

# WCR470N60T/WCR470N60TF

## 600V N-Channel Super Junction MOSFET

### Description

The WCR470N60T/WCR470N60TF 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

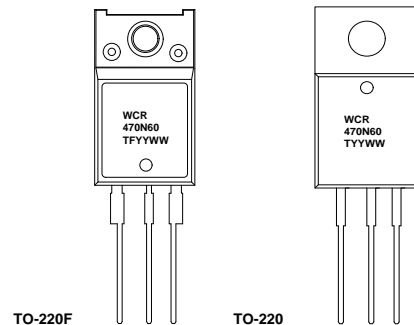
- 650V@ $T_J=150^{\circ}\text{C}$
- Typ. $R_{DS(on)}=0.42\Omega$
- Low gate charge(typ.  $Q_g=12.6\text{nC}$ )
- 100% avalanche tested
- 100%  $R_g$  tested

### Order Information

Device	Package	Marking	Units/Tube
WCR470N60T-3/T	TO-220	WCR470N60TYYYWW	50
WCR470N60TF-3/T	TO-220F	WCR470N60TFYYWW	50

Note 1: WCR470N60T=Device code ; YY=Year ; WW=Week (A-z);

Note 2: WCR470N60TF=Device code ; YY=Year ; WW=Week (A-z);



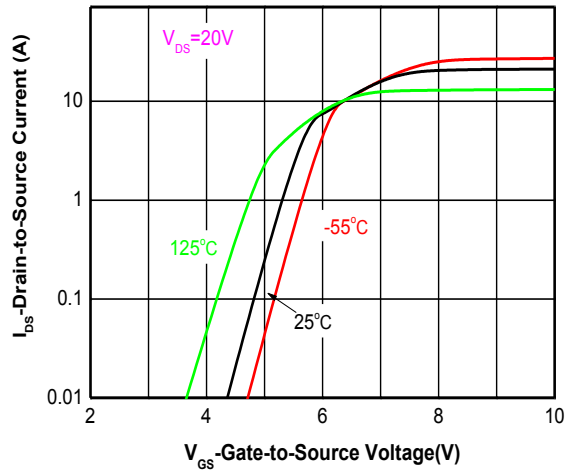
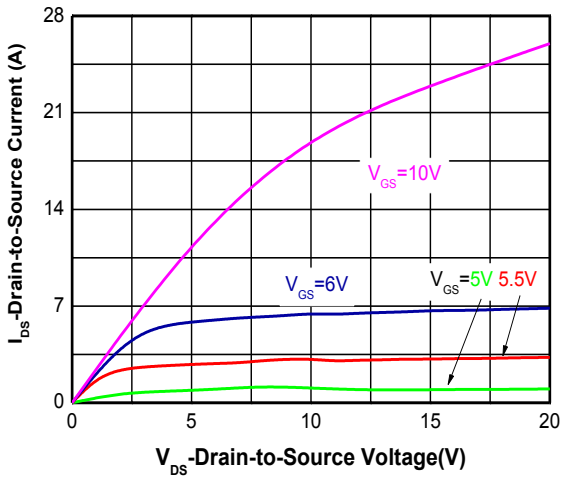
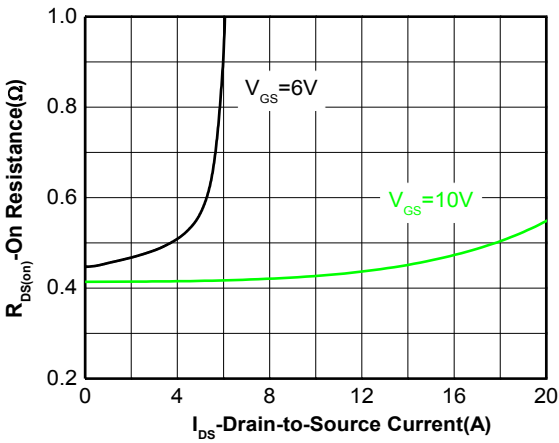
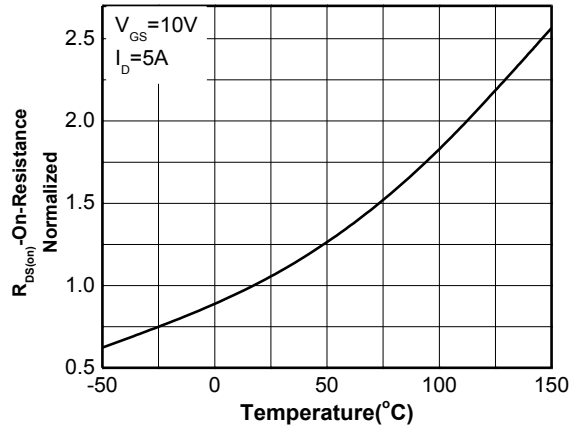
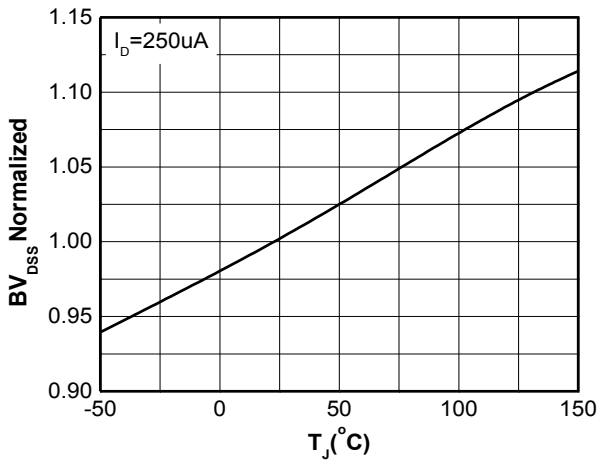
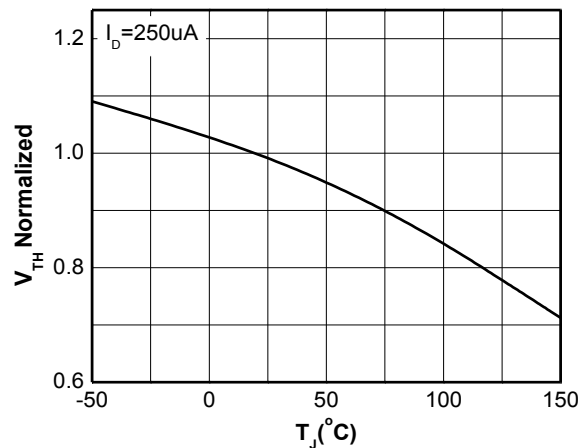
Absolusion Maximum Ratings $T_A=25^{\circ}\text{C}$ unless otherwise noted					
Parameter	Symbol	WCR470N60T	WCR470N60TF	Unit	
Drain-Source Voltage	$V_{DS}$	600		V	
Gate-Source Voltage	$V_{GS}$	$\pm 30$			
Continuous Drain Current <sup>A</sup>	$I_D$	$T_C=25^{\circ}\text{C}$	9.4	A	
		$T_C=100^{\circ}\text{C}$	5.9		
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	25		A	
Single Pulsed Avalanche Energy <sup>C</sup>	$E_{AS}$	120		mJ	
Avalanche Current <sup>B</sup>	$I_{AR}$	2		A	
Repetitive Avalanche Energy <sup>B</sup>	$E_{AR}$	0.28		mJ	
Power Dissipation	$P_D$	$T_C=25^{\circ}\text{C}$	73.5	29.8	W
		Derate above $25^{\circ}\text{C}$	0.58	0.24	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					
Maximum Junction-to-Ambient	$R_{\theta JA}$	60	80	$^{\circ}\text{C}/\text{W}$	
Maximum Junction-to-Case	$R_{\theta JC}$	1.7	4.2		

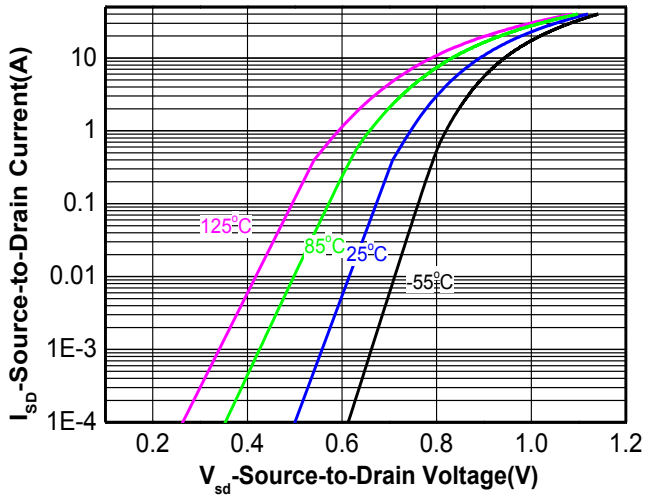
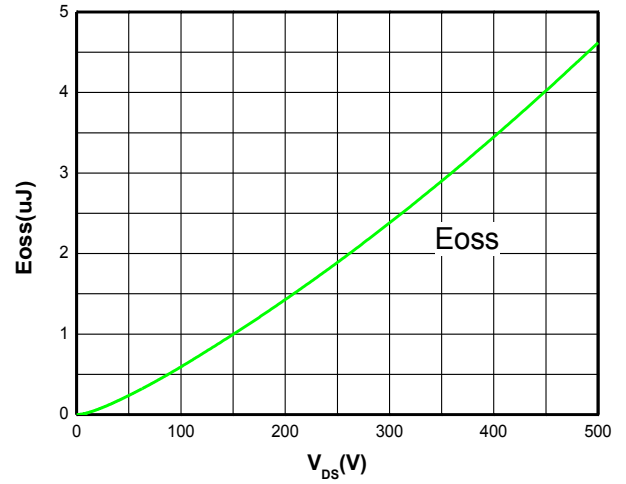
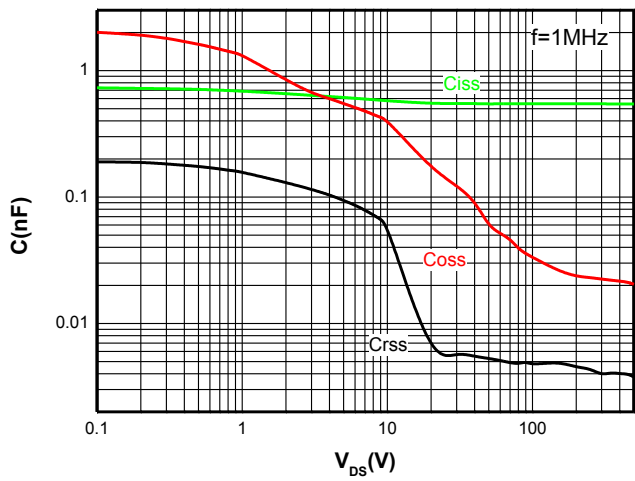
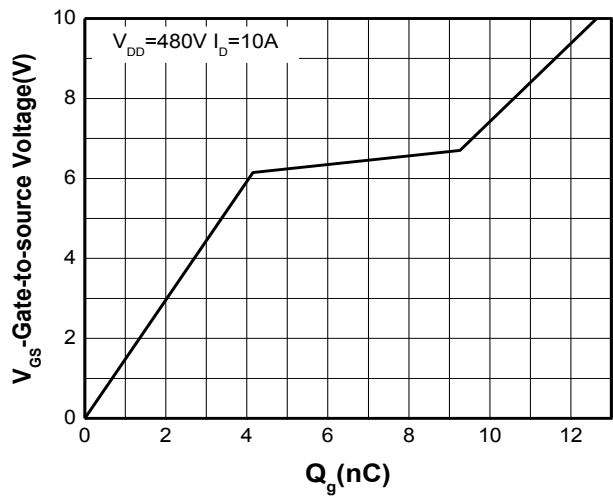
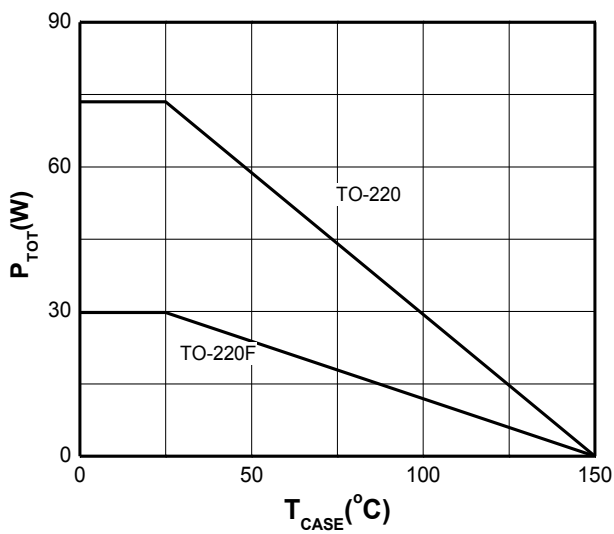
**Electronics Characteristics (T<sub>A</sub>=25°C, unless otherwise noted)**

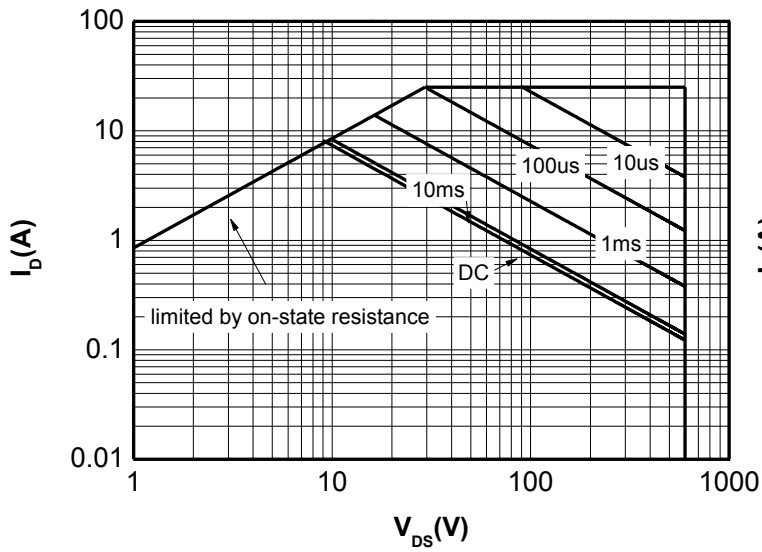
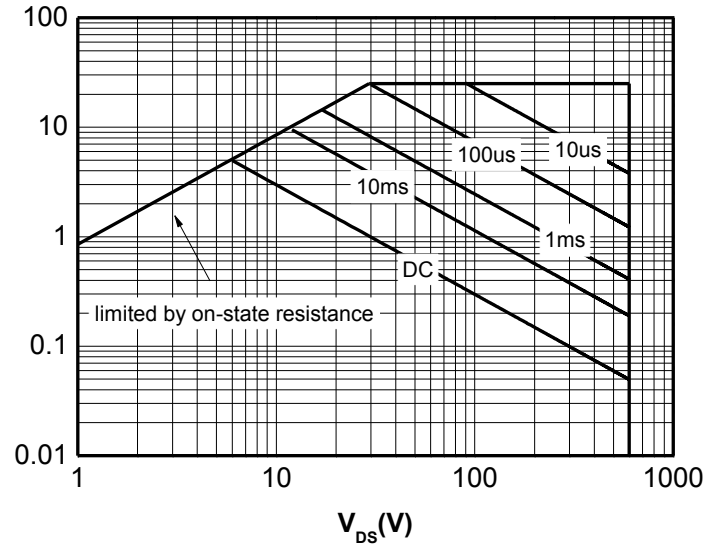
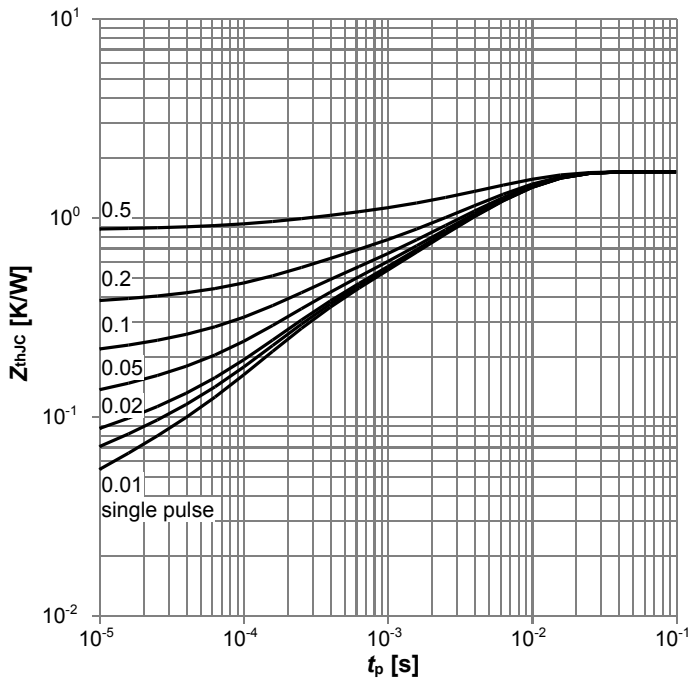
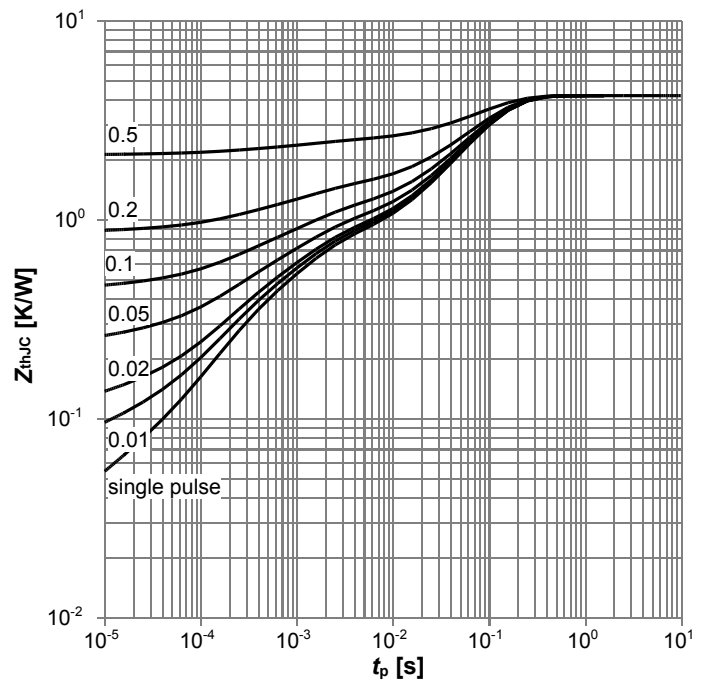
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250uA, T <sub>J</sub> =25°C	600			V
		V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250uA, T <sub>J</sub> =150°C		650		V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V, T <sub>J</sub> =25°C			1	uA
		V <sub>DS</sub> = 480V, V <sub>GS</sub> = 0V, T <sub>J</sub> =125°C			10	uA
Gate-to-source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 30 V			± 100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250uA	2.5	3.7	4.5	V
Drain-to-source On-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 5A		0.42	0.47	Ω
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 40V, I <sub>D</sub> = 5A (NOTE D)			20	s
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 30 V		547		pF
Output Capacitance	C <sub>OSS</sub>			123		
Reverse Transfer Capacitance	C <sub>RSS</sub>			6		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 480 V, I <sub>D</sub> = 10A (NOTE D, E)		12.6		nC
Gate-to-Source Charge	Q <sub>GS</sub>			4.1		
Gate-to-Drain Charge	Q <sub>GD</sub>			5.1		
Gate resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHZ		4.7		Ω
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 400 V, I <sub>D</sub> = 5 A, R <sub>G</sub> =20 Ω (NOTE D, E)		20		ns
Rise Time	t <sub>r</sub>			19		
Turn-Off Delay Time	t <sub>d(off)</sub>			39		
Fall Time	t <sub>f</sub>			14		
<b>Drain to Source Diode Characteristics and Maximum Ratings</b>						
Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 10.0A			1.5	V
Body-Diode Continuous Current	I <sub>S</sub>				9.4	A
Body-Diode Pulsed Current	I <sub>SM</sub>				26	A
Body Diode Reverse Recovery Time	T <sub>rr</sub>	I <sub>F</sub> =9.5A, di/dt=100A/us, V <sub>DS</sub> =100V(NOTE D)		346		nS
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			2.25		uC
Peak reverse recovery current	I <sub>rr</sub>			13		A

**NOTES:**

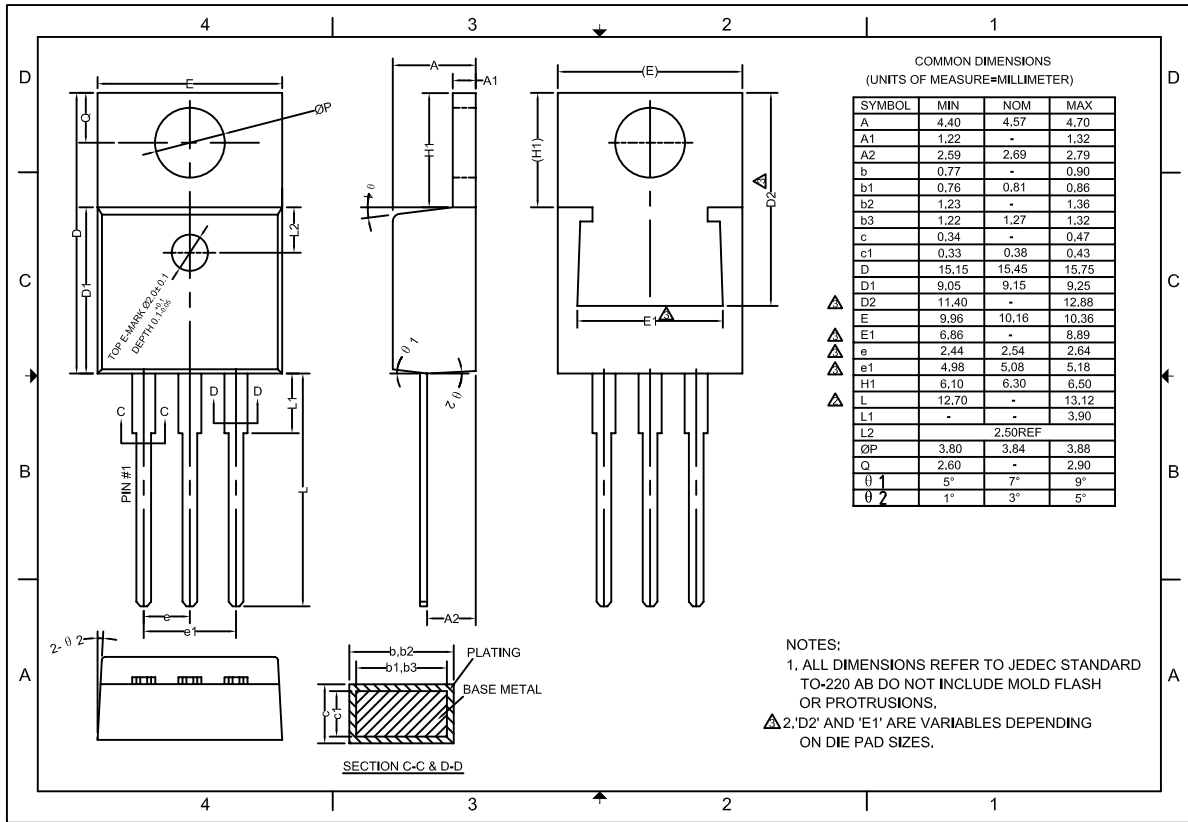
- Drain current limited by maximum junction temperature. Maximum duty cycle D=0.75
- Pulse width limited by maximum junction temperature
- L=60mH, I<sub>AS</sub>=2A, V<sub>DD</sub>=150V, Starting T<sub>J</sub>=25°C
- Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%
- Essentially Independent of Operating 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<sub>J(MAX)</sub>=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**

**Breakdown Voltage vs. Junction temperature**
**On-Resistance vs. Junction temperature**

**Threshold voltage vs. Junction temperature**


**Body diode forward voltage**

**Coss stored Energy**

**Capacitance**

**Gate charge Characteristics**

**Power dissipation**


**TO-220**
**Safe Operating Area(Note F)**

**TO-220F**
**Safe Operating Area(Note F)**

**TO-220**

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

## Package outline dimensions

**TO-220**

**TO-220F**
