

WCR380N60T/WCR380N60TF/WCR380N60TG 600V N-Channel Super Junction MOSFET

Description

The WCR380N60T series is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance. This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. This device is suitable for various AC/DC power conversion in switching mode operation for higher efficiency.

Features

- 650V@ $T_J=150^{\circ}\text{C}$
- Typ. $R_{DS(on)}=0.31\Omega$
- Low gate charge(typ. $Q_g=15\text{nC}$)
- 100% avalanche tested
- 100% R_g tested

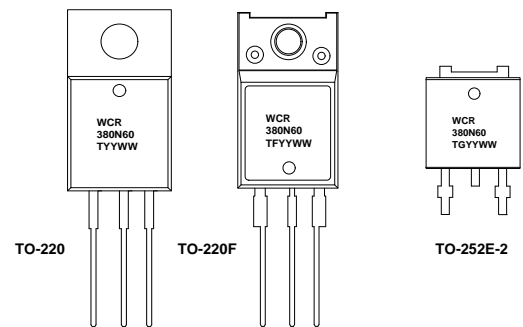
Order Information

Device	Package	Marking	Units/Tube
WCR380N60T-3/T	TO-220	WCR380N60TYYYWW	50
WCR380N60TF-3/T	TO-220F	WCR380N60TFYYWW	50
WCR380N60TG-3/T	TO-252E-2	WCR380N60TGYYYWW	70

Note 1: WCR380N60T=Device code ; YY=Year ; WW=Week (A-z);

Note 2: WCR380N60TF=Device code ; YY=Year ; WW=Week (A-z);

Note 3: WCR380N60TG=Device code ; YY=Year ; WW=Week (A-z);



Absolute Maximum Ratings $T_A=25^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	WCR380N60T	WCR380N60TF	Unit	
		WCR380N60TG			
Drain-Source Voltage	V_{DS}	600		V	
Gate-Source Voltage	V_{GS}	± 30			
Continuous Drain Current ^A	I_D	$T_C=25^{\circ}\text{C}$	10.6	A	
		$T_C=100^{\circ}\text{C}$	6.7		
Pulsed Drain Current ^B	I_{DM}	30		A	
Single Pulsed Avalanche Energy ^C	E_{AS}	132		mJ	
Avalanche Current ^B	I_{AR}	2.1		A	
Repetitive Avalanche Energy ^B	E_{AR}	0.30		mJ	
Power Dissipation	P_D	$T_C=25^{\circ}\text{C}$	83	31.2	W
		Derate above 25°C	0.66	0.25	W/ $^{\circ}\text{C}$
Operating and Storage Temperature Range	T_J, T_{STG}	-55~150		$^{\circ}\text{C}$	
Lead Temperature	T_L	260		$^{\circ}\text{C}$	

Thermal Resistance Ratings

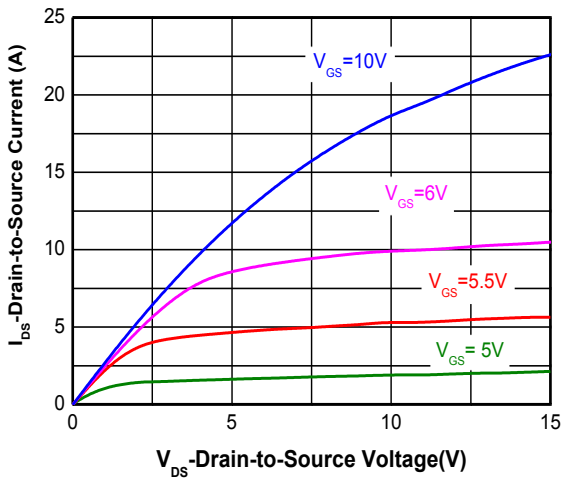
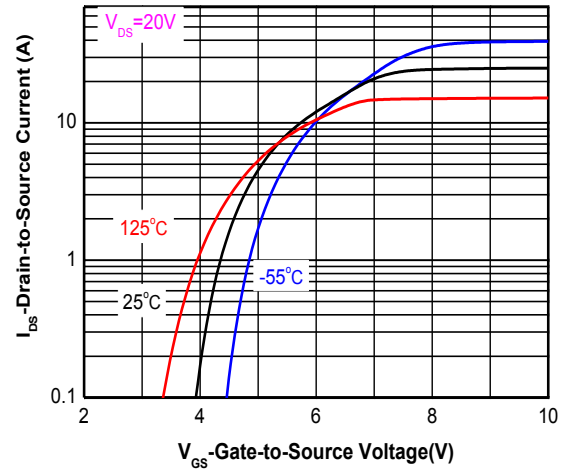
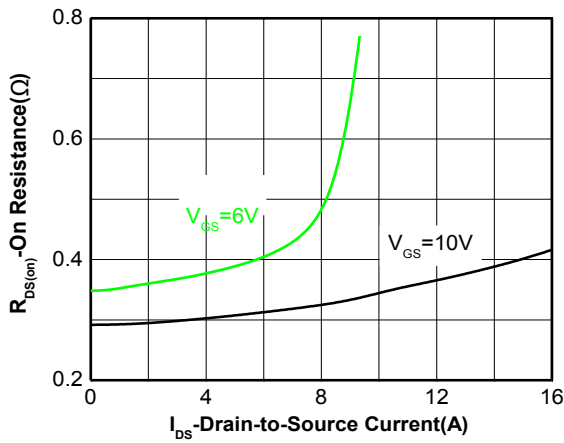
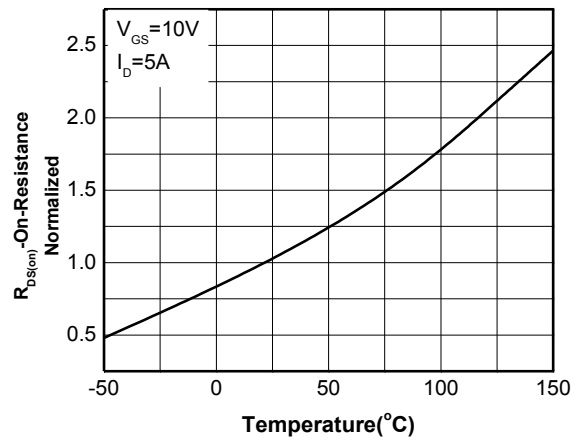
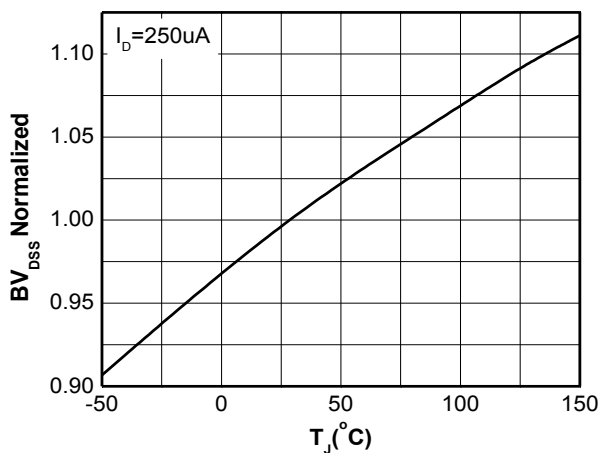
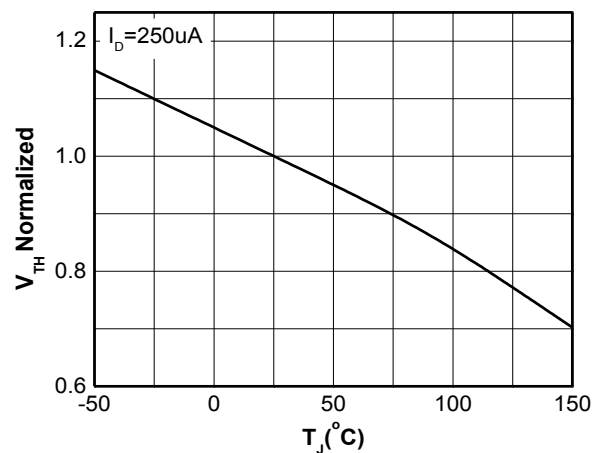
Parameter	Symbol	WCR380N60T	WCR380N60TF	Unit
Maximum Junction-to-Ambient	$R_{\theta JA}$	60	80	$^{\circ}\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	1.5	4	

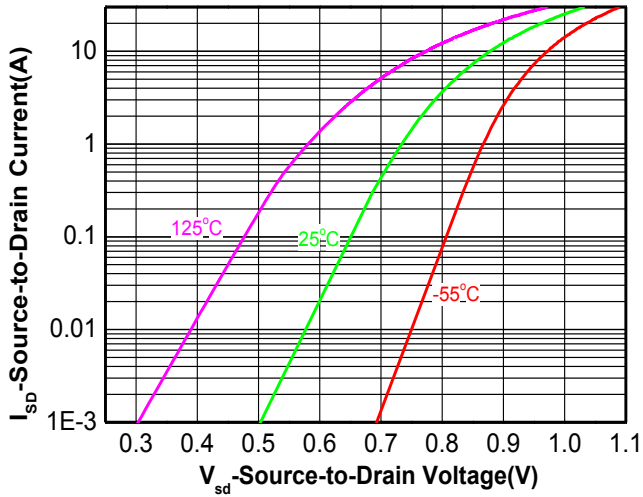
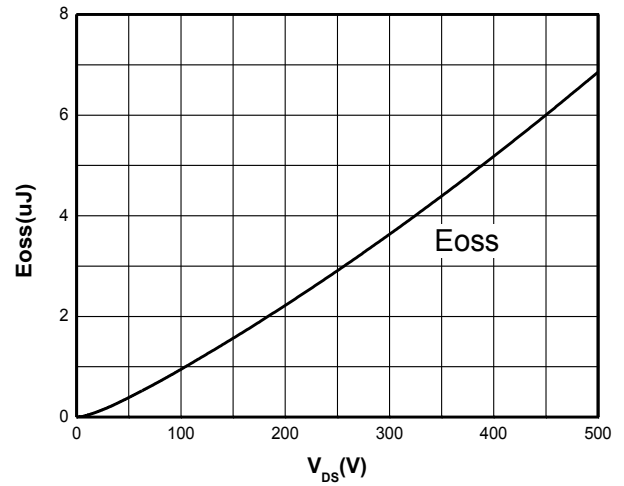
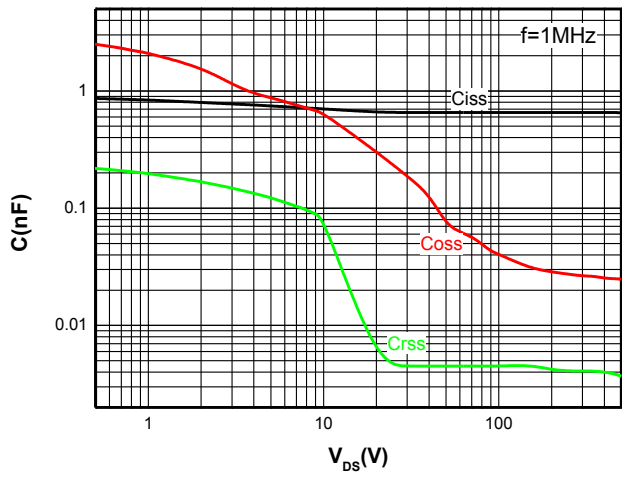
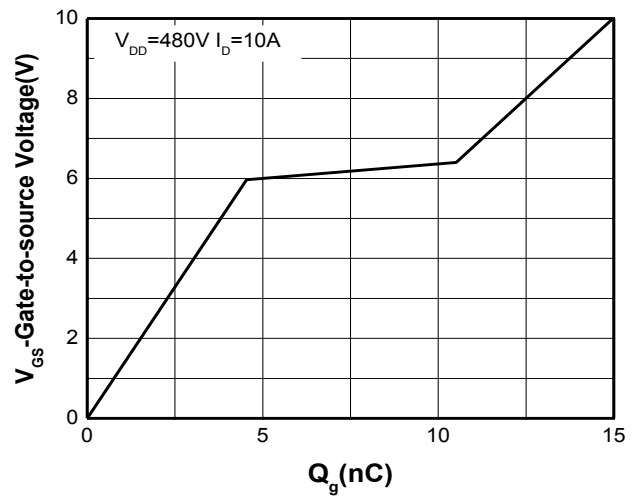
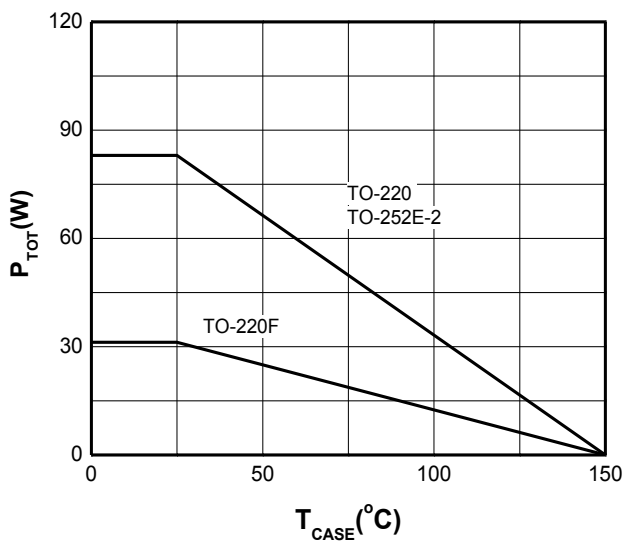
Electronics Characteristics (T_A=25°C, unless otherwise noted)

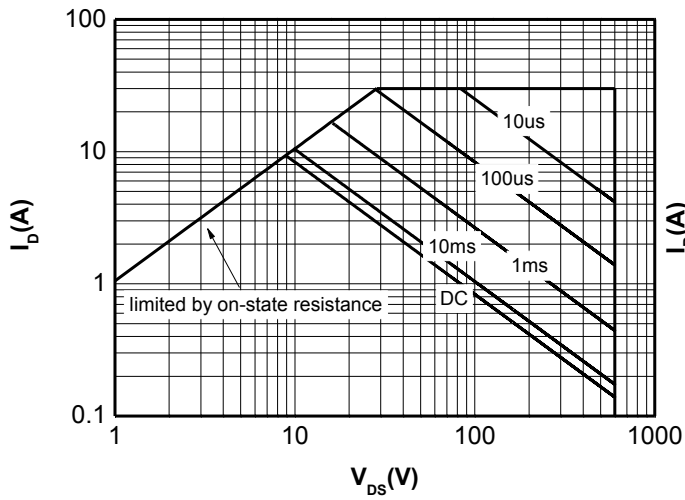
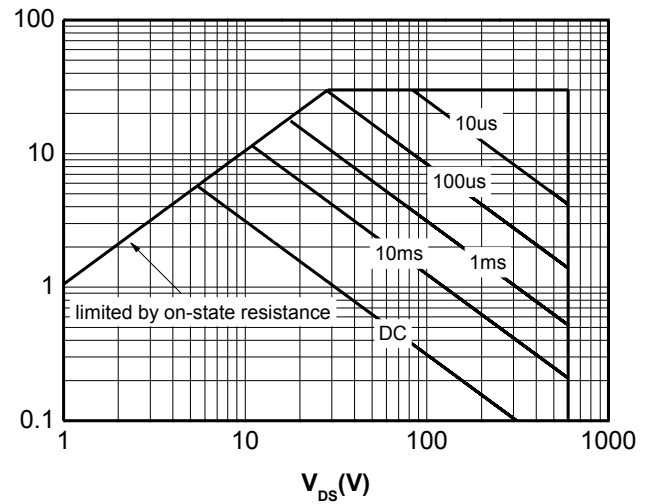
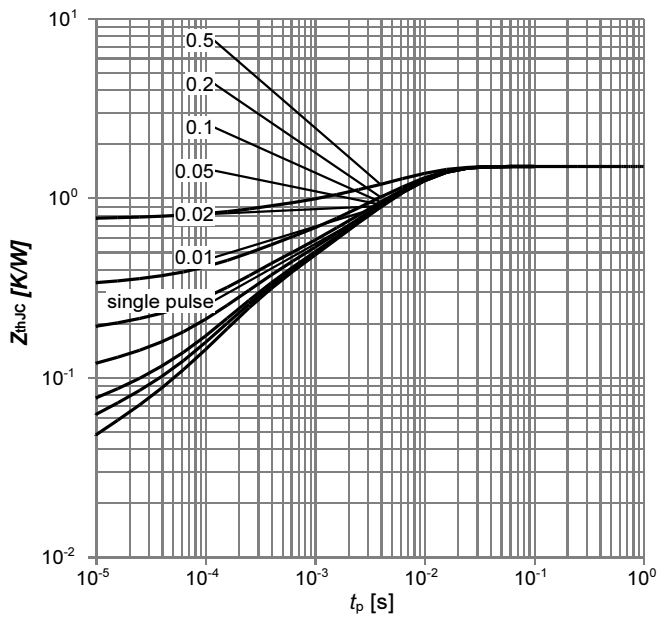
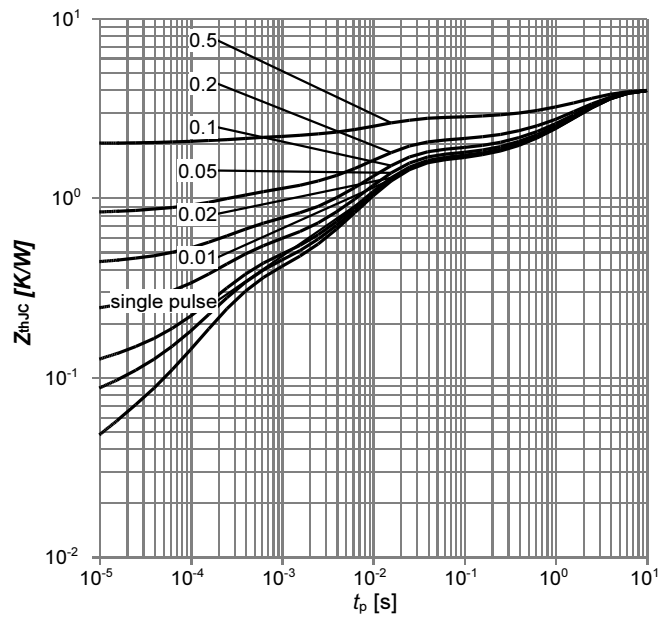
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0 V, I _D = 250uA, T _J =25°C	600			V
		V _{GS} = 0 V, I _D = 250uA, T _J =150°C		650		V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 600V, V _{GS} = 0V, T _J =25°C			1	uA
		V _{DS} = 480V, V _{GS} = 0V, T _J =125°C			10	uA
Gate-to-source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 30 V			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250uA	2.5		4.5	V
Drain-to-source On-resistance	R _{DS(on)}	V _{GS} = 10V, I _D = 5A		0.31	0.38	Ω
Forward Transconductance	g _{FS}	V _{DS} = 40V, I _D = 5A (NOTE D)			20	s
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 30 V		656		pF
Output Capacitance	C _{OSS}			188		
Reverse Transfer Capacitance	C _{RSS}			25		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 480 V, I _D = 10A (NOTE D, E)		15		nC
Gate-to-Source Charge	Q _{GS}			4.6		
Gate-to-Drain Charge	Q _{GD}			6		
Gate resistance	R _g	V _{GS} =0V, V _{DS} =0V, F=1MHZ		3.7		Ω
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{d(on)}	V _{GS} = 10V, V _{DS} = 400 V, I _D = 5A, R _G =20 Ω (NOTE D, E)		21		ns
Rise Time	t _r			17		
Turn-Off Delay Time	t _{d(off)}			43		
Fall Time	t _f			14		
Drain to Source Diode Characteristics and Maximum Ratings						
Forward Voltage	V _{SD}	V _{GS} = 0 V, I _S = 9.5A			1.5	V
Body-Diode Continuous Current	I _S				10	A
Body-Diode Pulsed Current	I _{SM}				30	A
Body Diode Reverse Recovery Time	T _{rr}	I _F =9.5A, di/dt=100A/us, V _{DS} =100V(NOTE D)		525		nS
Body Diode Reverse Recovery Charge	Q _{rr}			3.97		uC
Peak reverse recovery Current	I _{rrm}			15.1		A

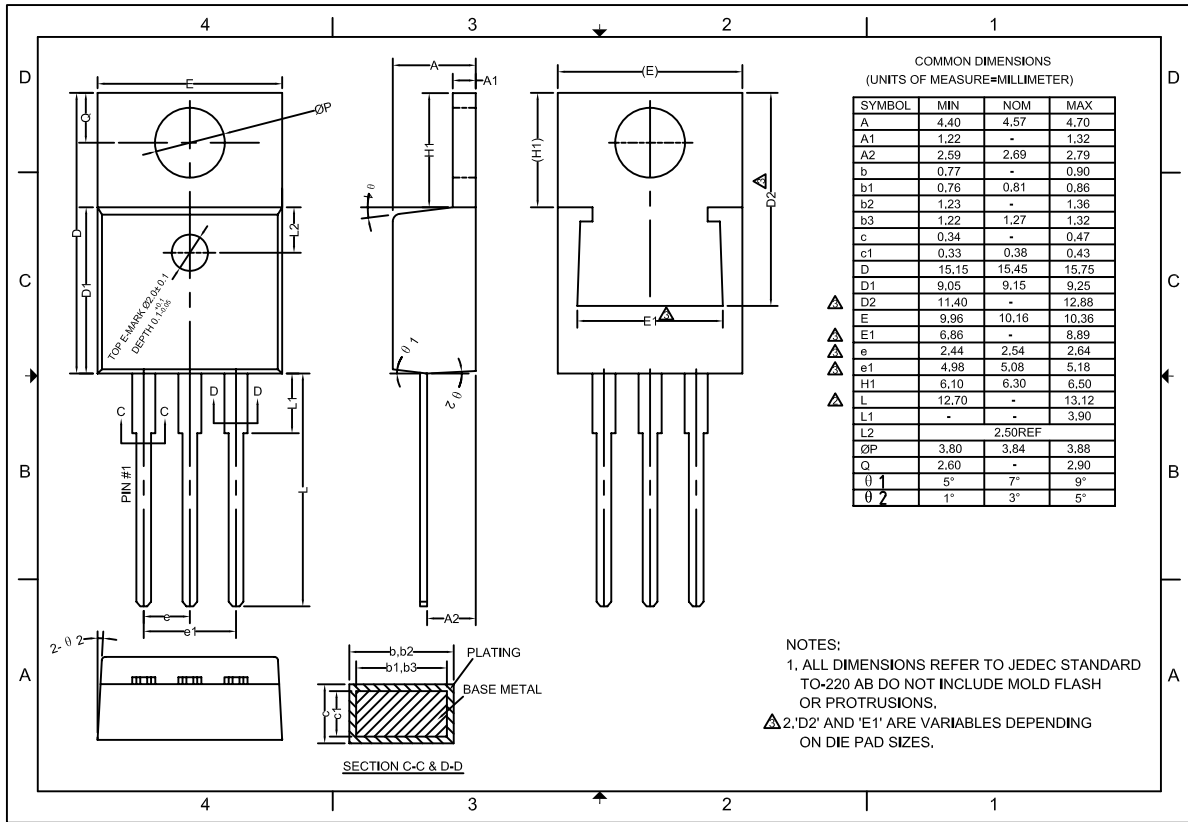
NOTES:

- Drain current limited by maximum junction temperature. Maximum duty cycle D=0.75
- Pulse width limited by maximum junction temperature
- L=60mH, I_{AS}=2.1A, V_{DD}=150V, Starting T_J=25°C
- Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%
- Essentially Independent of Operating Temperature Typical Characteristics
- These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heat sink, assuming a maximum junction temperature of T_{J(MAX)}=150°C. The SOA curve provides a single pulse rating.

Typical Characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)

Output characteristics

Transfer characteristics

On-Resistance vs. Drain current

On-Resistance vs. Junction temperature

Breakdown Voltage vs. Junction temperature

Threshold voltage vs. Junction temperature


Body diode forward voltage

Coss stored Energy

Capacitance

Gate charge Characteristics

Power dissipation


TO-220 TO-252E-2
Safe operating area (Note F)

TO-220F
Safe operating area (Note F)

TO-220 TO-252E-2

TO-220F
Transient thermal response (Junction-to-Case)(Note F)

Package outline dimensions
TO-220

TO-220F
