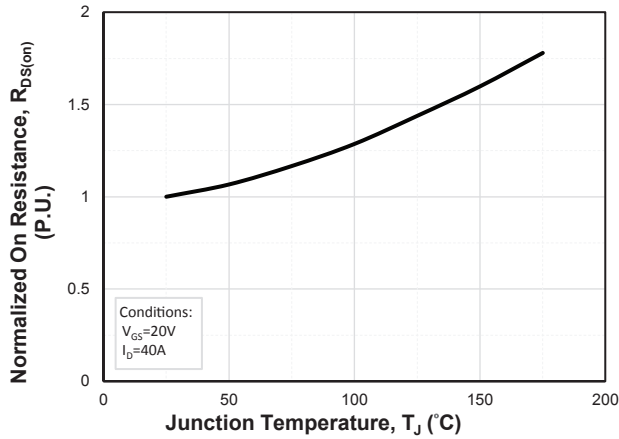
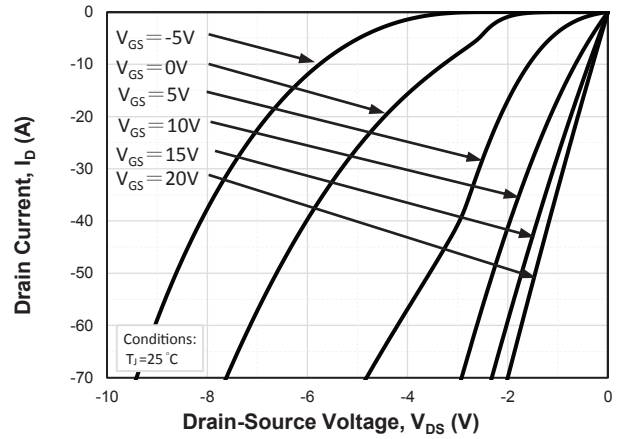
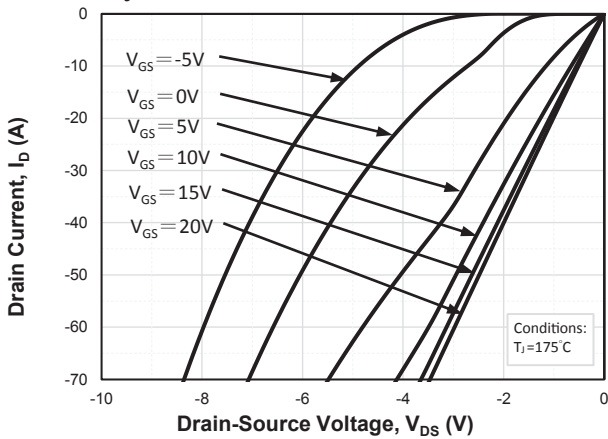
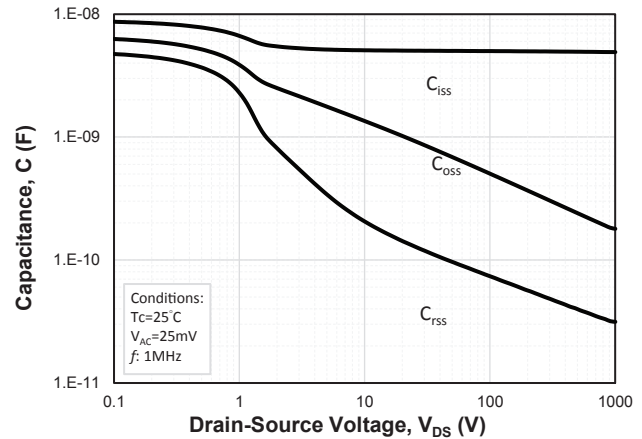
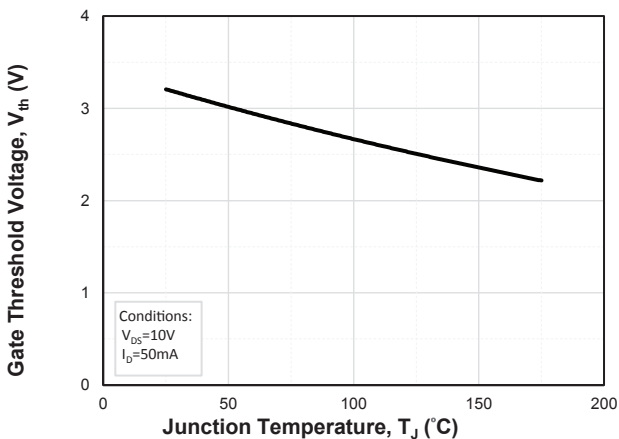
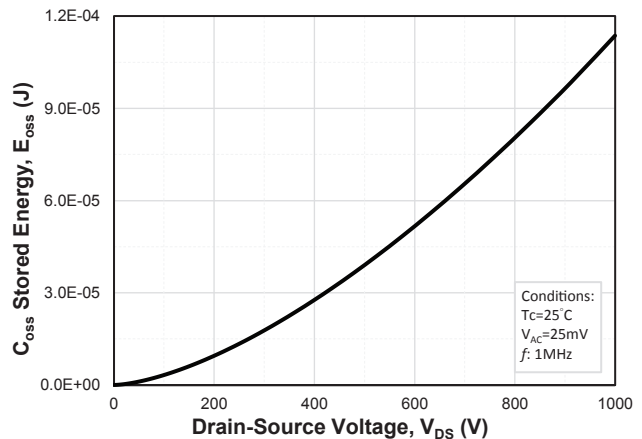
Symbol	mm		
	Min.	Typ.	Max.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
φP	3.51	3.61	3.65
φP1	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

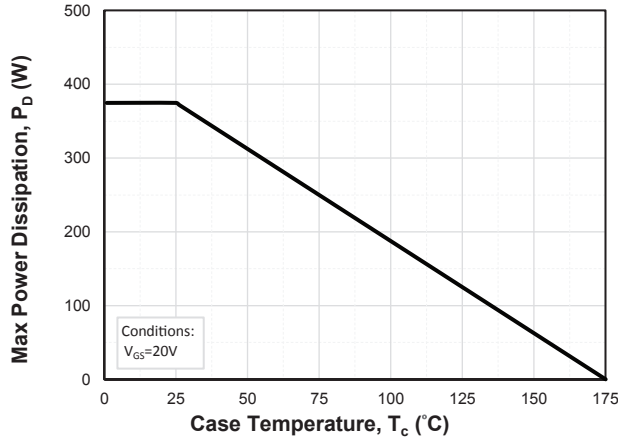
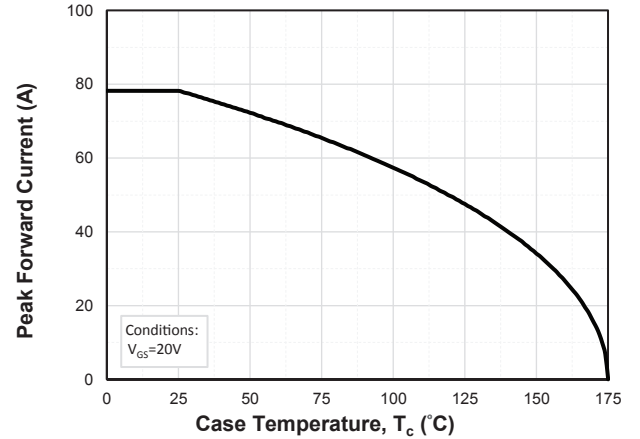
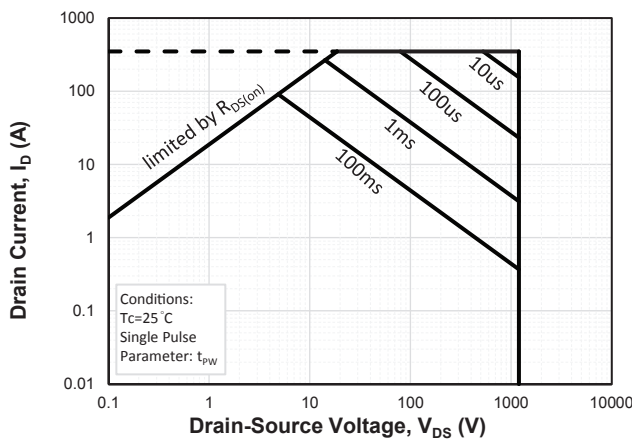
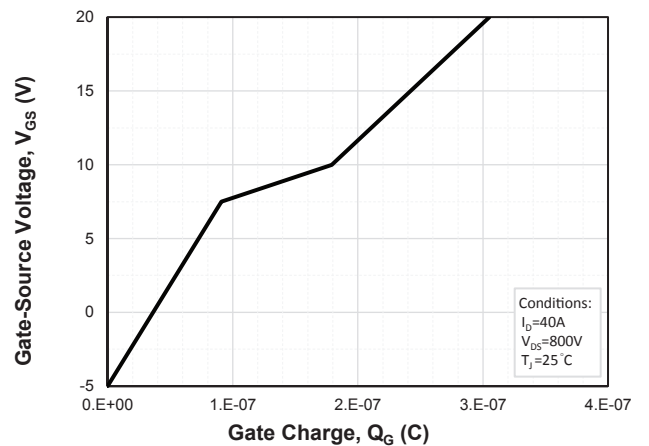
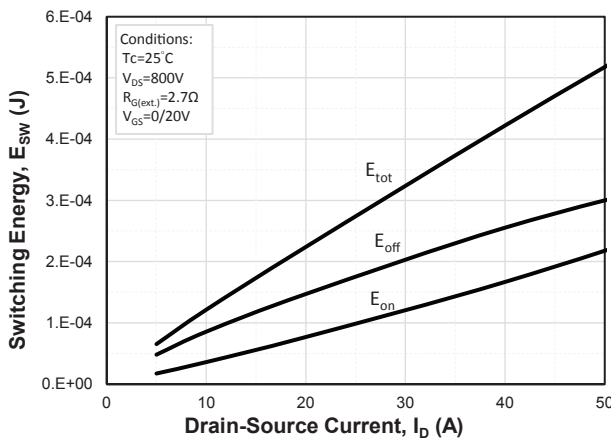
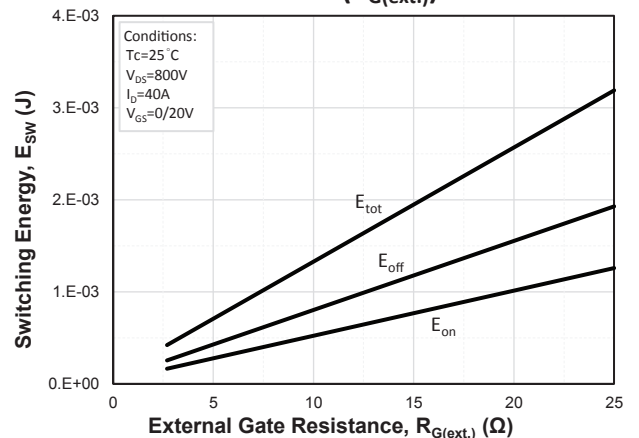
**Electrical Characteristics @  $T_c = 25^\circ\text{C}$  (unless otherwise specified)**

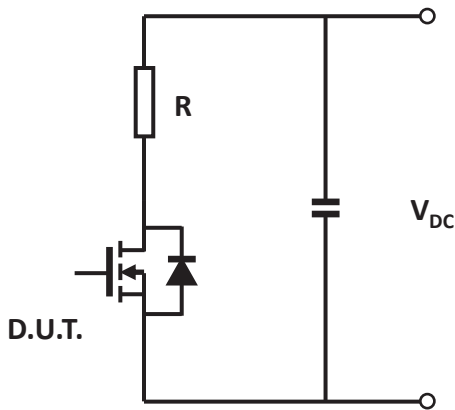
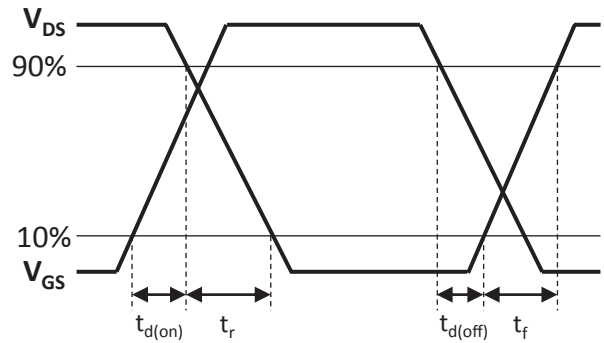
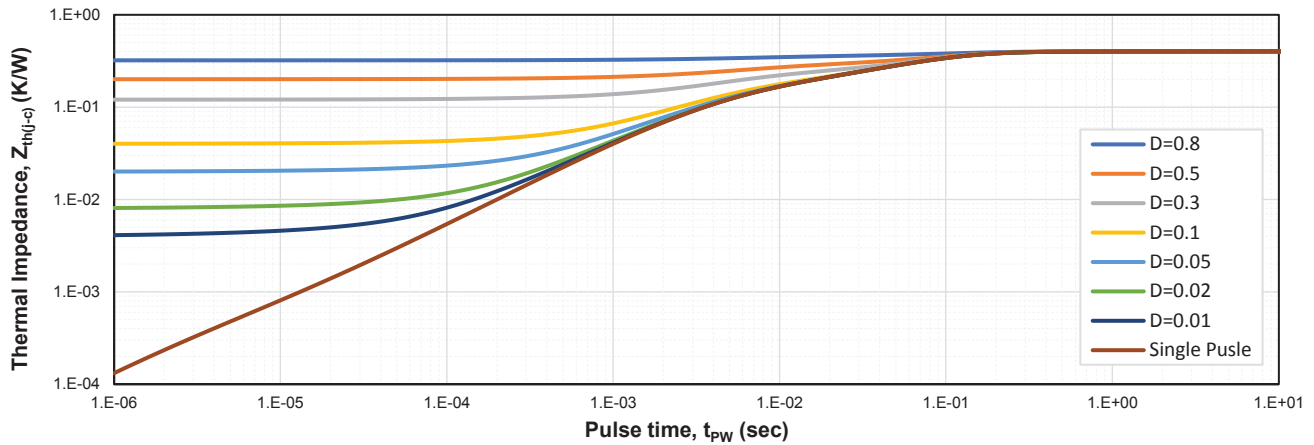
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>OFF Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_{DS}=0.1mA$	1200	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS}=0V, V_{DS}=1200V$	-	<1	50	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=20V, V_{DS}=0V$	-	-	250	nA
<b>ON Characteristics</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=10V, I_{DS}=50mA$	-	2.7	-	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=20V, I_{DS}=40A$	-	30	40	m $\Omega$
Internal Gate Resistance	$R_{G(int.)}$	$f=1MHz, V_{AC}=25mV$	-	0.7	-	$\Omega$
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=800V$	-	4909	-	pF
Output Capacitance	$C_{oss}$	$V_{GS}=0V$	-	198	-	
Reverse Transfer Capacitance	$C_{riss}$	$V_{AC}=25mV$ Freq.=1MHz	-	34	-	
$C_{oss}$ Stored Energy	$E_{oss}$	$V_{GS}=0V, V_{DS}=800V$ Freq.=1MHz, $V_{AC}=25mV$	-	80.5	-	$\mu J$
Turn-On Switching Energy	$E_{on}$	$V_{DD}=800V$ $V_{GS}=0V/+20V, I_D=40A$	-	167*	-	
Turn-Off Switching Energy	$E_{off}$	$R_{G(ext.)}=2.7\Omega$	-	254*	-	
<b>Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{DS}=800V$	-	31	-	ns
Rise Time	$t_r$	$V_{GS}=-4/+20V$	-	55	-	
Turn-Off Delay Time	$t_{d(off)}$	$I_D=40A, R_L=20\Omega$	-	8	-	
Fall Time	$t_f$	$R_{G(ext.)}=2.7\Omega$	-	12	-	
Total Gate Charge	$Q_g$	$V_{DS}=800V$	-	305	-	nC
Gate to Source Charge	$Q_{gs}$	$V_{GS}=-5/+20V$	-	91	-	
Gate to Drain Charge	$Q_{gd}$	$I_D=40A$	-	88	-	
<b>Body Diode Characteristics</b>						
Inverse Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=10A$	-	3	-	V
Continuous Diode Forward Current	$I_S$	$V_{GS}=0V, T_c=25^\circ C$	-	50	-	A
Reverse Recovery Time	$T_{rr}$	$V_{GS}=0V$	-	79	-	ns
Reverse Recovery Charge	$Q_{rr}$	$I_{SD}=30A, V_{DS}=400V,$ $di/dt=300A/\mu s$	-	284	-	nC
Peak Reverse Recovery Current	$I_{rrm}$		-	6.8	-	A

\*Based on the results of calculation, note that the energy loss caused by the reverse recovery of free-wheeling diode is not included in Eon.

**Typical Device Performance**
**Fig.1 Forward Output Characteristics at  $T_J=25^\circ\text{C}$** 

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

**Fig.3 On-Resistance vs. Drain Current for Various  $T_J$** 

**Fig.4 Transfer Characteristics for Various  $T_J$** 

**Fig.5 On-Resistance vs. Gate Voltage for Various  $T_J$** 

**Fig.6 On-Resistance vs. Temperature for Various Gate Voltage**


**Typical Device Performance**
**Fig.7 Normalized On-Resistance vs. Temperature**

**Fig.8 Reverse Output Characteristics at  $T_J = 25^\circ\text{C}$** 

**Fig.9 Reverse Output Characteristics at  $T_J = 175^\circ\text{C}$** 

**Fig.10 Capacitances vs. Drain to Source Voltage**

**Fig.11 Threshold Voltage vs. Temperature**

**Fig.12 Output Capacitor Stored Energy**


**Typical Device Performance**
**Fig.13 Maximum Power Dissipation Derating vs. Case Temperature**

**Fig.14 Drain Current Derating vs. Case Temperature**

**Fig.15 Safe Operating Area**

**Fig.16 Gate Charge Characteristics**

**Fig.17 Clamped Inductive Switching Energy vs. Drain Current**

**Fig.18 Clamped Inductive Switching Energy vs. External Gate Resistor (R\_G(ext.))**


**Typical Device Performance**
**Fig.19 Schematic of Resistive Switching**

**Fig.20 Switching Times Definition**

**Fig.21 Transient Junction to Case Thermal Impedance**


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